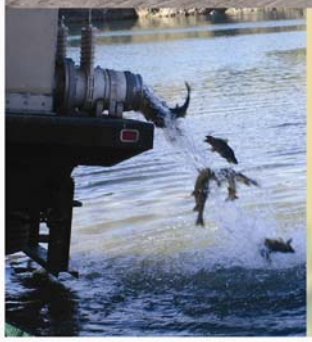
# Lower Colorado River Multi-Species Conservation Program

*Balancing Resource Use and Conservation*

## Final Implementation Report, Fiscal Year 2008 Work Plan, and Budget Fiscal Year 2006 Accomplishment Report



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

June 2007

# Lower Colorado River Multi-Species Conservation Program
# Steering Committee Members

**Federal Participant Group**

Bureau of Reclamation
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
The Cocopah Indian Tribe

**Conservation Participant Group**

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

# Lower Colorado River
# Multi-Species Conservation Program

## Final Implementation Report,
## Fiscal Year 2008 Work Plan, and Budget
## Fiscal Year 2006 Accomplishment Report

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

**June 2007**

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## Tables

# Acronyms

| | |
|---|---|
| AGFD | Arizona Game and Fish Department |
| AMP | Adaptive Management Program |
| ASU | Arizona State University |
| BO | Biological and Conference Opinion |
| BHCO | Brown-headed Cowbird |
| BLM | Bureau of Land Management |
| BLRA | California Black Rail |
| BONY | Bonytail |
| CAP | Central Arizona Project |
| CAWCD | Central Arizona Water Conservation District |
| CDFG | California Department of Fish and Game |
| CESA | California Endangered Species Act |
| CLRA | Yuma Clapper Rail |
| CNWR | Cibola National Wildlife Refuge |
| CRIT | Colorado River Indian Tribes |
| CVCA | Cibola Valley Conservation Area |
| ESA | Endangered Species Act |
| FLSU | Flannelmouth Sucker |
| FMA | Funding and Management Agreement |
| FY | Fiscal Year |
| GBBO | Great Basin Bird Observatory |
| GIS | Geographic Information System |
| GPS | Global Positioning System |
| HCP | Habitat Conservation Plan |
| HUCH | Humpback Chub |
| IA | Implementation Agreement |
| ISC | Interim Surplus Criteria |
| ISG | Interim Surplus Guidelines |
| LCR | Lower Colorado River |
| LCR MSCP | LCR Multi-Species Conservation Program |
| LEBI | Western Least Bittern |
| MAPS | Monitoring Avian Productivity and Survivorship |
| MCWA | Mohave County Water Authority |
| Metropolitan | The Metropolitan Water District of Southern California |
| MSHCP | Clark County Multi-Species Habitat Conservation Program |
| NAU | Northern Arizona University |
| NDOW | Nevada Division of Wildlife |
| NEPA | National Environmental Policy Act |
| NFH | National Fish Hatchery |
| NFWG | Native Fish Work Group |
| NPS | National Park Service |
| NWR | National Wildlife Refuge |
| PIT | Passive Integrated Transponder |
| PVER | Palo Verde Ecological Reserve |
| RASU | Razorback Sucker |
| Reclamation | Bureau of Reclamation |
| SDCWA | San Diego County Water Authority |
| SFH | State Fish Hatchery |
| SIA | Secretarial Implementation Agreement |
| SNWA | Southern Nevada Water Authority |
| SWA | State Wildlife Area |
| SWFL | Southwestern Willow Flycatcher |
| TL | Total Length |
| U of A | University of Arizona |
| UCD | University of California, Davis |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| WMA | Wildlife Management Area |
| YAO | Reclamation, Yuma Area Office |
| YBCU | Yellow-billed Cuckoo |

## Program Overview

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a partnership of Federal and non-Federal stakeholders responding to the need to balance the use of the Lower Colorado River water resources and the conservation of native species and their habitats in compliance with the Endangered Species Act (ESA). This is a long-term plan to conserve at least 26 species along the Lower Colorado River from Lake Mead to the Southerly International Boundary of Mexico through implementation of a Habitat Conservation Plan (HCP).

This long-term (50-year) program will accommodate current water diversions and power production, and optimize opportunities for future water and power development, to the extent consistent with the law. The comprehensive program addresses future Federal agency consultation needs under Section 7 of the ESA, and non-Federal agency needs for endangered species incidental take authorization under Section 10 of the ESA. The program also allows California agencies to meet their obligations under California state law for the California Endangered Species Act (CESA).

Twenty-six Federal or state-listed candidate and sensitive species and their associated habitats, ranging from aquatic and wetland habitats to riparian and upland areas, are covered in the LCR MSCP. Of the 26 covered species, 6 are currently listed under the Federal ESA. The program addresses the biological needs of mammals, birds, fish, amphibians, and reptiles, as well as invertebrates and plants.

Implementing the LCR MSCP will create 8,132 acres of new habitat (5,940 acres of cottonwood-willow, 1,320 acres of honey mesquite, 512 acres of marsh, and 360 acres of backwater) and produce 660,000 subadult razorback suckers and 620,000 bonytail to augment the existing populations of these fish in the Lower Colorado River. The LCR MSCP may also participate in the recovery programs for these fish by funding other appropriate activities in lieu of stocking. The program also establishes a $25 million fund to support projects implemented by land-use managers to protect and maintain existing habitat for covered species.

The program's estimated cost, in 2003 dollars, is $626 million and will be annually adjusted for inflation. The Bureau of Reclamation (Reclamation) will pay 50% of the LCR MSCP cost. The states of California, Nevada, and Arizona will pay the remaining 50%, with California paying one-half of the state total, and Nevada and Arizona each paying one-quarter of the state total.

## Program Implementation

On April 2, 2005, and April 4, 2005, the Secretary of the Interior, representatives from Arizona, California, and Nevada, and water and power organizations in these states signed the program documents required to implement the LCR MSCP. Program documents for the LCR MSCP include an Environmental Impact Statement/Environmental Impact Report, a Biological Assessment, a Biological and Conference Opinion (2005 BO), an HCP, a Record of Decision, a Funding and Management Agreement (FMA), an Implementation Agreement (IA), and a Section

10 Permit. These documents can be found on the LCR MSCP Web site at http://www.lcrmscp.gov

Implementation of the LCR MSCP also provides compliance for two other actions:

1. In December of 2001, the U.S. Fish and Wildlife Service (USFWS) issued to Reclamation the "Biological Opinion for Interim Surplus Criteria, Secretarial Implementation Agreements, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary, Arizona, California and Nevada" (2001 BO). Although this is a separate compliance action, the requirements listed in the 2001 BO were integrated into the LCR MSCP and are being implemented by Reclamation in conjunction with the LCR MSCP. Section 8.6 of the FMA states that implementation of the 2001 Biological Opinion conservation and mitigation measures shall be credited against the requirements of the LCR MSCP in accordance with the HCP.

2. On April 4, 2005, Reclamation entered into a Memorandum of Agreement with the California Partners to implement the LCR MSCP in a coordinated manner to help meet the requirements of the CESA permit issued by the California Department of Fish and Game. The requirements of that CESA permit are generally consistent with the LCR MSCP HCP. A copy of the Memorandum of Agreement and the CESA Permit are available from the California Partners upon request.

As agreed to in the FMA, Reclamation is the entity responsible for implementing the LCR MSCP over the 50-year term of the program. The FMA also calls for the establishment of a Steering Committee, currently consisting of 56 entities, to provide input and oversight functions in support of LCR MSCP implementation. The Steering Committee includes non-Federal and Federal entities that are receiving ESA coverage through the LCR MSCP, or stakeholders interested in the environment of the Lower Colorado River. A complete list of Steering Committee membership can be viewed on the LCR MSCP Web site. Jerry Zimmerman, Colorado River Board of California, served as Chair of the Steering Committee, and George Cann, Colorado River Commission of Nevada, served as Vice-Chair for FY06.

Section 7.4.1 of the FMA requires Reclamation to submit an Implementation Report, Work Plan and Budget (Annual Report) to the Steering Committee each year, consistent with the program documents. This Annual Report contains a description of conservation activities accomplished during FY06, a summary of work underway during FY07, and proposed work to be performed during FY08. It also documents research and monitoring activities undertaken in support of the LCR MSCP program. Incidental Take for covered actions implemented during FY06 is also documented. This Annual Report fully meets the reporting requirements outlined in Section 7.4.1 of the FMA.

## LCR MSCP Program Funding

As outlined in the FMA, the total program cost in 2003 dollars is $626 million split in a 50-50 cost share between the Federal and non-Federal entities. Table 7-1 of the HCP outlines the

annual minimum funding level before inflation. Each year, the annual program cost is adjusted for inflation based on a formula outlined in Section 8.1.1 of the FMA. Table 1-1a provides Annual Contributions before inflation, preliminary Composite Inflation Indexes used to calculate both FY07 and FY08, and the Indexed Annual Contributions.

**Table 1-1a.** Federal/Non-Federal Funding Requirements for Lower Colorado River Multi-Species Conservation Program

| Fiscal Year | Annual Contribution Before Inflation | Composite Inflation Index | Composite Calculation Year* | Indexed Annual Program | Indexed Annual Federal | Indexed Annual Non-Federal |
|---|---|---|---|---|---|---|
| 2006 | $11,214,000 | 1.083 | 2004 | $12,144,762 | $6,072,381 | $6,072,381 |
| 2007 | $11,214,000 | 1.122 | 2005 | $12,582,108 | $6,291,054 | $6,291,054 |
| 2008 | $11,214,000 | 1.187 | 2006 | $13,311,018 | $6,655,509 | $6,655,509 |

*Indexed Annual Program costs are calculated using the Composite Inflation Index from 2 years prior as outlined in the FMA.

Section 8.1.2 of the FMA states that funds provided by either a Federal Party or a State Permittee that are in excess of their funding obligation for a specific year shall be treated as a credit against future funding obligations. Any shortage of the funds provided by either a Federal Party or a State Permittee will be treated as a deficit to future funding obligations. Table 1-1b provides a listing of funding credits by funding entity.

**Table 1-1b.** Funding Credit and Deficit Report

| Fiscal Year | Credits | Deficits | Funding Entity |
|---|---|---|---|
| 2004 | $3,381,440 | $0 | Reclamation |
| 2005 | $5,980,712 | $0 | Reclamation |
| 2005 | $145,737 | $0 | San Diego County Water Authority |
| 2006 | $506,149 | $0 | Reclamation |
| 2006 | $500,000 | $0 | San Diego County Water Authority |

Table 1-1c provides a summary of the LCR MSCP financial accomplishments. The table outlines required program funding, credits and deficits, the budget available in a given fiscal year, program accomplishment per year, and the LCR MSCP cumulative financial accomplishment.

**Table 1-1c.** LCR MSCP Program Account

| Fiscal Year | Required Federal Funding | Required Non-Federal Funding | Federal Credits | Non-Federal Credits | Total Budget Available | Program Accomplishment |
|---|---|---|---|---|---|---|
| 2004 | $0 | $0 | $3,381,440 | $0 | $3,381,440 | $3,381,440 |
| 2005 | $0 | $0 | $5,980,712 | $145,737 | $6,126,449 | $6,126,449 |
| 2006 | $6,072,381 | $6,072,381 | $506,149 | $500,000 | $13,150,911 | $13,150,911 |
| | | | | | **Total:** | **$22,658,800** |

## FY08 Contributions and Adjustments

As outlined in Table 1-1a, the annual funding commitment for FY08 is $11,214,000, based on the 2003 estimate, and $13,311,018 after the preliminary Composite Inflation Index of 1.187 is applied. In accordance with Section 8.3 of the FMA, the non-Federal share of the cost by state and the Federal share of the cost for FY08 are shown below. Section 8.3 of the FMA allows for adjusted non-Federal funding during the first 10 years of the program. The FY08 final funding amounts for the three states are shown below (amounts based on direction from the Central Arizona Water Conservation District—see Appendix A):

**Table 1-2.** FY2008 Contribution Schedule

| Funding Entity | FY08 Contributions | FY08 Adjusted Contributions |
|---|---|---|
| **Federal:** | **$6,655,509.00** | **$6,655,509.00** |
| **Non-Federal:** | **$6,655,509.00** | **$6,655,509.00** |
| California | $3,327,754.50 | $3,826,917.67 |
| Arizona | $1,663,877.25 | $665,550.90 |
| Nevada | $1,663,877.25 | $2,163,040.43 |
| **Total:** | **$13,311,018.00** | **$13,311,018.00** |

## 2001 Biological Opinion Account

A total of $6 million, plus interest, is available to Reclamation through the 2001 BO Funding Agreement. This funding is part of LCR MSCP contributions from the San Diego County Water Authority (SDCWA) and The Metropolitan Water District of Southern California (Metropolitan) and will be used to meet the financial commitments for these entities. The mitigation requirements outlined in the 2001 BO must be implemented on the front-end of the LCR MSCP;

therefore, funding in excess of the entities' LCR MSCP annual required contribution may be requested by Reclamation and result in a funding credit in the early years.

In FY06, Reclamation withdrew $145,737 from SDCWA and $100,000 from Metropolitan for implementation of the 2001 BO activities. These amounts were part of the FY06 LCR MSCP required funding contribution. In addition, Reclamation drew an additional $500,000 in FY06 from SDCWA's account. This money was used to accelerate construction at Imperial Ponds (E14). While the FY06 LCR MSCP required funding is not a credit, the $500,000 from SDCWA is a credit as shown in Table 1-1b.

## Habitat Maintenance Fund

As outlined in Section 8.4.2 of the FMA, during the first 10 years of LCR MSCP implementation, a share of each state's contribution will be set aside in an interest bearing account referred to as the Existing Habitat Maintenance Fund accounts. While each state is maintaining its own account, interest earned on these accounts will be added to the account for the benefit of implementing the LCR MSCP. Total funds contributed in FY06, required in FY07, and projected to be contributed in FY08 are listed below. No funds have been withdrawn from any of the accounts to date.

**Table 1-3.** Existing Habitat Maintenance Fund

| Funding Partner | FY06 Contribution | FY06 Contribution with interest | FY07 Contribution | FY08 Projected Contribution |
|---|---|---|---|---|
| California: | $270,750 | $278,250 | $280,500 | $296,750 |
| Arizona: | $135,375 | $138,251 | $140,250 | $148,375 |
| Nevada: | $135,375 | $138,871 | $140,250 | $148,375 |
| **Total:** | **$541,500** | **$555,372** | **$561,000** | **$593,500** |

## In-Kind Contributions

Section 8.7.4 of the FMA provides that in-kind goods or services shall be credited based on approval by the Program Manager and the Steering Committee. In April 2006, the Steering Committee passed Program Decision Document 06-001, *In-Kind Credit for Land and Water Contributions*, which provides specific guidelines for the calculation of in-kind credit for land and water. No in-kind contributions were received in FY06.

## CESA Permit

As discussed in the Program Implementation section of this Annual Report, the California Partners are responsible for meeting the terms of the CESA permit. While Reclamation and

non-Federal entities located in Nevada and Arizona have no legal requirement to comply with a CESA permit with respect to the LCR MSCP, Reclamation is working with the California Partners in meeting their requirements.

An aspect of the Memorandum of Agreement between Reclamation and the California Partners regarding LCR MSCP conservation actions for the CESA permit discusses Reclamation's commitment to place a high percentage of mesquite habitat in California. In exchange, the California Partners have made land and water available in the Palo Verde Irrigation District for program purposes. Given this exchange and the overall commonality between the CESA permit and the HCP, these California-specific actions are not expected to result in additional program costs.

## Proposed FY08 Program and FY06 Accomplishment

The minimum funding required in the LCR MSCP program documents for FY08 is $13,311,018. Reclamation is proposing an annual program budget totaling $14,947,500. Table 1-4 shows, by work task, FY06 estimates, and actual accomplishment, cumulative program accomplishment (FY04-FY06), FY07 approved program, FY08 proposed program, and out-year funding for FY09 and FY10. The FY08 proposed program provides funding for:

| | |
|---|---|
| Program Administration | $1,187,000 |
| Fish Augmentation | $1,285,000 |
| Species Research | $1,922,000 |
| System Monitoring | $2,113,000 |
| Conservation Area Development and Management | $6,382,000 |
| Post-Development Monitoring | $730,000 |
| Adaptive Management Program | $735,000 |
| Existing Habitat Maintenance | $593,500 |
| **TOTAL** | **$14,947,500** |

Reclamation will ensure the minimum program accomplishment occurs that meets the Indexed Annual Contribution outlined in Table 1-1a of $13,311,018; however, Reclamation is presenting work tasks totaling $14,947,500 to ensure adequate flexibility in accomplishing the program. By receiving Steering Committee and USFWS input on the broad range of work, Reclamation can accomplish additional work should funds become available, or a change in work priorities as future circumstances arise. In accordance with the FMA, a description of the work is being presented to the Steering Committee to ensure that no disputes exist, and the description will subsequently be presented to USFWS to ensure that work is consistent with the HCP.

Reclamation's goal is to fully implement the LCR MSCP in a biologically effective, cost-efficient, and transparent manner. During FY08, should Reclamation determine that a specific work task cannot be undertaken, funds identified for that specific work task will be redirected

and used for the following purposes: 1) funding another work task approved through this document, 2) increasing the funding for a work task that is expected to require funding in FY09 or FY10, 3) providing more than the minimum funding required to the Habitat Maintenance Fund, or 4) beginning activities associated with any changed circumstances as defined in Section 5.12.3 of the HCP, should any occur.

In FY06, Reclamation estimated work tasks totaling $12,144,500. Actual LCR MSCP costs for FY06 were $13,150,911. In accordance with the FMA, Reclamation is seeking a credit for FY06 in the amount of $506,149 and SDCWA is seeking a credit for FY06 in the amount of $500,000 (Tables 1-1b and 1-1c).

**Table 1-4.** Annual Funding Matrix

| Work Task | Name | FY2006 Estimate | FY2006 Actual Accomplishment[1] | Cumulative through FY2006[1] | FY2007 Approved Estimate | FY2008 Proposed Estimate | FY2009 Projected Estimate[2] | FY2010 Projected Estimate[2] |
|---|---|---|---|---|---|---|---|---|
| **A** | **Program Administration** | | | | | | | |
| A-1 | Program Administration | $1,000,000[3] | $1,120,653 | $1,567,243 | $1,142,196 | $1,187,000 | $1,187,000 | $1,187,000 |
| | | **$1,000,000** | **$1,120,653** | **$1,567,243** | **$1,142,196** | **$1,187,000** | **$1,187,000** | **$1,187,000** |
| | | | | | | | | |
| **B** | **Fish Augmentation** | | | | | | | |
| B-1 | Lake Mohave Razorback Sucker Larvae Collection | $225,000 | $222,391 | $424,214 | $200,000 | $200,000 | $200,000 | $200,000 |
| B-2 | Willow Beach National Fish Hatchery | $200,000 | $206,486 | $386,486 | $225,000 | $235,000 | $235,000 | $235,000 |
| B-3 | Achii Hanyo Rearing Station | $25,000 | $13,190 | $113,190 | $50,000 | $50,000 | $50,000 | $50,000 |
| B-4 | Dexter National Fish Hatchery | $110,000 | $127,628 | $249,628 | $125,000 | $130,000 | $130,000 | $130,000 |
| B-5 | Bubbling Ponds Fish Hatchery | $140,000[4] | $176,017 | $214,017 | $225,000 | $235,000 | $235,000 | $235,000 |
| B-6 | Lake Mead Fish Hatchery | $45,000 | $101,713 | $133,713 | $55,000 | $50,000 | $50,000 | $50,000 |
| B-7 | Lake Side Rearing Ponds | $200,000 | $205,641 | $435,641 | $150,000 | $175,000 | $175,000 | $175,000 |
| B-8 | Fish Tagging Equipment | $45,000 | $50,870 | $194,332 | $75,000 | $75,000 | $75,000 | $75,000 |
| B-9 | Boulder City Wetlands Ponds | $0[5] | $570 | $4,370 | $0 | $0 | $0 | $0 |
| B-10 | Uvalde National Fish Hatchery | $60,000[4] | $57,122 | $57,122 | $260,000 | $60,000 | $60,000 | $60,000 |
| B-11 | Overton Wildlife Management Area | $35,000[5] | $39,704 | $39,704 | $75,000 | $75,000 | $75,000 | $75,000 |
| | | **$1,085,000** | **$1,201,332** | **$2,252,417** | **$1,440,000** | **$1,285,000** | **$1,285,000** | **$1,285,000** |

**Table 1-4.** (cont.)

| Work Task | Name | FY2006 Estimate | FY2006 Actual Accomplishment[1] | Cumulative through FY2006[1] | FY2007 Approved Estimate | FY2008 Proposed Estimate | FY2009 Projected Estimate[2] | FY2010 Projected Estimate[2] |
|---|---|---|---|---|---|---|---|---|
| **C** | **Species Research** | | | | | | | |
| C-1 | Brown-Headed Cowbird Trap Assessment | $85,000 | $73,525 | $125,989 | $0 | $0 | $0 | $0 |
| C-2 | Sticky Buckwheat and Threecorner Milkvetch | $25,000 | $10,000 | $10,000 | $11,000 | $11,000 | $11,000 | $11,000 |
| C-3 | MSCP Covered Species Profile Development | $100,000 | $161,445 | $209,292 | $15,000 | $15,000 | $15,000 | $15,000 |
| C-4 | Relict Leopard Frog | $15,000 | $14,128 | $14,128 | $11,000 | $11,000 | $11,000 | $11,000 |
| C-5 | Effects of Abiotic Factors on Insect Populations… | $90,000 | $8,584 | $8,584 | $90,000 | $90,000 | $90,000 | $0 |
| C-6 | Insect Population Biology in Riparian Restoration… | $126,000 | $76,875 | $76,875 | $30,000 | $0 | $0 | $0 |
| C-7 | Survey and Habitat Characterization for MacNeill's Sootywing Skipper | $150,000 | $189,789 | $189,789 | $160,000 | $160,000 | $80,000 | $0 |
| C-8 | Razorback Sucker Survival Study | $190,000 | $187,974 | $425,953 | $190,000 | $205,000 | $25,000 | $0 |
| C-9 | Razorback Sucker Pen Rearing Tests | $48,000 | $30,254 | $72,254 | $35,000 | $0 | $0 | $0 |
| C-10 | Razorback Sucker Growth Studies | $125,000 | $63,518 | $63,518 | $125,000 | $125,000 | $125,000 | $125,000 |
| C-11 | Bonytail Rearing Study | $165,000 | $95,301 | $95,301 | $165,000 | $165,000 | $165,000 | $165,000 |
| C-12 | Demographics… Razorback Sucker | $185,000 | $173,576 | $173,576 | $185,000 | $215,000 | $30,000 | $0 |

**Table 1-4.** (cont.)

| Work Task | Name | FY2006 Estimate | FY2006 Actual Accomplishment[1] | Cumulative through FY2006[1] | FY2007 Approved Estimate | FY2008 Proposed Estimate | FY2009 Projected Estimate[2] | FY2010 Projected Estimate[2] |
|---|---|---|---|---|---|---|---|---|
| C-13 | Lake Mead Razorback Sucker | $350,000 | $265,621 | $363,621 | $300,000 | $150,000 | $150,000 | $150,000 |
| C-14 | Humpback Chub Program Support | $15,000 | $38,229 | $38,229 | $10,000 | $10,000 | $10,000 | $10,000 |
| C-15 | Flannelmouth Sucker Habitat… | $80,000 | $98,025 | $150,025 | $80,000 | $80,000 | $80,000 | $80,000 |
| C-16 | Evaluation of Past Bonytail Stocking | $0 | $0 | $0 | $60,000 | $0 | $0 | $0 |
| C-17 | Senator Wash Razorback Sucker | $0 | $0 | $45,000 | $0 | $0 | $0 | $0 |
| C-18 | Point Count Design… | $0 | $0 | $49,920 | $0 | $0 | $0 | $0 |
| C-19 | Southwestern Willow Flycatcher Feather and… | $0 | $0 | $20,970 | $0 | $0 | $0 | $0 |
| C-20 | Southwestern Willow Flycatcher Prey Base… | $0 | $0 | $104,981 | $0 | $0 | $0 | $0 |
| C-21 | Yellow-Billed Cuckoo Demographics… | $0 | $0 | $112,964 | $0 | $0 | $0 | $0 |
| C-22 | Yellow-Billed Cuckoo Surveys… | $0 | $0 | $50,971 | $0 | $0 | $0 | $0 |
| C-23 | Evaluation of Remote Sensing Techniques of… | $0 | $0 | $0 | $145,000 | $145,000 | $0 | $0 |
| C-24 | Bird Habitat Requirements | $0 | $0 | $0 | $0 | $150,000 | $150,000 | $150,000 |
| C-25 | Imperial Ponds Native Fish… | $0 | $0 | $0 | $0 | $225,000 | $225,000 | $225,000 |
| C-26 | Raceway Rearing at Lake Mead SFH | $0 | $0 | $0 | $0 | $100,000 | $100,000 | $100,000 |

**Table 1-4.** (cont.)

| Work Task | Name | FY2006 Estimate | FY2006 Actual Accomplishment[1] | Cumulative through FY2006[1] | FY2007 Approved Estimate | FY2008 Proposed Estimate | FY2009 Projected Estimate[2] | FY2010 Projected Estimate[2] |
|---|---|---|---|---|---|---|---|---|
| C-27 | Small Mammal Population Studies | $0 | $0 | $0 | $0 | $65,000 | $65,000 | $65,000 |
| | | **$1,749,000** | **$1,486,844** | **$2,401,940** | **$1,612,000** | **$1,922,000** | **$1,332,000** | **$1,107,000** |
| | | | | | | | | |
| **D** | **System Monitoring** | | | | | | | |
| D-1 | Marsh Bird Presence/Absence Surveys | $25,000 | $44,997 | $79,917 | $25,000 | $35,000 | $35,000 | $35,000 |
| D-2 | Southwestern Willow Flycatcher Presence/Absence | $880,000 | $848,505 | $1,633,099 | $925,000 | $575,000 | $575,000 | $575,000 |
| D-3 | Southwestern Willow Flycatcher Habitat Monitoring | $90,000 | $74,346 | $234,315 | $90,000 | $90,000 | $90,000 | $90,000 |
| D-4 | Southwestern Willow Flycatcher Hualapai Tribal … | $68,000 | $66,046 | $130,703 | $76,000 | $78,000 | $0 | $0 |
| D-5 | Monitoring Avian Productivity… | $300,000 | $245,205 | $539,050 | $300,000 | $300,000 | $300,000 | $300,000 |
| D-6 | System Monitoring Riparian Obligate Avian Species | $100,000 | $158,961 | $158,961 | $100,000 | $135,000 | $135,000 | $135,000 |
| D-7 | Yellow-Billed Cuckoo Presence/Absence | $500,000 | $454,775 | $454,775 | $500,000 | $500,000 | $500,000 | $500,000 |
| D-8 | Razorback Sucker and Bonytail Stock Assessment | $285,000 | $306,624 | $472,624 | $325,000 | $300,000 | $300,000 | $300,000 |
| D-9 | System Monitoring and Research of Covered Bat… | $110,000 | $99,887 | $154,887 | $100,000 | $100,000 | $100,000 | $100,000 |

**Table 1-4.** (cont.)

| Work Task | Name | FY2006 Estimate | FY2006 Actual Accomplishment[1] | Cumulative through FY2006[1] | FY2007 Approved Estimate | FY2008 Proposed Estimate | FY2009 Projected Estimate[2] | FY2010 Projected Estimate[2] |
|---|---|---|---|---|---|---|---|---|
| D-10 | Small Mammal Population Studies | $60,000 | $19,344 | $19,344 | $65,000 | $0 | $0 | $0 |
| D-11 | Vegetation Type… | $0 | $0 | $725,873 | $0 | $0 | $0 | $0 |
| | | **$2,418,000** | **$2,318,690** | **$4,603,548** | **$2,506,000** | **$2,113,000** | **$2,035,000** | **$2,035,000** |
| | | | | | | | | |
| **E** | **Conservation Area Development and Management** | | | | | | | |
| E-1 | Beal Lake Riparian and Marsh | $200,000 | $272,378 | $1,897,645 | $358,000 | $150,000 | $265,000 | $275,000 |
| E-2 | Beal Lake Native Fish | $210,000 | $270,840 | $485,412 | $100,000 | $50,000 | $70,000 | $70,000 |
| E-3 | ‘Ahakhav Tribal Preserve | $120,000 | $53,580 | $1,135,299 | $60,000 | $145,000 | $145,000 | $195,000 |
| E-4 | Palo Verde Ecological Preserve | $310,000 | $590,486 | $657,231 | $976,000 | $1,185,000 | $1,460,000 | $2,000,000 |
| E-5 | Cibola Valley Conservation Area | $1,633,000 | $1,292,929 | $1,410,645 | $2,656,000 | $1,703,000 | $1,800,000 | $1,950,000 |
| E-6 | Cottonwood Genetics Study | $25,000 | $23,438 | $243,369 | $15,000 | $15,000 | $0 | $0 |
| E-7 | Mass Planting… | $10,000 | $12,309 | $319,309 | $15,000 | $15,000 | $0 | $0 |
| E-8 | Seed Feasibility Study | $150,000 | $488,610 | $492,610 | $160,000 | $65,000 | $210,000 | $0 |
| E-9 | Hart Mine Marsh | $100,000 | $117,539 | $170,859 | $125,000 | $250,000 | $1,000,000 | $1,250,000 |
| E-10 | Walker Lake | $75,000 | $0 | $0 | $0 | $0 | $0 | $0 |
| E-11 | Draper Lake | $70,000 | $0 | $0 | $0 | $0 | $0 | $0 |
| E-12 | Butler Lake | $140,000 | $32,151 | $109,717 | $120,000 | $0 | $0 | $0 |
| E-13 | McAllister Lake | $75,000 | $82,437 | $153,488 | $50,000 | $0 | $0 | $0 |
| E-14 | Imperial Ponds | $595,000 | $2,114,868 | $2,219,177 | $2,070,000 | $974,000 | $498,000 | $252,000 |

**Table 1-4.** (cont.)

| Work Task | Name | FY2006 Estimate | FY2006 Actual Accomplishment[1] | Cumulative through FY2006[1] | FY2007 Approved Estimate | FY2008 Proposed Estimate | FY2009 Projected Estimate[2] | FY2010 Projected Estimate[2] |
|---|---|---|---|---|---|---|---|---|
| E-15 | Backwater Inventory | $200,000 | $265,497 | $265,497 | $430,000 | $387,000 | $285,000 | $460,000 |
| E-16 | Conservation Area Site Selection | $200,000 | $158,330 | $293,144 | $50,000 | $200,000 | $200,000 | $200,000 |
| E-17 | Topock Marsh Pumping | $70,000 | $1,127 | $1,127 | $70,000 | $5,000 | $70,000 | $70,000 |
| E-18 | Law Enforcement and Fire Suppression | $50,000 | $0 | $0 | $75,000 | $25,000 | $75,000 | $75,000 |
| E-19 | Needles-Topock (AZ RM 240) Stabilization | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| E-20 | Pintail Slough | $0 | $0 | $95,000 | $0 | $0 | $0 | $0 |
| E-21 | Planet Ranch, Bill Williams River | $0 | $0 | $20,000 | $0 | $0 | $0 | $0 |
| E-22 | Pratt Agricultural Lease | $0 | $0 | $5,088 | $0 | $0 | $0 | $0 |
| E-23 | Mittry Lake Fire Rehabilitation… | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| E-24 | Unit 1 – Cibola National Wildlife Refuge | $0 | $0 | $0 | $120,000[6] | $1,213,000 | $1,072,000 | $1,236,000 |
| | | **$4,233,000** | **$5,776,519** | **$9,974,617** | **$7,450,000** | **$6,382,000** | **$7,150,000** | **$8,033,000** |
| | | | | | | | | |
| **F** | **Post Development Monitoring** | | | | | | | |
| F-1 | Habitat Monitoring | $250,000 | $138,256 | $375,470 | $275,000 | $325,000 | $350,000 | $390,000 |
| F-2 | Avian Use of Restoration Sites | $125,000 | $28,524 | $106,095 | $150,000 | $150,000 | $150,000 | $150,000 |
| F-3 | Small Colonization of Restoration… | $45,000 | $10,384 | $37,761 | $50,000 | $55,000 | $55,000 | $55,000 |

**Table 1-4.** (cont.)

| Work Task | Name | FY2006 Estimate | FY2006 Actual Accomplishment[1] | Cumulative through FY2006[1] | FY2007 Approved Estimate | FY2008 Proposed Estimate | FY2009 Projected Estimate[2] | FY2010 Projected Estimate[2] |
|---|---|---|---|---|---|---|---|---|
| F-4 | Post-Development Monitoring of Covered Bat… | $0 | $0 | $0 | $60,000 | $70,000 | $70,000 | $70,000 |
| F-5 | Post-Development Monitoring of Fish Restoration Sites | $0 | $0 | $0 | $65,000 | $130,000 | $130,000 | $130,000 |
| | | **$420,000** | **$177,164** | **$519,326** | **$600,000** | **$730,000** | **$755,000** | **$795,000** |
| | | | | | | | | |
| **G** | **Adaptive Management Program** | | | | | | | |
| G-1 | Data Management | $225,000 | $97,959 | $332,959 | $650,000 | $450,000 | $450,000 | $450,000 |
| G-2 | Annual Report Writing and Production | $35,000 | $57,263 | $92,263 | $75,000 | $0 | $0 | $0 |
| G-3 | Adaptive Management Research Projects | $230,000 | $281,328 | $281,328 | $275,000 | $230,000 | $230,000 | $230,000 |
| G-4 | Science/Adaptive Management | $173,000 | $82,870 | $82,870 | $100,000 | $20,000 | $20,000 | $20,000 |
| G-5 | Public Outreach | $35,000 | $8,789 | $8,789 | $35,000 | $35,000 | $35,000 | $35,000 |
| | | **$698,000** | **$528,209** | **$798,209** | **$1,135,000** | **$735,000** | **$735,000** | **$735,000** |
| | | | | | | | | |
| **H** | **Existing Habitat Maintenance** | | | | | | | |
| H-1 | Existing Habitat Maintenance | $541,500[7] | $541,500 | $541,500 | $561,000 | $593,500 | $593,500 | $593,500 |
| | | **$541,500** | **$541,500** | **$541,500** | **$561,000** | **$593,500** | **$593,500** | **$593,500** |
| | | | | | | | | |
| | **Program Total:** | **$12,144,500[7]** | **$13,150,911** | **$22,658,800** | **$16,446,196[6]** | **$14,947,500** | **$15,072,500** | **$15,770,500** |

[1] Financial accomplishment is reported as obligations rather than expenditures to accurately portray program accomplishment.
[2] FY09 and FY10 numbers are not adjusted for projected inflation.

[3]A-1 Program Administration: The approved FY06 estimate was not inflated using the composite inflation index. The FY06 estimate increased from $1,000,000 to $1,102,494 after the composite inflation index was applied.
[4]B-10 Uvalde NFH: During the course of FY06, Uvalde NFH was identified as a rearing location for razorback sucker and bonytail. Funds of $60,000 were transferred from B-5 Bubbling Ponds to this new work task. In a letter dated 5-15-06, the USFWS stated that this new work task was consistent with the HCP.
[5]B-9 Boulder City Wetlands Ponds: During FY06, Boulder City declined to further participate in the MSCP fish augmentation program. Work Task B11, Overton Wildlife Management Area, was identified and funds re-assigned to maintain fish augmentation accomplishment. In a letter dated 5/15/06, the USFWS stated that this new work task was consistent with the HCP.
[6]E-24 Unit 1 – Cibola Valley National Wildlife Refuge: Steering Committee approved new work task at 4/25/07 meeting.
[7]H-1 Existing Habitat Maintenance: Total dollars in FY06 Estimate were $541,000. The number should have been $541,500.

# Compliance Reporting

## LCR MSCP

As required in the FMA, the following information is included in the Annual Report:

1. *A running tabulation of habitat created or restored by the LCR MSCP*.

   The LCR MSCP objectives include creating or restoring habitat for covered species. The marsh and terrestrial habitat objectives are initially based on land cover types as determined by the Anderson and Ohmart definitions. Backwater cover type is an area of open water with associated emergent vegetation. The backwater habitat is further defined as being suitable for fish.

   The following information outlines how Reclamation and USFWS will account for and credit the 8,132 acres of new habitat. The year that vegetation is planted or a backwater is constructed, Reclamation will begin accounting for those acres in the annual report. In the year that Reclamation determines the created or restored land cover types have developed or matured into what constitutes suitable habitat based on current knowledge of species needs, then that acreage will be credited toward the LCR MSCP objectives in the Compliance Section of the Annual Report. This will be done by moving the acres from the Year Established column of Table 1-5 to the Actual Habitat Created column noting the year it was achieved.

   Through the adaptive management process, establishment and management of habitat may evolve to reflect new knowledge of species needs. Existing created or restored habitats will not be replaced based on new knowledge, but may be modified or managed differently to reflect the current understanding of the species needs. Table 1-5 summarizes habitat creation by location, acres, and year initiated.

2. *A running tabulation and description of all Conservation Measures that have been completed from the commencement of the LCR MSCP to the date of the report.*

   Table1-6 provides a summary of fish repatriation. Table 1-7 provides a matrix showing those work tasks that work toward the completion of the conservation measures. Conservation measures are still in progress.

3. *A description of any take known to have occurred during the previous budget period.*

   In accordance with FMA section 7.4.1(F), any incidental take known to have occurred during LCR MSCP Implementation in FY06 is reported in Appendix B. The USFWS Section 10 Permit and the 2005 BO authorize incidental take resulting from conduct of Federal Covered Actions and non-Federal Covered Activities, and Reclamation's implementation of the Conservation Plan, as long as Conservation Measures and Avoidance and Minimization Measures are in place. Due to the wide range and scope of the program, surrogate measures were used in the program compliance documents to

quantify impacts. These same surrogates are used to determine types and levels of any incidental take known to have occurred in FY06. As described in the 2005 BO, the surrogate measures for incidental take are:

**Flow-Related:** Total loss of suitable habitat for covered species that utilize cottonwood-willow, marsh, and backwaters resulting from the changes in points of diversions, extension of the interim surplus guidelines (ISG), and implementation of the shortage criteria.

As total habitat loss is calculated for all of these actions, take is being documented as amount and type of covered actions and activities being implemented.

**Non-Flow-Related:** Acreage or miles of habitats affected by non-flow-related actions.

**Other Non-Flow-Related (Continuing Actions):** Acreage or miles of facilities affected by maintenance actions.

**Creation of Restoration Sites:** Affected habitat acreage for the covered species, with the understanding that during creation of higher value habitat there may be harassment of individuals.

Appendix B summarizes the surrogate measures for incidental take for Federal Flow-Related Actions, Federal Non-Flow-Related Actions, and Non-Federal Activities. Non-Federal Flow-Related Activities are included as part of the Federal Flow-Related Actions.

4. *Any recommendation made by the USFWS or any state wildlife agency regarding the LCR MSCP.*

   Appendix C contains the incoming letter from the USFWS stating that the two new work tasks for FY06 are consistent with the HCP, and the formal letters from the California Department of Fish and Game on the Fish Augmentation Plan.

5. *Approval or rejection of any minor modification described in Section 14.1 of the Implementation Agreement.*

   No minor modifications to the LCR MSCP have been made at this time.

**Table 1-5.** LCR MSCP Habitat Objectives

| Land Cover Type | Projected Acres[1] | Year Established | Projected Year To Be Credited | Actual Habitat Created (Acres) | Year Achieved |
|---|---|---|---|---|---|
| **Nurseries** | | | | | |
| (All Plant Species) | | | | | |
| Work Task E4 – PVER, Phase 1 | 31 | FY06 | | | |
| Work Task E5 – CVCA, Phase 1 | 22 | FY06 | | | |
| **Total** | **53** | | | | |
| **Cottonwood/Willow** | | | | | |
| Work Task E5 – CVCA, Phase 1 | 64 | FY06 | FY09 | | |
| Work Task E4 – PVER, Phase 2 | 80 | FY07 | FY10 | | |
| Work Task E5 – CVCA, Phase 3 | 105 | FY07 | FY10 | | |
| Work Task E4 – PVER, Phase 3 | 90 | FY08[2] | FY11 | | |
| Work Task E5 – CVCA, Phase 2 | 69 | FY08[2] | FY11 | | |
| Work Task E4 – PVER, Phase 4 | 110 | FY09[2] | FY11 | | |
| Work Task E24 – Crane Roost | 150 | FY09[2] | FY11 | | |
| **Total** | **668** | | | | |
| **Honey Mesquite** | | | | | |
| Work Task E5 – CVCA, Phase 4 | 60 | FY09[2] | FY10 | | |
| **Total** | **60** | | | | |
| **Marsh** | | | | | |
| Work Task E14 – Field 18 | 12 | FY08[2] | FY09 | | |
| Work Task E9 – Hart Mine Marsh | 100 | FY10[2] | FY11 | | |
| **Total** | **112** | | | | |
| **Backwater** | | | | | |
| Isolated | | | | | |
| Work Task E14 – Imperial Ponds | 80 | FY07 | FY08 | | |
| **Total** | **80** | | | | |
| Surface Connected | | | | | |
| **Total** | **0** | | | | |

[1]This column represents the land to be utilized at a specific site and the targeted land cover type. The actual vegetation planted will be a variety of native plant species developed in an integrated mosaic. This development provides habitat for multiple covered LCR MSCP species at the same site. Thus, two separate areas that meet the classification of cottonwood-willow land cover may exhibit different characteristics, such as vegetation density and plant species composition, depending on how the mosaic was developed and is being managed. Land cover types established under restoration research (E1, E3, E6, E7, and E8) are not included in the projected acres at this time.
[2]Projected.

**Table 1-6.** Summary of Fish Repatriation

| **Razorback Sucker** | |
|---|---|
| **Reach 2 (Lake Mohave)** | |
| FY05 Work Task B2 | 10,373 |
| FY05 Work Task B4 | 136 |
| FY05 Work Task B7 | 1,691 |
| FY06 Work Task B2 | 10,191 |
| FY06 Work Task B7 | 1,151 |
| **Total** | 23,542 |
| **Reach 3 Davis to Parker Dam** | |
| FY06 Work Task B2 | 6,268 |
| Total | 6,268 |
| Reach 4-5 (Below Parker Dam) | |
| FY05 Work Task B5 | 4,814 |
| FY06 Work Task B5 | 11,455 |
| **Total** | 16,269 |
| **Total Razorback Sucker** | **46,079** |
| **Bonytail** | |
| **Reach 3** | |
| FY05 Work Task B3 | 6,725 |
| FY06 Work Task B3 | 1,708 |
| FY06 Work Task B4 | 2,397 |
| **Total** | 10,830 |
| **Reach 4-5 (Below Parker Dam)** | |
| FY06 Work Task B3 | 4,006 |
| **Total** | 4,006 |
| **Total Bonytail** | **14,836** |
| | |
| **Total Razorback Sucker and Bonytail** | **60,915** |

**Table 1-7.** Status of Conservation Measures

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| Yuma Clapper Rail | CLRA1 | Create habitat, 512 acres | E4 E5 E9 E10 E11 E12 E13 E14 E15 E16 | E1 E4 E5 E9 E10 E11 E12 E13 E14 E15 E19 E20 E21 E23 F1 F2 | C24 E1 E4 E5 E9 E12 E13 E14 E15 E19 E20 E21 E23 F1 F2 |
| | CLRA-R | Restoration research | E1 E3 | E1 E3 | E1 E3 |
| | CLRA2 | Maintain existing important habitat | H1 | D1 H1 | C24 D1 H1 |
| | MRM1 | Define habitat characteristics | C3 D1 F1 F2 | C3 C21 D1 D2 D5 D6 F1 F2 | C3 C21 D1 D2 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 D1 F1 F2 | C3 D1 D2 D5 D6 F1 F2 F4 | C3 D1 D2 D5 D6 F1 F2 F4 |
| | MRM5 | Monitor selenium levels in backwater | | | |
| | CMM1 | Reduce risk of loss to wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Southwestern Willow Flycatcher | WIFL1 | Create habitat, 4,050 acres | E4 E5 E16 | C5 C6 C20 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E22 E23 G3 F1 F2 | C5 C6 C20 C24 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E22 E23 E24 G3 F1 F2 |
| | WIFL1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | WIFL2 | Maintain existing important habitat | H1 | C5 C6 C20 D3 D4 E21 H1 | C5 C6 C20 C24 D3 D4 E21 H1 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D2 D3 D4 D5 D6 F2 | C3 C5 C6 D1 D2 D3 D4 D5 D6 F2 | C3 C5 C6 D1 D2 D3 D4 D5 D6 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D2 D3 D4 D5 D6 F1 F2 | C3 C5 C6 C21 D1 D2 D3 D4 D5 D6 F1 F2 F4 | C3 C5 C6 C21 D1 D2 D3 D4 D5 D6 F1 F2 F4 G6 |
| | MRM4 | Brown-headed cowbird evaluation | C1 D2 | C1 D2 | D2 |
| | CMM1 | Reduce risk of loss to wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Desert Tortoise | DETO1 | Acquire/protect, protect 230 acres | | | |
| | DETO2 | Avoid impacts on individuals and burrows | | | |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| Bonytail | BONY1 | Coordinate conservation efforts with USFWS and recovery programs | | | |
| | BONY2 | 360 acres | E2 E10 E11 E12 E13 E14 E15 E16 | E2 E10 E11 E12 E13 E14 E15 | C25 E2 E12 E13 E14 E15 |
| | BONY2-R | Restoration Research | E14 | E14 E20 | E14 E20 |
| | BONY3 | Rear/stock 620,000:<br>4,000-6,000 sub-adult/year for 40 years Lake Mohave<br>4000 sub-adult/year for 50 years Lake Havasu<br>8,000 experimental augmentation at Parker-Imperial for 5 consecutive years<br>4,000 sub-adults/year Parker-Imperial for 45 years | B2 B3 B4 B8 B9 C11 D8 | B2 B3 B4 B7 B8 B9 B10 C9 C11 C16 D8 | B2 B3 B4 B7 B8 B10 C9 C11 C16 D8 |
| | BONY4 | Develop (if necessary) additional rearing capacity | B2 B3 B4 C11 | B2 B3 B4 B7 B8 B10 C9 C11 | B2 B3 B4 B7 B8 B10 C9 C11 |
| | BONY5 | Monitor and research, adaptive management pops. and backwater habitat | B8 B9 D8 | B7 B8 B9 D8 C11 C16 C23 F5 G3 | B7 B8 B9 D8 C11 C16 C23 F5 G3 |
| | MRM5 | Monitor selenium levels in backwater | E15 | E15 | E15 |
| Humpback Chub | HUCH1 | $500,000 to existing programs | C14 | C14 | C14 |
| Razorback Sucker | RASU1 | Coordinate conservation efforts with USFWS and recovery programs | | | |
| | RASU2 | 360 acres | E2 E10 E11 E12 E13 E14E15 E16 | E2 E10 E11 E12 E13 E14 E15 | C25 E2 E12 E13 E14 E15 |
| | RASU2-R | Restoration research | | | |
| | RASU3 | Rear/stock 660,000:<br>24,000 sub-adult/year for 5 years (Parker, Mohave — see plan)<br>6,000 sub-adult/year for 45 years Lake Havasu<br>6,000 sub-adult/year for 45 years Parker Dam | B1 B2 B4 B5 B6 B7 B8 B9 C9 C10 D8 | B1 B2 B3 B4 B5 B6 B7 B8 B10 B11 C9 C10 D8 | B1 B2 B3 B4 B5 B6 B7 B8 B10 B11 C9 C10 D8 |
| | RASU4 | Develop (if necessary) additional rearing capacity | B2 B4 B5 B6 C9 C10 | B2 B4 B3 B5 B6 B7 B8 B10 B11 C9 C10 | B2 B4 B3 B5 B6 B7 B8 B10 B11 C9 C10 |
| | RASU5 | Support ongoing Lake Mohave conservation efforts | B1 B7 C12 D8 | B1 B2 B7 B8 C12 D8 | B1 B2 B7 B8 C12 D8 |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| | RASU6 | Monitor and research, adaptive management pops. and backwater habitat | B8 B9 C8 C12 D9 | B2 B7 B8 B11 C8 C10 C12 C17 C23 D8 F5 G3 | B2 B7 B8 B11 C8 C10 C12 C17 C23 D8 F5 G3 |
| | RASU7 | Funding for ongoing USBR/SNWA Lake Mead Studies | B6 C13 | B6 B11 C13 | B6 B11 C13 |
| | RASU8 | Continue conservation efforts identified in ISC/SIA BO | B1 B8 C8 | B1 B6 B8 B11 C8 | B1 B6 B8 B11 C8 |
| | MRM5 | Monitor selenium levels in backwater | | | |
| Western Red Bat | WRBA1 | Status/habitat surveys | D10 | D9 | D9 |
| | WRBA2 | Create 765 acres | D10 E4 E5 E16 | C5 C6 D9 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E23 F1 F4 | C5 C6 D9 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E23 E24 F1 F4 |
| | WRBA2-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D10 | C3 C5 C6 C18 C19 D1 D2 D10 | C3 C5 C6 C18 C19 C24 D1 D2 C27 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D10 F1 | C3 C5 C6 C18 C19 D1 D2 D10 F1 F4 | C3 C5 C6 C18 C19 C24 D1 D2 C27 F1 F4 G6 |
| | CMM1 | Reduce risk of loss of habitat to wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Western Yellow Bat | WYBA1 | Conduct surveys for species distribution | D10 | D9 F4 | D9 F4 |
| | WYBA2 | Avoid removal of roost trees (palms) | | F4 | F4 |
| | WYBA3 | Create 765 acres | D10 E4 E5 E16 | C5 C6 D9 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E23 F1 F4 | C5 C6 D9 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E23 E24 F1 F4 |
| | WYBA3-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D10 | C3 C5 C6 D1 D5 D10 | C3 C5 C6 C24D1 D5 C27 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D10 F1 | C3 C5 C6 D5 D10 F1 F4 | C3 C5 C6 D5 C27 F1 F4 |
| | CMM1 | Reduce risk of loss of habitat to wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| Desert Pocket Mouse | DPMO1 | Located occupied habitat, restore disturbed habitat | D11 | D10 F3 | C27 F3 |
| | | | | | |
| Colorado River Cotton Rat | CRCR1 | Status/habitat surveys — define habitat first 5 yrs | D11 | D10 F3 G3 | C27 F3 G3 |
| | CRCR2 | Create 125 acres | E4 E5 E16 F3 | D10 E1 E3 E4 E5 E6 E7 E8 E16 F3 E19 E21 E22 F1 F3 | C27 E1 E3 E4 E5 E6 E7 E8 E16 F3 E19 E21 E22 E24 F1 F3 |
| | CRCR2-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 D11 F1 F3 | C3 D11 F1 F3 | C3 C24 D11 F1 F3 |
| | CMM1 | Reduce risk of loss of habitat to wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Yuma Hispid Cotton Rat | YHCR1 | Status/habitat surveys — define habitat first 5 years | D11 | D10 F3 G3 | C27 F3 G3 |
| | YHCR2 | Create 76 acres | E4 E5 E16 F3 | E1 D10 E3 E4 E5 E6 E7 E8 E16 E19 E22 E23 F1 F3 | E1 C27 E3 E4 E5 E6 E7 E8 E16 E19 E22 E23 E24 F1 F3 |
| | YHCR2-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 D11 F1 F3 | C3 D11 F1 F3 F4 | C3 C24 D11 F1 F3 F4 |
| | CMM1 | Reduce risk of loss of habitat to wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Western Least Bittern | LEBI1 | Create 512 acres | E4 E5 E9 E10 E11 E12 E13 E14 E15 E16 | E1 E3 E4 E5 E7 E8 E9 E10 E11 E12 E13 E14 E15 E19 E20 E21 E22 F1 F2 | C24 E1 E3 E4 E5 E7 E8 E9 E12 E13 E14 E15 E19 E20 E21 E22 F1 F2 |
| | LEBI1-R | Restoration research | E1 E3 | E1 E3 | E1 E3 |
| | MRM1 | Define habitat characteristics | C3 D1 F1 F2 | C3 D1 D5 F1 F2 | C3 D1 D5 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 D1 F1 F2 | C3 D1 D5 F1 F2 F4 | C3 D1 D5 F1 F2 F4 |
| | MRM5 | Monitor selenium levels | | | |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| CA Black Rail | BLRA1 | Create 130 acres | E4 E5 E9 E10 E11 E12 E13 E14 E15 E16 | E1 E3 E4 E5 E8 E9 E10 E11 E12 E13 E14 E15 E23 F1 F2 | C24 E1 E3 E4 E5 E8 E9 E12 E13 E14 E15 E23 F1 F2 |
| | BLRA1-R | Restoration research | E1 E3 E7 E8 | E1 E3 E7 E8 | E1 E3 E7 E8 |
| | BLRA2 | Maintain existing occupied habitat | H1 | D1 H1 | C24 D1 H1 |
| | MRM1 | Define habitat characteristics | C3 D1 F1 F2 | C3 D1 D5 D6 F1 F2 | C3 D1 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 D1 F1 F2 | C3 D1 D2 D6 F1 F2 F4 | C3 D1 D2 D6 F1 F2 F4 |
| | MRM5 | Monitor selenium levels | | | |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Yellow-billed Cuckoo | YBCU1 | Create 4,050 acres | E4 E5 E14 E16 | C5 C6 C21 C22 E1 E3 E4 E5 E6 E8 E14 E19 E20 E21 E22 E23 F1 F2 | C5 C6 C21 C22 C24 E1 E3 E4 E5 E6 E8 E14 E19 E20 E21 E22 E23 E24 F1 F2 |
| | YBCU1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | YBCU2 | Maintain existing habitat | H1 | C5 C6 C21 C22 E22 H1 | C5 C6 C21 C22 C24 E22 H1 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D5 D6 D7 F1 F2 | C3 C5 C6 C22 D1 D5 D6 D7 F1 F2 | C3 C5 C6 C22 D1 D5 D6 D7 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D5 D6 D7 F1 F2 | C3 C5 C6 C22 D5 D6 D7 F1 F2 F4 | C3 C5 C6 C22 D5 D6 D7 F1 F2 F4 |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Elf Owl | ELOW1 | 1,784 reaches 3-5 | E4 E5 E16 | E1E3 E4 E5 E6 E8 E19 E21 E22 E23 F1 F2 | C24 E1E3 E4 E5 E6 E8 E19 E21 E22 E23 E24 F1 F2 |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| | ELOW1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | ELOW2 | Install elf owl boxes before Gila woodpeckers established | | | |
| | MRM1 | Define habitat characteristics | C3 D6 F1 F2 | C3 D1 D5 D6 F1 F2 | C3 D1 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 D6 F1 F2 | C3 D5 D6 F1 F2 F4 | C3 D5 D6 F1 F2 F4 |
| | MRM3 | Research nest competition European starlings | | | |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Gilded Flicker | GIFL1 | Create 4,050 acres reaches 3-7 | E4 E5 E16 | C5 C6 E1 E3 E4 E5 E6 E8 E19 E21 E22 E23 F1 F2 | C5 C6 C24 E1 E3 E4 E5 E6 E8 E19 E21 E22 E23 G24 F1 F2 |
| | GIFL1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | GIFL2 | Install artificial snags until vegetation has matured | | | |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D5 D6 F1 F2 F4 | C3 C5 C6 D5 D6 F1 F2 F4 |
| | MRM3 | Research nest competition European starlings | | | |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Gila Woodpecker | GIWO1 | Create 1,702 acres reaches 3-6 | E4 E5 E16 | C5 C6 E3 E1 E4 E5 E6 E8 E19 E20 E21 E22 E23 F1 F2 | C5 C6 C24 E3 E1 E4 E5 E6 E8 E19 E20 E21 E22 E23 E24 F1 F2 |
| | GIWO1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| | GIWO2 | Install artificial snags | | | |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D5 D6 F1 F2 F4 G6 | C3 C5 C6 D5 D6 F1 F2 F4 |
| | MRM3 | Research nest competition European starlings | | | |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Vermilion Flycatcher | VEFL1 | Create 5,208 acres | E4 E5 E16 | C5 C6 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E22 E23 F1 F2 | C5 C6 C24 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E22 E23 E24 F1 F2 |
| | VEFL1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D5 D6 F1 F2 F4 | C3 C5 C6 D5 D6 F1 F2 F4 |
| | MRM4 | Brown-headed cowbird evaluation | C1 | C1 | C1 |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Arizona Bell's Vireo | BEVI1 | Create 2,983 acres | E4 E5 E16 | C5 C6 E1 E4 E5 E6 E8 E21 E22 E23 F1 F2 | C5 C6 C24 E1 E4 E5 E6 E8 E21 E22 E23 E24 F1 F2 |
| | BEVI1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 E20 | E1 E3 E6 E7 E8 E19 E20 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D5 D6 F1 F2 F4 | C3 C5 C6 D5 D6 F1 F2 F4 |
| | MRM4 | Brown-headed cowbird evaluation | C1 | C1 | |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| Sonoran Yellow Warbler | YWAR1 | Create 4,050 acres | E4 E5 E16 | C5 C6 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E22 E23 F1 F2 | C5 C6 C24 E1 E3 E4 E5 E6 E7 E8 E19 E20 E21 E22 E23 E24 F1 F2 |
| | YWAR1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 E19 | E1 E3 E6 E7 E8 E19 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D5 D6 F1 F2 F4 | C3 C5 C6 D5 D6 F1 F2 F4 |
| | MRM4 | Brown-headed cowbird evaluation | C1 | C1 | C1 |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Summer Tanager | SUTA1 | Create 602 acres | E4 E5 E16 | C5 C6 E3 E4 E5 E6 E7 E8 E19 E20 E21 E22 F1 F2 | C5 C6 C24 E3 E4 E5 E6 E7 E8 E19 E20 E21 E22 E24 F1 F2 |
| | SUTA1-R | Restoration research | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 | E1 E3 E6 E7 E8 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 | C3 C5 C6 D1 D5 D6 F1 F2 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D5 D6 F1 F2 | C3 C5 C6 D5 D6 F1 F2 |
| | MRM4 | Brown-headed cowbird evaluation | C1 | C1 | C1 |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Flat-tailed Horned Lizard | FTHL1 | Acquire and protect 230 acres | | | |
| | FTHL2 | Implement conservation measures to avoid take | | | |
| Relict Leopard Frog | RLFR1 | 10,000/year for 10 years to conservation program | C4 | C4 | C4 |
| Flannelmouth Sucker | FLSU1 | 85 acres Reach 3 | E16 | E15 G3 | E15 G3 |
| | FLSU1-R | Restoration research | | | |
| | FLSU2 | 80,000/year for 5 years | C15 | C15 | C15 |
| | FLSU3 | Develop management needs/strategies | C15 | C15 | C15 |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| | MRM2 | Monitor and adaptively manage created habitat | C15 | C15 F4 | C15 F4 |
| | MRM5 | Monitor selenium levels in backwater | | | |
| MacNeill's Sootywing Skipper | MNSW1 | Status surveys/habitat — define habitat first 5 years | C7 | C7 | C7 |
| | MNSW2 | 222 acres | E4 E5 E16 | C7 E1E3 E4 E5 E19 E21 E22 F1 | C7 E1E3 E4 E5 E19 E21 E22 F1 |
| | MNSW2-R | Restoration research | E1 E3 E7 E8 | E1 E3 E7 E8 | E1 E3 E7 E8 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 F1 F2 | C3 C5 C6 F1 F2 F4 | C3 C5 C6 F1 F2 F4 |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 G3 | E18 G3 |
| | CMM2 | Replace created habitat affected by wildfire | | | |
| Sticky Buckwheat | STBU1 | 10,000 year to 2030 to MSHCP | C2 | C2 | C2 |
| Threecorner Milkvetch | THMI1 | 10,000 year to 2030 to MSHCP | C2 | C2 | C2 |
| California Leaf-nosed bat | CLNB1 | Distribution surveys | D10 | D9 F4 | D9 F4 |
| | CLNB2 | Create habitat near roost sites (priority when creating cottonwood-willow, mesquite habitat for other species) | | C5 C6 E21 | C5 C6 E21 |
| | MRM1 | Define habitat characteristics | C3 C5 C6 D10 F1 | C3 C5 C6 D1 D10 F1 | C3 C5 C6 D1 C27 F1 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D10 F1 | C3 C5 C6 D10 F1 F4 | C3 C5 C6 C27 F1 F4 |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habit affected by wildfire | | | |
| Pale Townsend's Big-eared Bat | PTBB1 | Distribution surveys | D10 | D9 F4 | D9 F4 |
| | PTBB2 | Create habitat near roost sites | | C5 C6 E21 | C5 C6 E21 |
| | MRM1 | Determine habitat characteristics | C3 C5 C6 D10 F1 | C3 C5 C6 D10 F1 | C3 C5 C6 C24 C27 F1 |
| | MRM2 | Monitor and adaptively manage created habitat | C3 C5 C6 D10 F1 | C3 C5 C6 D10 F1 F4 | C3 C5 C6 C24 C27 F1 F4 |
| | CMM1 | Reduce risk of loss of habitat affected by wildfire | E18 | E18 | E18 |
| | CMM2 | Replace created habitat affected by wildfire | | | |

| Species/Habitat/Action | Code | Description | FY2006 Approved | FY2007 Approved | FY2008 Proposed |
|---|---|---|---|---|---|
| Colorado River Toad | CRTO1 | Distribution surveys, habitat affinity, limiting factors | C3 | C3 | C3 |
| | CRTO2 | Protect existing occupied habitat | H1 | H1 | H1 |
| | CRTO3 | Research to establish in unoccupied habitat | | | |
| Lowland Leopard Frog | LLFR1 | Distribution surveys, habitat affinity, limiting factors | C3 | C3 G3 | C3 G3 |
| | LLFR2 | Protect existing occupied habitat | H1 | H1 | H1 |
| | LLFR3 | Research to establish in unoccupied habitat | C3 | C3 G3 | C3 G3 |
| **OTHER** | | | | | |
| Topock Marsh Pumping | AMM2 | Avoid flow-related impacts on covered species | E17 | C21 C22 D2 E17 | C21 C22 D2 E17 |
| Law Enforcement and Fire Suppression | CMM1 | Reduce effects of fire and vandalism on created habitats | E18 | E18 | E18 |

## 2001 Biological Opinion

In addition to fulfilling the requirements in the LCR MSCP HCP, the work plans also satisfied conservation measures required in the 2001 BO. The requirements listed in the 2001 BO were integrated into the LCR MSCP and are being implemented by Reclamation in conjunction with the LCR MSCP.

Requirements under the 2001 BO specifically related to the SIA include:

**Conservation Measure 1.** *Stock 20,000 razorback suckers, 250 mm or greater in total length, into the Colorado River between Parker and Imperial dams. This will be completed by 2006.*

**Status:** Completed — The total number of razorback suckers stocked below Parker Dam (reaches 4 and 5) between 2003 and January 2007 was 20,012.

**Table 1-8.** Summary of Razorback Sucker Stockings in Compliance with SIA Biological Opinion

| YEAR | DATE | NUMBER | LOCATION |
|---|---|---|---|
| 2005 | 4-Feb | 620 | Backwater A-7 |
| | 4-Feb | 619 | Backwater A-10 |
| | 21-Apr | 729 | Backwater A-7 |
| | 21-Apr | 649 | Backwater A-10 |
| | 22-Sep | 1,089 | Backwater A-7 |
| | 22-Sep | 1,108 | Backwater A-10 |
| | **Subtotal** | **4,814** | |
| 2006 | 21-Jan | 790 | Backwater A-7 |
| | 21-Jan | 791 | Backwater A-10 |
| | 31-Mar | 851 | Backwater A-7 |
| | 31-Mar | 865 | Backwater A-10 |
| | 20-Apr | 1,613 | A-10 Lower |
| | 14-Sep | 1,632 | A-10 Upper |
| | 14-Sep | 728 | A-10 Lower |
| | 21-Sep | 1,655 | Buckskin Mtn Park |
| | 30-Nov | 2,530 | River Island Park |
| | **Subtotal** | **11,455** | |
| 2007 | 19-Jan | 1,926 | River Island Park |
| | 25-Jan | 1,143 | A-10 Upper |
| | 25-Jan | 674 | A-10 Lower |
| | **Subtotal** | **3,743** | |
| | **TOTAL** | **20,012** | |

**Conservation Measure 2.** *Restore or create 44 acres of backwaters along the LCR between Parker and Imperial dams. Maintenance of these backwaters for native fish and wildlife will be ensured for the life of the water transfers. This will be completed within 5 years of the first water transfers.*

**Status:** Expansion of the Imperial Ponds, located on Imperial National Wildlife Refuge, has been identified to fulfill the requirements of Conservation Measure 2. Expansion of the ponds from 25 acres to approximately 80 acres began in June of 2006. By the end of FY06, two of the six proposed ponds were completely excavated. Excavation of all six ponds was completed during spring 2007.

**Conservation Measure 3.** *Provide $50,000 for the capture of wild-born or F1 generation bonytails from Lake Mojave to be incorporated into the brood stock for this species and to support rearing efforts at Achii Hanyo Native Fish Rearing Facility. These efforts will be funded for 5 years (2001-2006).*

**Status:** Completed — Reclamation and the USFWS attempted to capture adult bonytail from Lake Mohave during the April to June spawning periods in 2003 and 2004 with no success. Approximately $50,000 was expended by the two agencies during this effort. Rather than continue the capture effort, Reclamation provided $200,000 to USFWS in July 2004 to improve rearing capabilities for bonytail at Achii Hanyo Native Fish Rearing Facility.

**Conservation Measure 4, Tier 1.** *Identify and monitor 372 acres of currently occupied southwestern willow flycatcher habitat that may be affected by water transfers and changes in points of delivery between Parker and Imperial dams. Soil moisture will be monitored and if levels decease as a result of water transfer actions, management actions will be taken to maintain monitored habitat. The monitoring program will be reviewed every 5 years to determine the appropriate level of effort to monitor effects of water transfer actions. Monitoring will continue for up to 5 years after implementation of all water transfer actions unless it becomes part of a broader effort associated with recovery actions. Restore and maintain 372 acres of new replacement southwestern willow flycatcher habitat along the lower Colorado River.*

**Status:** In FY05, Reclamation modified an existing contract to include the monitoring of 372 acres of occupied southwestern willow flycatcher habitat. This acreage is split into 11 different sites between Palo Verde Diversion Dam and Imperial Dam. Annual monitoring of soil moisture conditions at these sites is being performed to determine if a change in soil moisture conditions has occurred due to water transfer actions. No change in soil moisture conditions attributable to water transfer actions was observed through 2006; therefore, no management actions have been required.

Phases 1-3 at the Cibola Valley Conservation Area (CVCA) and Palo Verde Ecological Reserve (PVER) have been identified to fulfill the habitat creation requirements of Conservation Measure

4, Tier 1. In FY06, Reclamation implemented Phase 1 of the CVCA by planting a 22-acre native plant nursery and 64 acres of cottonwood-willow land cover, which is intended to be managed as southwestern willow flycatcher habitat. At PVER, 31 acres of native plant nursery was established.

Also in FY06, a contract for the collection, propagation, and planting of more than 250,000 native plants for Phase 2 of both CVCA and PVER properties was awarded. The trees will be mass transplanted on approximately 140 acres of active agricultural fields in March-April of 2007 and will be managed for southwestern willow flycatcher habitat.

**Conservation Measure 4, Tier 2**. *Establish baseline soil moisture conditions within 1 year of acceptance of the BO. Depending on the status of southwestern willow flycatcher population trends along the lower Colorado River, replace additional flycatcher habitat if management actions to prevent adverse changes to Tier 1 monitored habitat are no longer viable or will not be successful in maintaining baseline conditions.*

**Status:** No change in baseline soil moisture was observed; therefore, no management actions were required. No additional southwestern willow flycatcher habitat replacement is necessary.

Requirements under the 2001 BO specifically related to the ISC include:

1. *Reclamation will continue to provide funding and support for the ongoing Lake Mead razorback sucker study. The initial continuation will be conducted for 5 years, followed by a review and determination of the scope of studies for the following 10 years of the duration of the ISC.*

   The ongoing 5 years of study have been completed through C13.

2. *Reclamation will provide rising spring water surface elevations of 5-10 feet on Lake Mead, to the extent practicable and that hydrologic conditions allow.*

   During the period of the ISC compliance actions to date there has been no practicable opportunity to provide rising spring water surface elevations.

3. *Reclamation will continue existing operations on Lake Mohave that benefit native fish during the 15-year ISC period and will explore additional ways to provide benefits to native fish.*

   To date, existing operations on Lake Mohave that benefit native fish have been continued.

4. *Reclamation will monitor water levels of Lake Mead from February through April of each year during the 15 years ISC are in place. Should water levels reach 1,160 feet because of the implementation of the ISC, Reclamation will implement a program to collect and rear larval razorbacks in Lake Mead during the spawning season following this determination.*

The level of Lake Mead did reach the 1,160 feet msl elevation during FY05. Reclamation, the Southern Nevada Water Authority, and NDOW are cooperatively rearing razorback sucker larvae captured from Lake Mead for future repatriation into Lake Mead. Work was completed on a new native fish room at Lake Mead State Fish Hatchery, and planning was initiated for additional rearing capacity at Overton Wildlife Management Area (B6 and B11).

## California Endangered Species Act (CESA) Permit

In conjunction with Federal ESA coverage, California State law requires CESA permitting for the California activities. The California Partners applied for and received a CESA Incidental Take Permit pursuant to CDFG Code sections 2081(a) and 2081(b). The California Partners negotiated the terms of the CESA permit with CDFG to be compatible with the LCR MSCP. This CESA permit provides compliance only for California Partners.

The LCR MSCP conservation activities fulfill the requirements of the CESA permit. However, certain CESA permit requirements are more specific in relationship to location or timing. All other CESA permit requirements are otherwise the same as those for the LCR MSCP. The LCR MSCP accomplishments in FY06 also meet the CESA permit requirements. Listed below are the CESA requirements that are more detailed than the LCR MSCP HCP.

1. Requirements for various types of coordination with CDFG during the identification, development, and construction and maintenance for habitat created or restored within the State of California under the LCR MSCP.
2. Various reporting requirements to be made to CDFG including annual status reports and notifications.
3. Riparian, Marsh, and Backwater Replacement Plans are to be submitted to CDFG for approval for riparian and marsh habitat creation and restoration within the State of California under the LCR MSCP.
4. Monitoring, Research, and Adaptive Management Plans for the replacement habitat created or restored under the LCR MSCP within the State of California are to be submitted to CDFG for approval.
5. Locations of all habitat replaced or restored in the State of California under the LCR MSCP must be approved by the CDFG.
6. A minimum of 2,614 acres of the LCR MSCP riparian replacement habitat is to be located in California, including 1,566 acres of cottonwood-willow and 1,048 acres of honey mesquite.
7. A minimum of 240 acres of LCR MSCP marsh habitat is to be created or restored within the State of California, including 170 acres for Yuma clapper rail and 70 acres for California black rail. The acreage shall also support at least 58 acres of Colorado River cotton rat habitat.
8. Habitat created within California will be protected in perpetuity.

9. An endowment fee of $295.00 per acre (in 2005 dollars) will be provided to CDFG for each acre of habitat that is transferred to the Department in Fee Title at the time of transfer.
10. A total of 270,000 razorback sucker and 200,000 bonytail of at least 12 inches in length will be stocked into reaches 3 and 4.

Key activities accomplished in FY06 include stocking 11,455 razorback suckers in reaches 4 and 5 (B5). More than 25,000 razorback sucker and bonytail in total were repatriated to the Lower Colorado River.

A total of 31 acres were developed for the nursery at PaloVerde Ecological Reserve (PVER) to provide plant materials for vegetating the remainder of the site. A 22-acre nursery was planted at the Cibola Valley Conservation Area (CVCA); in addition, 64 acres were planted using a vegetable mass transplanter.

At the Imperial Ponds, as of April 2007, all construction of ponds has been completed. This will create an additional 80 acres of backwater habitat.

## Overview of Work Tasks

In addition to program administration, LCR MSCP work tasks are categorized into a number of target areas: Fish Augmentation (Section B), Species Research (Section C), System Monitoring (Section D), Conservation Area Development and Management (Section E), Post-Development Monitoring (Section F), and Adaptive Management (Section G). A number of connections exist between these target areas.

This introduction provides an overview of proposed LCR MSCP work tasks by program functions: 1) fish augmentation, monitoring, and research, 2) monitoring and research for terrestrial, riparian, and marsh habitats and associated covered species, and 3) conservation area development and management. The introduction provides background information on program development and proposed work strategy for each program function. Maps are provided at the beginning of each description to show specific work task locations. The following list includes work task numbers and titles to assist in the reading of this Annual Report. Appendix D contains a list of closed work tasks.

| | |
|---|---|
| A-1 | Program Administration |
| B-1 | Lake Mohave Razorback Sucker Larvae Collection |
| B-2 | Willow Beach National Fish Hatchery |
| B-3 | Achii Hanyo Rearing Station |
| B-4 | Dexter National Fish Hatchery |
| B-5 | Bubbling Ponds Fish Hatchery |
| B-6 | Lake Mead Fish Hatchery |
| B-7 | Lake Side Rearing Ponds |
| B-8 | Fish Tagging Equipment |
| B-10 | Uvalde National Fish Hatchery |
| B-11 | Overton Wildlife Management Area |
| C-1 | Brown-Headed Cowbird Trap Assessment |
| C-2 | Sticky Buckwheat and Threecorner Milkvetch Conservation |
| C-3 | Multi-Species Conservation Program Covered Species Profile Development |
| C-4 | Relict Leopard Frog |
| C-5 | Effects of Abiotic Factors on Insect Populations in Riparian Restoration Sites |
| C-6 | Insect Population Biology in Riparian Restoration Sites |
| C-7 | Survey and Habitat Characterization for MacNeill's Sootywing |
| C-8 | Razorback Sucker Survival Studies |
| C-9 | Razorback Sucker and Bonytail Pen Rearing Tests |
| C-10 | Razorback Sucker Growth Studies |
| C-11 | Bonytail Rearing Studies |
| C-12 | Demographics and Post-Stocking Survival of Repatriated Razorback Suckers in Lake Mohave |
| C-13 | Lake Mead Razorback Sucker Study |
| C-14 | Humpback Chub Program Support |
| C-15 | Flannelmouth Sucker Habitat Use, Preference, and Recruitment Downstream of Davis Dam |
| C-16 | Evaluation of Past Bonytail Stockings |
| C-23 | Evaluation of Remote Sensing Techniques for PIT-Tagged Fish |
| C-24 | Avian Species Habitat Requirements |

C-25 Imperial Ponds Native Fish Research
C-26 Evaluation of Raceway Rearing of Razorback Rucker at Lake Mead Fish Hatchery
C-27 Small Mammal Population Studies
D-1 Marsh Bird Surveys
D-2 Southwestern Willow Flycatcher Presence/Absence Surveys
D-3 Southwestern Willow Flycatcher Habitat Monitoring
D-4 Southwestern Willow Flycatcher Presence/Absence Survey Hualapai Tribe
D-5 Monitoring Avian Productivity and Survivorship
D-6 System Monitoring for Riparian Obligate Avian Species
D-7 Yellow-Billed Cuckoo Presence/Absence Surveys
D-8 Razorback Sucker and Bonytail Stock Assessment
D-9 System Monitoring and Research of Covered Bat Species
D-10 System Monitoring and Studies on Small Mammal Populations
E-1 Beal Lake Riparian Restoration
E-2 Beal Lake Native Fish
E-3 Ahakhav Tribal Preserve
E-4 Palo Verde Ecological Reserve
E-5 Cibola Valley Conservation Area
E-6 Cottonwood Genetics Study
E-7 Mass Transplanting Demonstration
E-8 Seed Feasibility Study
E-9 Hart Mine Marsh
E-12 Butler Lake
E-13 McAllister Lake
E-14 Imperial Ponds
E-15 Backwater Site Selection
E-16 Conservation Area Site Selection
E-17 Topock Marsh Pumping
E-18 Law Enforcement and Fire Suppression
E-24 Cibola NWR Unit #1
F-1 Habitat Monitoring
F-2 Avian Use of Restoration Sites
F-3 Small Mammal Colonization of Restoration Sites
F-4 Post-Development Monitoring of Covered Bat Species
F-5 Post-Development Monitoring of Fish Restoration Sites
G-1 Data Management
G-2 Annual Report Writing and Production
G-3 Adaptive Management Research Projects
G-4 Science/Adaptive Management Strategy
G-5 Public Outreach
H-1 Existing Habitat Maintenance

## Fish Augmentation, Monitoring, and Research

The LCR MSCP will implement 17 conservation measures for four native fish species: 8 conservation measures for razorback sucker (RASU), 5 conservation measures for bonytail (BONY), 3 conservation measures for flannelmouth sucker (FLSU), and 1 conservation measure for humpback chub (HUCH). These conservation measures will be accomplished through work tasks assigned to one of six target areas:

1. Fish Augmentation (Section B)
2. Species Research (Section C)
3. System Monitoring (Section D)
4. Conservation Area Development (Section E)
5. Post-Development Monitoring (Section F)
6. Adaptive Management (Section G)

A brief summary of the work planned for each target area is provided below.

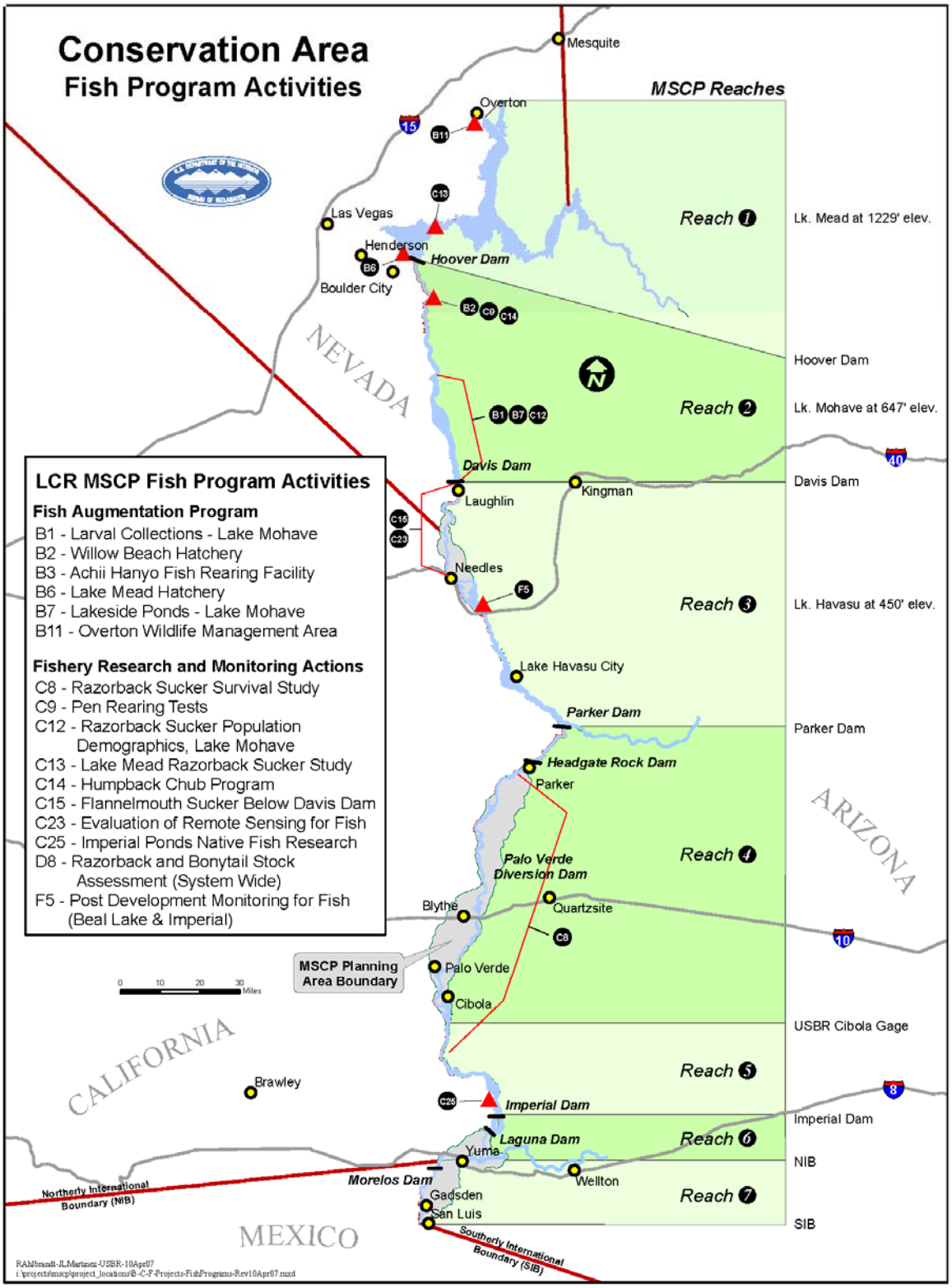
### Fish Augmentation (Section B)

The target goal of the augmentation program is to provide a total of 660,000 RASU and 620,000 BONY for reintroduction into the Colorado River over a 50-year period. The program has three primary work areas:

1. Acquire fish for grow-out.
2. Develop facilities to grow the fish.
3. Rear the fish to target size and stock them into the LCR MSCP project areas.

(A Fish Augmentation Plan for the LCR MSCP is available on the LCR MSCP Web site.)

**Acquire fish for grow-out:** To obtain sufficient numbers of young fish for grow-out, LCR MSCP will develop and maintain adult brood stock for each species. The adult RASU population in Lake Mohave is the most genetically diverse among RASU populations and is the intended brood stock for the species. Development and maintenance of this stock (underway since 1992) is a recovery goal for RASU, and this action has now become a project feature of the LCR MSCP. In-lake spawning by adult RASU is currently producing sufficient fish larvae for the augmentation program. The LCR MSCP is able to collect these wild larvae directly from the spawning areas on Lake Mohave between January and April each year and deliver them to Willow Beach National Fish Hatchery (NFH). The larvae are reared to meet stocking requirements of the LCR MSCP. A portion of the larvae are reared to subadult size and returned (repatriated) to Lake Mohave to maintain the RASU brood stock. The LCR MSCP will support maintenance of this genetically diverse stock throughout the life of the program. A second brood stock of RASU was developed by the USFWS during the 1990s from Lake Mohave offspring, and is maintained at Dexter NFH.


Conservation Area
Fish Program Activities
MSCP Reaches
Mesquite
Overton
B11
C13
Las Vegas
Henderson
B6
Hoover Dam
Boulder City
B2
C9
C14
NEVADA
Reach 1
Lk. Mead at 1229' elev.
Hoover Dam
Reach 2
Lk. Mohave at 647' elev.
B1
B7
C12
Davis Dam
Laughlin
Kingman
Davis Dam
C15
C23
Needles
F5
Reach 3
Lk. Havasu at 450' elev.
Lake Havasu City
Parker Dam
Parker Dam
Headgate Rock Dam
Parker
ARIZONA
Palo Verde Diversion Dam
Reach 4
Blythe
Quartzsite
C8
MSCP Planning Area Boundary
Palo Verde
Cibola
USBR Cibola Gage
CALIFORNIA
Reach 5
Brawley
C25
Imperial Dam
Imperial Dam
Laguna Dam
Reach 6
Yuma
NIB
Morelos Dam
Wellton
Northerly International Boundary (NIB)
Gadsden
San Luis
Reach 7
SIB
MEXICO
Southerly International Boundary (SIB)
LCR MSCP Fish Program Activities
Fish Augmentation Program
B1 - Larval Collections - Lake Mohave
B2 - Willow Beach Hatchery
B3 - Achii Hanyo Fish Rearing Facility
B6 - Lake Mead Hatchery
B7 - Lakeside Ponds - Lake Mohave
B11 - Overton Wildlife Management Area
Fishery Research and Monitoring Actions
C8 - Razorback Sucker Survival Study
C9 - Pen Rearing Tests
C12 - Razorback Sucker Population Demographics, Lake Mohave
C13 - Lake Mead Razorback Sucker Study
C14 - Humpback Chub Program
C15 - Flannelmouth Sucker Below Davis Dam
C23 - Evaluation of Remote Sensing for Fish
C25 - Imperial Ponds Native Fish Research
D8 - Razorback and Bonytail Stock Assessment (System Wide)
F5 - Post Development Monitoring for Fish (Beal Lake & Imperial)
0 10 20 30 Miles
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In January 2007, the exotic quagga mussel was found in lakes Mead, Mohave, and Havasu, and at the Lake Mead State Fish Hatchery (SFH) and the Willow Beach NFH. To insure that quagga mussels do not gain access to Bubbling Ponds SFH, RASU larvae will be provided to Bubbling Ponds SFH from the Dexter NFH brood stock. This is a temporary change to the fish acquisition strategy, and the arrangement is acceptable to both the USFWS and AGFD. The RASU brood stock at Dexter NFH originated from Lake Mohave, and their use as brood fish is guided by a genetic management plan. Fish from this stock have been used in the past 15 years. The RASU from this stock were put into Davis Cove in 1992 by the Lake Mohave Native Fish Work Group. This stock was the source of RASU provided to AGFD in the mid-1990s for rearing and stocking into Lake Havasu, and Dexter NFH currently uses this stock to provide fish for the San Juan River Recovery Implementation Program.

Dexter NFH maintains the only BONY brood stock in the world (the parents of these fish also came from Lake Mohave). A captive management plan for this stock has been developed by USFWS and is in effect. The LCR MSCP is providing funding to Dexter NFH to support maintenance of this brood stock, hatch out young BONY, and deliver the young to grow-out facilities. In addition, USFWS and Reclamation (Lower Colorado and Upper Colorado Regions) have entered into an agreement to bring BONY from Dexter NFH to Uvalde NFH to determine the capability of this rearing station for this species.

**Develop facilities to grow the fish:** The LCR MSCP will require grow-out facilities for RASU and BONY for many years. The program will provide support to the following existing facilities that are currently rearing RASU or BONY, or have agreed to enter into or continue a partnership with the LCR MSCP to provide rearing space for these fishes:

1. Willow Beach NFH (USFWS)
2. Achii Hanyo Native Fish Rearing Facility (USFWS)
3. Dexter NFH (USFWS)
4. Bubbling Ponds SFH (AGFD)
5. Lake Mead SFH (NDOW)
6. Uvalde NFH (USFWS)
7. Overton WMA (NDOW)

Activities required for developing, operating, and maintaining these facilities will be identified in annual work plans, but will most likely include such routine items as:

1. Repair or replace pond liners.
2. Develop, repair, or replace water delivery systems including pipes, valves, pumps, well motors, etc.
3. Construct new ponds.
4. Install or repair fish collection kettles.
5. Repair or replace bird netting and other predator control devices.
6. Maintain access roads, work areas, lighting, and security systems (alarms, fences).
7. Repair or replace backup power generators, load banks, and electric service components.

**Rear fish to target size and stock fish into LCR:** The HCP provides instructions for RASU and BONY augmentations. The augmentation stockings are of three types. Type I requirements are to stock fish for simple population development and maintenance, with a few thousand fish to be stocked each year for 40 to 50 years. For Type II requirements, fish are to be released in large quantities each year for 5 consecutive years. Concurrent with these latter stockings, extensive scientific monitoring will be conducted to provide data to the LCR MSCP adaptive management program. Type III stocking requirements complete specific actions associated with conservation measures from previous endangered species consultations.

| Species | Location | Notes |
|---|---|---|
| RASU | Reach 3 | 6,000 per year (300 mm TL) for 45 years (Type I) |
| " | Reach 4/5 | 6,000 per year (300 mm TL) for 45 years (Type I) |
| " | Reach 3, 4, 5 | 24,000 per year for five consecutive years with at least 6,000 into Reach 3 and 6,000 into Reach 4/5 for research (Type II) |
| " | Reach 2 | Sufficient numbers to maintain brood stock @ 50,000 adults (Type III) |
| " | Reach 1 | Larvae reared to honor ISG/SIA commitments (Type III) |
| | | |
| BONY | Reach 2 | 5,000 per year (300 mm TL) for 40 years, to begin in 2016 (or upon completion of USFWS's BO actions) (Type I) |
| " | Reach 3 | 4,000 per year (300 mm TL) for 50 years (Type I) |
| " | Reach 4/5 | 8,000 per year (300 mm TL) for five consecutive years for research (Type II) |
| " | Reach 4/5 | 4,000 per year (300 mm TL) for 45 years (Type I) |

These fish will all be reared at one or more of the hatcheries listed previously. These hatcheries are interrelated and dependent upon each other to achieve this augmentation program. There currently is sufficient capacity among the hatcheries listed above to rear the numbers of fish needed for the Type I stockings through 2011. The current strategy is to rear fish to accomplish Type I and Type III needs, while continuing facility development and improvements to add capacity. Sufficient capacity to start the expanded stocking actions required to initiate the adaptive management research (Type II) is expected to be in place by FY11.

## Species Research (Section C)

In order to fully comply with the HCP, research will be conducted on covered species and their habitats to guide selection and application of conservation techniques, to document successful implementation of conservation measures, and to develop alternatives to conservation actions that prove ineffective. This strategy will allow researchers to quantify existing knowledge, identify data gaps, and design and implement species research to fill these data gaps. Species research for fishes is currently focusing on the following areas:

1. *Fish Propagation and Culturing:* As described in the previous section, the LCR MSCP must rear and stock many thousands of RASU and BONY over the life of the program. RASU and BONY are rare fishes, and have only been in captivity for a few decades. Propagation and culturing techniques used for other fishes, such as rainbow trout and channel catfish, do not always work for native Colorado River fishes. One of the first focus areas for species research is the rearing of RASU and BONY (see Razorback Sucker Growth Studies (C10) and Bonytail Rearing Studies (C11)). A new study for 2008 will evaluate raceway rearing of RASU at Lake Mead SFH (C26) and assess growth rates, food conversion, and condition factor for fish reared in flowing water.

2. *Post-Stocking Survival:* Reclamation has reared and stocked more than 70,000 RASU into the Colorado River downstream of Parker Dam, and the LCR MSCP is expected to stock another 200,000 or more. The question of survival is still outstanding. Reclamation began a study to assess post-stocking survival in 2003. This species study, Razorback Sucker Survival Studies (C8), was integrated into the LCR MSCP. The work continues and is expected to be completed in FY08. Species research to evaluate past BONY stockings (C16) began in 2007.

3. *Brood Stock Development and Maintenance:* The LCR MSCP continues the development and maintenance of the RASU brood stock in Lake Mohave. The target population size for this group is 50,000 adult fish. The Lake Mohave Native Fish Work Group has repatriated more than 100,000 sub-adult fish to date; however, recapture data suggest that fewer than 5,000 have survived. Demographics and Post Stocking Survival of Repatriated Razorback Suckers in Lake Mohave (C12) began in FY06 to address the question of what happened to these fish. One facet of this work is assessing the effect of fish size at time of release on survival to adulthood. To evaluate this effect, RASU being reared for repatriation to Lake Mohave are now being grown to 500 mm total length. This targeted fish size will be in place through 2008.

4. *Lake Mead Investigations:* The LCR MSCP is continuing the Lake Mead Razorback Sucker Study (C13), which is a conservation measure from an earlier ESA consultation, the 2001 BO. This is the tenth year of the Lake Mead Razorback Sucker Study; the goal for 2007 is to compile a 10-year summary to allow resource managers to evaluate results to date and determine the scope and direction of further work. While this decision is being made, monitoring of the Lake Mead RASU population will continue.

5. *Managing Native Fishes in Restored Backwaters:* Creation of backwater habitats for covered fish species is another major goal of the LCR MSCP. Work accomplished under Covered Species Profile Development (C3), Development of Backwater Rating Criteria, synthesized existing data for covered species that are found in backwater habitats. These data are being used to develop backwater rating criteria under Backwater Site Selection work task (E15). In 2007, pond construction activities for Imperial Ponds will be completed, and research into operation and maintenance of native fish populations in the ponds will begin (C25).

6. *Support Humpback Chub Research in the Grand Canyon:* The HCP outlines specific research actions in the conservation measures for HUCH. Humpback Chub Program Support (C14) provides funding support for conservation activities being conducted under the Glen Canyon Adaptive Management Program.

7. *Flannelmouth Sucker Investigations:* FLSU conservation is addressed by Flannelmouth Sucker Habitat Use, Preference, and Recruitment Downstream of Davis Dam (C15), which provides funding to investigate this species in the Colorado River downstream of Davis Dam. This work is in its second year and is expected to continue through 2010.

8. *Remote Sensing for Fish:* Research is underway to look at ways to census and monitor stocked fish without having to actually capture them. Evaluation of Remote Sensing Techniques for PIT-Tagged Fish (C23) is evaluating the use of stationary PIT-tag detection equipment. Under Adaptive Management Research Projects (G3), ocular surveys, photography, and video-monitoring techniques are being investigated.

## System Monitoring (Section D)

As described in the HCP, system monitoring will be conducted on existing populations and habitats of covered species to determine species status, distribution, density, migration, productivity, and other ecologically important parameters. System monitoring allows program staff to develop and maintain a knowledge base of data for existing populations and their habitats, and to have these data available for long-term assessment of species under the adaptive management program.

Only three of the four covered native fish species (RASU, BONY, and FLSU) are being monitored by the LCR MSCP at this time. The fourth species, HUCH, is essentially extirpated from the main-stem Colorado River below the Grand Canyon. It is possible that a stray HUCH could occasionally be found in upper Lake Mead, but this would be a remarkable find (no such find has occurred in the last three decades).

The system monitoring actions for RASU and BONY are covered in Razorback Sucker and Bonytail Stock Assessment (D8). Under this work task, Reclamation will annually gather information on the status of these species by project reach. A status report will be developed annually, depicting the end-of-year status in terms of distribution and abundance of each species.

Monitoring data for FLSU are included in the research actions being conducted for this species, as described earlier.

## Conservation Area Development (Section E)

Habitat creation for native fish is limited to backwater development. The LCR MSCP is required to establish 360 acres of backwater habitat for BONY and RASU in Reaches 3-6. Up to 85 acres will be created in Reach 3 for FLSU. Implementation strategies range from making minor modifications in existing backwaters to major modifications such as the complete excavation of undeveloped land. Future backwater development for native fishes will be guided by the outcome of Backwater Site Selection (E15). This work task is central to facilitating development of the remaining backwaters necessary under the LCR MSCP.

## Post-Development Monitoring (Section F)

Post-development monitoring will be conducted at each conservation area following completion of habitat creation activities. This monitoring will evaluate both the maturation of the site as it develops into covered species habitat and the use of the habitat by the covered species. Beal Lake Native Fish (E2) is the only created backwater habitat developed to date. Imperial Ponds (E14) construction is slated for completion in 2007. Post-Development Monitoring of Fish Restoration Sites (F5) provides funding to support post-development monitoring of these sites.

## Adaptive Management Program (Section G)

The LCR MSCP Adaptive Management Program (AMP) will address uncertainties encountered during implementation of the conservation measures outlined in the HCP. The program has three central components: 1) gauging the effectiveness of existing conservation measures, 2) proposing alternative or modified conservation measures, as needed, and 3) addressing changed and unforeseen circumstances.

With FY06 being the first full year of LCR MSCP implementation, it is as yet unnecessary to formally change any part of the program through the AMP. The current needs of the AMP are in the form of data collection and organization so that, when needed, the information can be readily accessed for use in the decision-making process. Data Management (G1) will fund the database management for the AMP. For native fishes, all stocking and tagging data developed by the LCR MSCP are provided to and maintained by Arizona State University (ASU) in an electronic database.

Another aspect of the AMP that is needed early on is a tool box of evaluation techniques that can gauge the effectiveness of conservation measures as they are completed. Adaptive Management Research Projects (G3) will allow for the development of these tools. Funds allocated from G3 are being used to investigate non-intrusive survey techniques to assess relative abundance of RASU.

Fishery program activities under the LCR MSCP are coordinated with the other recovery actions (Upper Colorado River Basin Recovery Implementation Program, San Juan River Recovery Implementation Program, Glen Canyon Adaptive Management Program) through participation in meetings and presentations to research and management groups, including local chapters of the American Fisheries Society, Colorado River Aquatic Biologists, Lake Mohave Native Fish Work Group, and the Lower Colorado River Native Fish Work Group.

## Monitoring and Research for Terrestrial, Riparian, and Marsh Habitats and Associated Covered Species

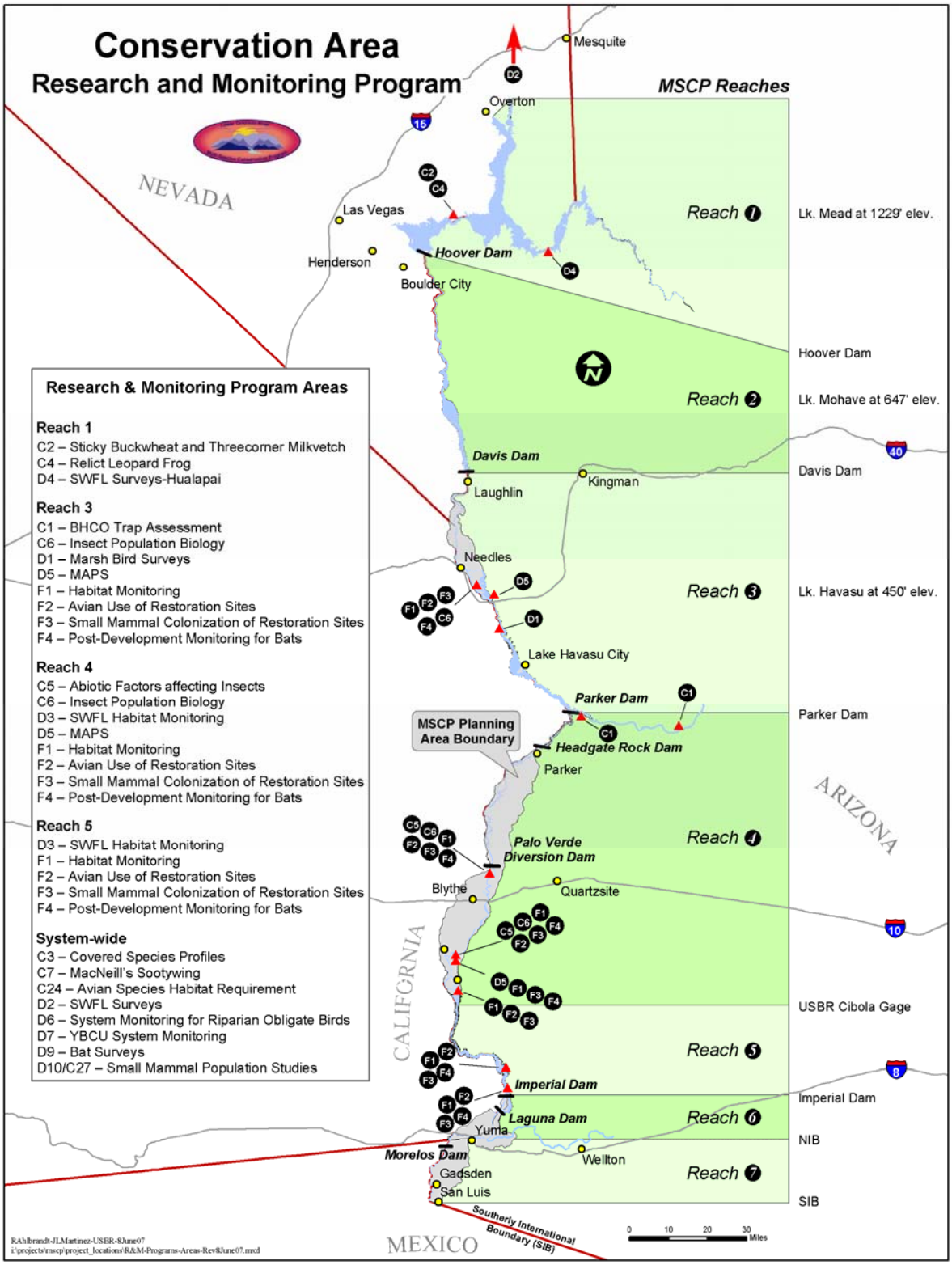
The LCR MSCP utilizes a habitat-based approach to the conservation of covered species. In order to fully comply with the HCP, monitoring and research programs will be conducted throughout the LCR MSCP implementation period. Monitoring and research activities use standardized and scientifically accepted protocols for evaluating covered species and their habitats, guide selection and application of conservation techniques, document successful implementation of conservation measures, and develop alternatives to ineffective conservation actions. The HCP lists five general elements of the monitoring and research program:

1. Species Research (Section C)
2. System Monitoring (Section D)
3. Restoration Research (Incorporated into Section E)
4. Post-Development Monitoring (Section F)
5. Adaptive Management (Section G)

Although the HCP separates the monitoring and research program into five elements, connectivity and overlap exist throughout the monitoring and research program. Work tasks may have multiple goals or study results may directly lead to additional work tasks in other elements. A *Draft Final Science Strategy* was completed in FY06, which provides programmatic guidance for ensuring that the implementation of conservation measures will be based on scientific information, methods, principles, and standards. A 5-year planning and evaluation period has been identified in the science strategy to provide short-term priorities. The *Draft Final Science Strategy* can be found on the LCR MSCP Web site.

Initial monitoring and research efforts emphasized the continuation of existing monitoring programs, where applicable, and accumulation of additional data on existing covered species and their habitats. All known information on the covered species, especially data necessary for habitat creation and maintenance, will be synthesized from past and ongoing research and monitoring programs to quantify existing knowledge and identify data gaps. Species research projects will then be designed to acquire the additional data needed for successful implementation of the conservation measures.

Creation of riparian, marsh, and backwater habitats for targeted covered species is a major goal of the LCR MSCP. Information gathered through the synthesis of past and ongoing research and monitoring programs, and new data accumulated through targeted research projects identified during the above process, will be used to guide the project design of proposed habitat creation. In addition, research will be conducted to evaluate habitat restoration and maintenance techniques to ensure that efficient and effective techniques are used in the adaptive management process. Each habitat creation project will have a restoration development and monitoring plan detailing targeted covered species habitat requirements and methods used to monitor successful implementation of the project. Post-development monitoring will occur to evaluate whether each habitat creation project is implemented as designed, whether habitat requirements are provided


Conservation Area
Research and Monitoring Program
MSCP Reaches
NEVADA
ARIZONA
CALIFORNIA
MEXICO
Mesquite
Overton
Las Vegas
Henderson
Boulder City
Hoover Dam
Davis Dam
Laughlin
Kingman
Needles
Lake Havasu City
Parker Dam
Headgate Rock Dam
Parker
MSCP Planning Area Boundary
Palo Verde Diversion Dam
Blythe
Quartzsite
Imperial Dam
Laguna Dam
Yuma
Morelos Dam
Wellton
Gadsden
San Luis
Reach 1
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
Reach 7
Lk. Mead at 1229' elev.
Hoover Dam
Lk. Mohave at 647' elev.
Davis Dam
Lk. Havasu at 450' elev.
Parker Dam
USBR Cibola Gage
Imperial Dam
NIB
SIB
Southerly International Boundary (SIB)
0 10 20 30 Miles
Research & Monitoring Program Areas
Reach 1
C2 – Sticky Buckwheat and Threecorner Milkvetch
C4 – Relict Leopard Frog
D4 – SWFL Surveys-Hualapai
Reach 3
C1 – BHCO Trap Assessment
C6 – Insect Population Biology
D1 – Marsh Bird Surveys
D5 – MAPS
F1 – Habitat Monitoring
F2 – Avian Use of Restoration Sites
F3 – Small Mammal Colonization of Restoration Sites
F4 – Post-Development Monitoring for Bats
Reach 4
C5 – Abiotic Factors affecting Insects
C6 – Insect Population Biology
D3 – SWFL Habitat Monitoring
D5 – MAPS
F1 – Habitat Monitoring
F2 – Avian Use of Restoration Sites
F3 – Small Mammal Colonization of Restoration Sites
F4 – Post-Development Monitoring for Bats
Reach 5
D3 – SWFL Habitat Monitoring
F1 – Habitat Monitoring
F2 – Avian Use of Restoration Sites
F3 – Small Mammal Colonization of Restoration Sites
F4 – Post-Development Monitoring for Bats
System-wide
C3 – Covered Species Profiles
C7 – MacNeill's Sootywing
C24 – Avian Species Habitat Requirement
D2 – SWFL Surveys
D6 – System Monitoring for Riparian Obligate Birds
D7 – YBCU System Monitoring
D9 – Bat Surveys
D10/C27 – Small Mammal Population Studies
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for targeted covered species, and to guide habitat management decisions. Information gathered through post-development monitoring will, in turn, be used to further define habitat requirements through the adaptive management process.

System monitoring programs may be used to guide existing habitat maintenance programs, evaluate existing covered species populations, design avoidance and minimization measures, and provide data for the adaptive management of created and existing covered species habitat. Existing system monitoring programs will be evaluated and continued under the LCR MSCP, where applicable. System monitoring programs may utilize single species or multi-species protocols, depending on data priority, existing activities, effectiveness, and efficiency.

The monitoring and research program of the LCR MSCP provides information to manage existing habitats, create new habitats, enhance covered species populations, and avoid or minimize disturbance to covered species and their habitats. Information gathered during species research, system monitoring, restoration research, and post-development activities may be utilized for a variety of purposes. Some monitoring projects are designed to answer research questions, provide information for system monitoring, and provide post-development monitoring data. Research projects are designed to provide data for monitoring protocols and habitat creation plans. Information gathered by non-LCR MSCP programs may be incorporated when applicable.

## Species Research (Section C)

Species research work tasks are designed to provide the necessary information required to create and manage habitats and populations for covered species. Work tasks identified in this section focus on identifying known life history and habitat requirements for covered species (Multi-Species Conservation Program Covered Species Profile Development (C3)), and addressing information gaps in establishing and managing created habitats for these species. Information gained will be used to design and evaluate protocols for system-wide surveys in Section D, and to help design and manage habitat created in Section E. Species research activities fill specific needs described in conservation measures within the HCP or continue ongoing studies. New research projects have been identified since the completion of covered species accounts in 2006 (C3). These species accounts will be updated annually, when applicable.

In 2006, species research work tasks continued existing research projects identified prior to LCR MSCP implementation. Brown-headed Cowbird Trap Assessment (C1) evaluated the success of a trapping program initiated under the 1997 BO. Information gathered through this post-trap assessment will help determine trapping intervals, if brown-headed cowbird (BHCO) trapping becomes necessary under the LCR MSCP or the SIA. Information gained from this study will be utilized in conjunction with additional BHCO control research being conducted under Southwestern Willow Flycatcher Presence/Absence Surveys (D2).

Three species research work tasks were designed to define insect relationships to riparian plant communities. Effects of Abiotic Factors on Insect Populations in Riparian Restoration Sites (C5), and Insect Population Biology in Riparian Restoration Sites (C6) were initiated in 2006. Information gathered will help direct future habitat creation planning efforts for targeted covered species that utilize insects as a major portion of their prey base. Survey and Habitat

Characterization for MacNeill's Sootywing (C7) defines surveys and habitat characterization for the MacNeill's sootywing skipper. Conservation measures call for surveying potential skipper habitat, locating skipper populations, and describing habitat requirements to guide future restoration efforts. It is anticipated that these efforts will be completed by 2009. Information gathered from these research projects will be used to help design and manage the created habitats planned in Section E.

The HCP outlines specific conservation measures for sticky buckwheat, threecorner milkvetch, and relict leopard frog. Conservation measures for both plant species are limited to providing funding to the Clark County MSHCP Rare Plant Workgroup to support implementation of conservation measures that are beyond the permit requirements of the Clark County MSHCP. Similarly, the HCP conservation measure for relict leopard frog directs funding to the Relict Leopard Frog Conservation Team to support implementation of planned, but unfunded, conservation measures. Sticky Buckwheat and Threecorner Milkvetch Conservation (C2), and Relict Leopard Frog (C4) accomplish these conservation measures.

For 2008, two new species research work tasks have been written to acquire additional information identified in the species accounts (C3). Information obtained in Avian Species Habitat Requirements (C24) will be used to create habitat suitability index models for covered avian species. These models will identify potential limiting factors or important habitat requirements that will be used to design, create, and manage marsh habitat creation projects.

Research will be conducted on covered mammal species in 2007 to determine distribution, population status, genetic differentiation, and habitat use (C27). These studies will be utilized to determine study plans and protocols for future system-wide monitoring that will be implemented in 2009. Data from these studies, and from Small Mammal Colonization of Restoration Sites (F3), will help determine habitat characteristics needed for the design and management of created habitats in Section E.

## System Monitoring (Section D)

System monitoring will be conducted to determine the ongoing status of covered species and their habitats in the LCR MSCP planning area. System monitoring programs that were established prior to LCR MSCP implementation were continued in 2005-07. In 2007, in addition to continuing existing monitoring programs (D1 through D5), several new system monitoring projects were initiated throughout the LCR MSCP area for species or guilds of species not previously monitored (System Monitoring for Riparian Obligate Avian Species (D6), Yellow-Billed Cuckoo Presence/Absence Surveys (D7), and System Monitoring and Research of Covered Bat Species (D9). System monitoring may utilize single species or multi-species protocols, depending on species priority, effectiveness, and efficiency.

In accordance with previous BOs and in anticipation of the implementation of the LCR MSCP, Reclamation began system-wide monitoring for several species and guilds of species including the SWFL, Yuma clapper rail (CLRA), and neotropical migratory birds. These studies have been integrated into the LCR MSCP, where applicable.

System monitoring for CLRA has been conducted since the 1980s. In anticipation of LCR MSCP initiation, a multi-species marsh bird protocol was designed by the U of A. Marsh bird surveys will continue to be conducted annually by an inter-agency group using the multi-species survey protocol approved by USFWS in 2006. Reclamation will continue to be an active participant in the LCR marsh bird survey effort under Work Task D1, to maintain existing CLRA (CLRA2) and CBLRA (BLRA2) habitat areas in accordance with the HCP.

Three system monitoring work tasks (Southwestern Willow Flycatcher Presence/Absence Surveys (D2), Southwestern Willow Flycatcher Habitat Monitoring (D3), and Southwestern Willow Flycatcher Presence/Absence Survey Hualapai Tribe (D4)) continue existing monitoring for SWFL and its habitat. Presence/absence surveys and life history studies have been conducted system-wide since 1996 and continue under D2. These surveys will continue, using the current single-species protocol, until the existing contract expires after the 2007 field season. Work task D2 will be evaluated in 2007 and any changes to the protocol or deliverables will be incorporated into future work tasks. Cost estimates for FY08 anticipate changes to the protocol and deliverables. Additional surveys are being conducted by the Hualapai tribe within the Grand Canyon (D4). These surveys will also be evaluated at the end of the 2007 field season, in conjunction with the overall system monitoring effort for SWFL. Habitat occupied by SWFL is monitored between Parker and Imperial dams under the 2001 BO requirements subsumed within the LCR MSCP (D3). The 2001 BO Reasonable and Prudent Measure 4 requires annual presence/absence surveys for up to 5 years after the implementation of all water transfers (D2), while Conservation Measure 4 requires habitat monitoring to be conducted annually for the same time period (D3).

System monitoring for YBCU was initiated in 2006 using data acquired from species research work tasks completed in 2005 (C21 and C22). Presence/absence surveys will continue in 2007 (D7). Surveys for YBCU utilize a species-specific protocol to provide data on this late successional riparian obligate species. In 2007, YBCU survey protocol and life history studies will be evaluated and any changes to the protocol or deliverables will be incorporated into future work tasks. Data from these studies will be used to help design and manage created habitats in Section E.

System monitoring for SWFL and YBCU utilize single-species monitoring protocols. Multi-species protocols have been developed to monitor additional avian species covered in the LCR MSCP. System monitoring for riparian obligate avian covered species (D6) will use a multi-species protocol developed by the Great Basin Bird Observatory (GBBO), through the auspices of Nevada Partners in Flight. The United States Geological Survey (USGS) will provide a sampling design in 2007, with implementation anticipated during the 2007 breeding season. Surveys will be conducted annually for the first 5 years. Survey interval will be evaluated during the 5-year program review outlined in the *Draft Final Science Strategy*.

Additional avian monitoring is being conducted through the establishment of Monitoring Avian Productivity and Survivorship (MAPS) stations along the lower Colorado River (D5). The MAPS program provides data for long-term trend analysis on a regional level and detailed information on a site-specific level, including demographic data not obtained through less

intensive survey methods. In 2006, two MAPS stations were operated at Cibola and Havasu National Wildlife Refuges (NWR). Each station must be operated for at least 5 years to obtain site specific data. The Cibola Nature Trail site will have met that requirement by 2007, while the Havasu NWR site is scheduled to be run through at least 2009. The MAPS program will be evaluated for effectiveness in achieving system and post-development monitoring goals and objectives.

System Monitoring and Research of Covered Bat Species (D9) was initiated in 2006. In 2007, system monitoring is being conducted using the protocol developed in 2006. Acoustic surveys and capture techniques will provide information on bat distribution and habitat use. Data from these studies, along with Post-Development Monitoring of Covered Bat Species (F4) will be used to help design and manage created habitats in Section E.

## Post-Development Monitoring (Section F)

Because the LCR MSCP is a habitat-based program, extensive monitoring of created habitats is necessary to evaluate implementation and effectiveness of designed habitat creation projects. To accomplish this task, pre-development monitoring of proposed projects will be conducted to document baseline conditions prior to project implementation. After habitat creation has been initiated, post-development monitoring for biotic and abiotic habitat characteristics will be conducted to document successful implementation and to record successional change within the restored areas.

In 2006, post-development monitoring for habitat characteristics and avian use was conducted at several riparian restoration demonstration sites, which were established under Reasonable and Prudent Alternative 14 of the 1997 BO, and at habitat creation sites listed in Section E. Protocols developed during these monitoring activities will be used for monitoring prior to and after completion of LCR MSCP habitat creation projects.

Beal Lake Riparian (E1), and Cibola Nature Trail Restoration Demonstration sites were established as riparian restoration research projects under the 1997 BO. Habitat and avian use was monitored under Habitat Monitoring (F1) and Avian Use of Restoration Sites (F2) at each site during 2006 to acquire data necessary for riparian habitat creation.

Restoration Development and Monitoring plans were written for Beal Lake Riparian (E1), ‘Ahakhav Tribal Preserve (E3), Palo Verde Ecological Reserve (E4), Cibola Valley Conservation Area (E5), and Imperial Ponds (E14). These plans describe habitat creation activities, monitoring activities, and targeted habitat goals. Future habitat creation projects will require restoration and monitoring plans prior to initiation.

Monitoring was conducted to evaluate plant survivorship, growth, and successional change within created habitats listed in Section E (F1). Pre- and post-development avian monitoring was conducted at habitat creation sites that targeted avian covered species (F2). Presence/absence surveys were conducted for small mammals at two restoration demonstration sites in 2006 (F3). Information obtained during these surveys will be used to develop monitoring protocols for

future pre- and post-development monitoring, and for potential system monitoring or studies on distribution of covered small mammal species. Data from these studies, along with system monitoring of small mammal species (D10/C27), will be used to help prepare designs and manage created habitats in Section E.

In 2007, pre-development data will be collected for sites or phases proposed for habitat creation implementation, including Palo Verde Ecological Reserve (E4), Cibola Valley Conservation Area (E5), and Hart Mine Marsh (E9). Post-development monitoring will occur for sites or phases where implementation has already occurred, such as Beal Lake Riparian (E1), 'Ahakhav Tribal Preserve (E3), and Cibola Valley Conservation Area (E5). Post-development habitat monitoring is expected to continue through the life of the program at intervals determined by age and successional stages of each stand.

Each proposed habitat creation project will be designed to provide known habitat requirements for targeted covered species. To evaluate effectiveness in providing these habitat requirements, pre-development monitoring will be conducted for targeted covered species, including avian species (F2), small mammals (F3), and bats (F4). Because initial habitat creation efforts are focused on converting agricultural fields into habitat, it is anticipated that habitat suitability indices for covered species at agricultural sites will be determined such that it will not be necessary to conduct pre-development monitoring at the same intensity for future agricultural conversion. Post-development monitoring will occur for these covered species to evaluate effectiveness in providing habitat requirements for the targeted covered species.

## Adaptive Management Program (Section G)

The AMP will address uncertainties encountered during program implementation by gauging the effectiveness of existing conservation measures, proposing alternative or modified conservation measures as needed, and addressing changed or unforeseen circumstances. The *Draft Final Science Strategy* details the AMP process for the research and monitoring programs at the project and programmatic levels. A 5-year planning cycle has been identified to allow for the receipt of new information, the analysis of that information, and the incorporation of the new information into the design or direction of future work tasks. The 5-year planning cycle will allow for a review of past activities and the setting of priorities for the next 5-year cycle. Work tasks identified in FY06 and FY07 under the AMP fill needs identified at LCR MSCP initiation.

Data Management (G1) is an integral component of any conservation program, including the LCR MSCP. Funds are allocated to design a data management system capable of tracking all information needed in the decision making process. Implementation of the data management system is expected to begin in FY07.

Some research and monitoring priorities may be established during the first years of program implementation. Funding has been allocated under Adaptive Management Research Projects (G3) to begin priority research identified at the start of LCR MSCP implementation, when applicable.

## Conservation Area Development and Management

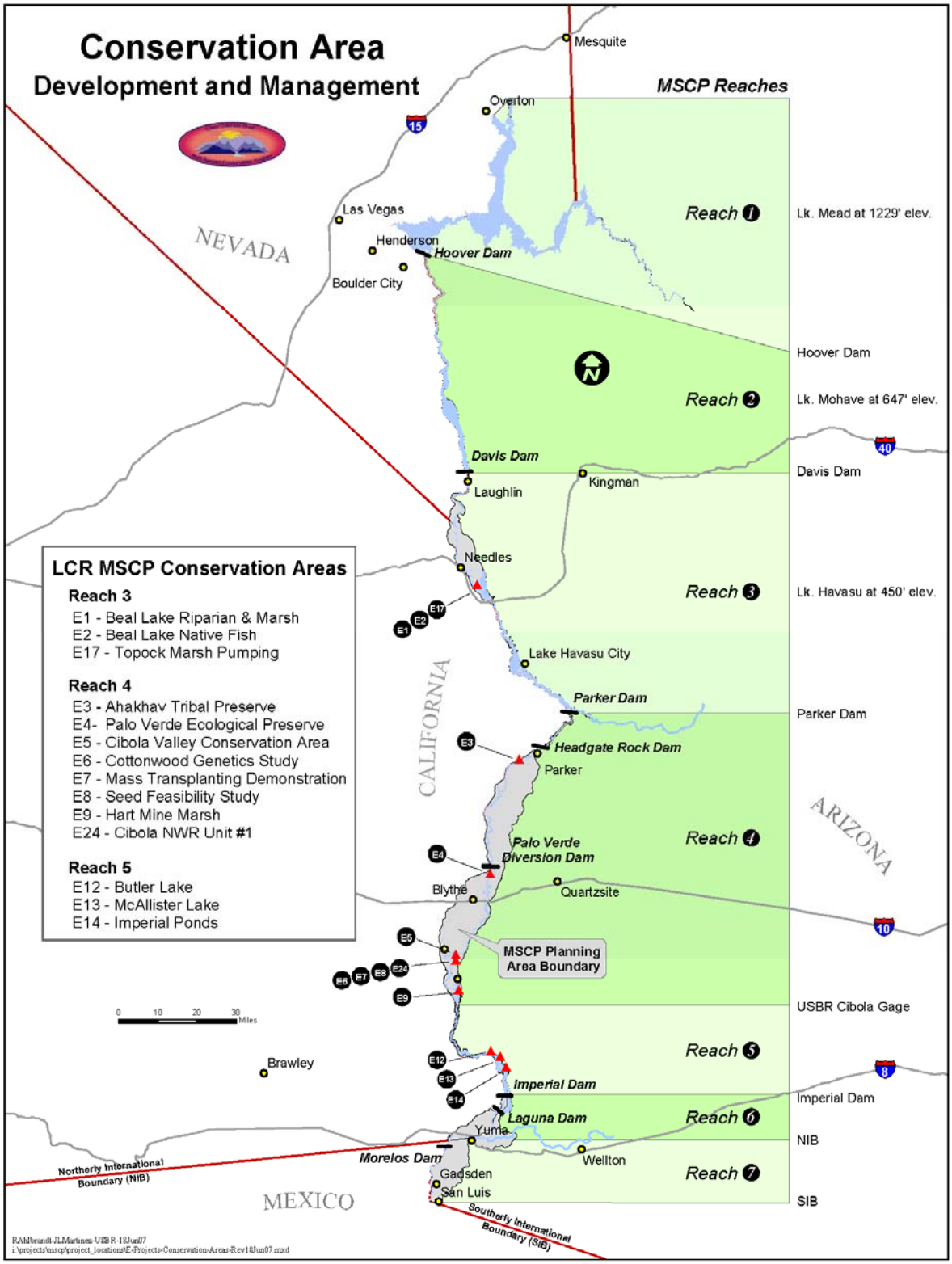
A major component of the LCR MSCP is the creation and management of habitat. Section E addresses the identification, selection, development, and management of created habitat and any restoration research being conducted. In general, habitat creation projects target land cover types with the intention of the vegetation being managed for or developed into a specific habitat. The term "created habitat" is typically used when an established land cover type has met or exceeded its species-specific performance standard. "Land cover type" is defined in the HCP as, "the dominant feature of the land surface discernible from aerial photographs defined by vegetation, or human uses." This definition is used in conjunction with species-specific performance standards to evaluate the creation of habitat. Cottonwood-willow, honey mesquite, marsh, and backwater are the predominant land cover types to be created under the LCR MSCP. For terrestrial and marsh land cover types, trees, shrubs, and groundcover are typically planted or seeded to create the desired land cover type. For backwater land cover types, which include open water and associated emergent marsh, the evaluation of the physical, chemical, and biological conditions suitable for the establishment and maintenance of healthy fish populations and other backwater associated species in the LCR define the habitat. Maturation and management of the land cover types ultimately create the habitat.

As described in the conservation measures, habitat creation goals for the LCR MSCP include the establishment of:

1. 5,940 acres of cottonwood-willow
2. 1,320 acres of honey mesquite
3. 512 acres of marsh
4. 360 acres of backwater

To the extent practicable based on site conditions, cottonwood-willow, honey mesquite, marsh, and backwaters will be restored in proximity to each other to create integrated mosaics of habitat that approximate the relationships among aquatic and terrestrial communities historically present along the LCR floodplain. The selection process is described in the *Draft Guidelines for the Screening and Evaluation of Potential Conservation Areas*, which is available on the LCR MSCP Web site. These Conservation Areas are discrete areas of conserved habitats managed as a single unit under the LCR MSCP. Conservation Areas include LCR MSCP created habitats as well as buffer areas and other lands that may be included in the conservation area design. Conservation Areas developed primarily for riparian and marsh species follow a different selection and evaluation process from those established primarily for native fish. Costs associated with development of the guidelines and implementation of the guidelines are described in Backwater Site Selection (E15), and Conservation Area Site Selection (E16).

Conservation areas developed primarily for riparian or marsh land cover types such as PVER (E4) and CVCA (E5) involve the conversion of existing land cover types (such as active agricultural, fallow agricultural, and undeveloped land) to native riparian species. Restoration research requirements for Conservation Areas are being developed as a part of the *Draft Final*


Conservation Area
Development and Management
MSCP Reaches
Mesquite
Overton
Las Vegas
Henderson
Hoover Dam
Boulder City
NEVADA
Reach 1
Lk. Mead at 1229' elev.
Hoover Dam
Reach 2
Lk. Mohave at 647' elev.
Davis Dam
Kingman
Laughlin
Davis Dam
Needles
Reach 3
Lk. Havasu at 450' elev.
Lake Havasu City
Parker Dam
Parker Dam
Headgate Rock Dam
Parker
CALIFORNIA
ARIZONA
Reach 4
Palo Verde Diversion Dam
Blythe
Quartzsite
MSCP Planning Area Boundary
USBR Cibola Gage
Reach 5
Brawley
Imperial Dam
Imperial Dam
Laguna Dam
Reach 6
Yuma
NIB
Morelos Dam
Wellton
Reach 7
Gadsden
San Luis
SIB
MEXICO
Northerly International Boundary (NIB)
Southerly International Boundary (SIB)
LCR MSCP Conservation Areas
Reach 3
E1 - Beal Lake Riparian & Marsh
E2 - Beal Lake Native Fish
E17 - Topock Marsh Pumping
Reach 4
E3 - Ahakhav Tribal Preserve
E4- Palo Verde Ecological Preserve
E5 - Cibola Valley Conservation Area
E6 - Cottonwood Genetics Study
E7 - Mass Transplanting Demonstration
E8 - Seed Feasibility Study
E9 - Hart Mine Marsh
E24 - Cibola NWR Unit #1
Reach 5
E12 - Butler Lake
E13 - McAllister Lake
E14 - Imperial Ponds
0 10 20 30 Miles
RAhlbrandt-JLMartinez-USBR-18Jun07
i:\projects\mscp\project_locations\E-Projects-Conservation-Areas-Rev18Jun07.mxd

*Science Strategy*. The requirements are expected to include methods to cost-effectively establish and manage planned land cover types while excluding growth of non-native plant species. Terrestrial restoration research projects underway include Beal Lake Riparian (E1), ‘Ahakhav Tribal Preserve (E3), Cottonwood Genetics Study (E6), Mass Transplanting Demonstration (E7), and Seed Feasibility Study (E8).

Strategies for conservation areas that are being developed primarily as backwaters for native fish are likely to range from making modifications to existing backwaters with good water quality, to making improvements to backwaters with poor water quality, to the excavation and creation of backwaters on undeveloped land. Restoration research requirements for backwater development are being developed as part of the *Draft Final Science Strategy*, and are expected to include researching the screening of water to exclude non-native fish, maintaining water quality in isolated backwaters, and controlling non-native fish species.

Two additional significant requirements are incorporated into the LCR MSCP in Section E. First, the LCR MSCP assumed management of 300 acres of backwater created and dedicated to native fish under the 1997 BO. These backwater acres are included in Beal Lake Native Fish (E2), E13, and E14. Second, a commitment from the 2001 BO to create 372 acres of cottonwood-willow for SWFL and create 44 acres of backwater for native fish was incorporated into the LCR MSCP. Habitat created to satisfy the SIA commitment also applies to the LCR MSCP habitat creation requirements and does not represent additional acreage to the totals listed above.

In 2006, conservation area development included securing land and water resources, which allows the LCR MSCP to fulfill the obligations and commitments of the 2001 BO. Working with LCR MSCP partners, three conservation areas are being developed to fulfill the commitments of the SIA. The first conservation area (PVER) contains approximately 1,300 acres of active agricultural lands in Palo Verde Irrigation District and is owned by the CDFG. The second conservation area (CVCA) contains approximately 1,000 acres of active agricultural lands and is owned by Mohave County Water Authority and serviced by the Cibola Valley Irrigation and Drainage District. Phase 1 at both PVER and CVCA were planted in FY06. Expansion of Imperial Ponds (E14) began in June of 2006 and when complete in FY07 is anticipated to fulfill the backwater creation portion of the SIA.

Creating and maintaining the appropriate habitats as dictated by the conservation measures presents several challenges. Present flow regimes on the LCR have been altered considerably from dynamic pre-development flows. Introduced and invasive species exist throughout the program area. Approaches to habitat creation must not only acknowledge the differences from historical conditions, but must also be able to work effectively within the context of current conditions. In addition, existing knowledge and practices must be incorporated to take advantage of appropriate available technologies. An example of this as applied to riparian habitat creation is the use of agricultural technology and infrastructure to deliver water and simulate flooding events for riparian habitat creation projects. To meet these challenges and the goals of the LCR MSCP, three components of habitat creation have been developed: site identification and selection, research and demonstration, and development and management. The following sections describe the distinctions between the components of habitat creation and how they are interconnected within the context of an adaptive approach.

## Site Identification/Selection

A logical process for identifying and selecting locations for habitat creation projects contributes to the overall success of the LCR MSCP. In general, ideal sites are those that have the greatest potential for successfully achieving the desired habitat in the most cost-effective manner. Though this objective appears obvious, it is obscured by a number of variables that can affect both cost-effective development and habitat success. These variables can be logistical: site accessibility, available infrastructure, availability of sufficient resources (water); physical: depth to groundwater, soil texture and chemistry, water quality, eutrophic stage; and political: potential impacts to other species or habitats, permitting requirements, and landowner/partner support. This represents only a portion of the known variables that must be considered when identifying and selecting sites, as unforeseen factors can contribute to greater costs and may limit success in habitat creation. As the program proceeds, this newly acquired knowledge will be incorporated into the site selection processes outlined in work tasks E15 and E16. During FY06, a thorough review of the information gathered during the backwater site selection process was completed, and the report was posted on the LCR MSCP Web site in FY07. Appropriate adaptations are being made through the AMP to properly address and apply newly acquired information, allowing for more accurate assessment of development costs and success potential for future habitat creation projects.

## Research/Demonstration

Restoration research and demonstration projects are vital in supplying new information to make habitat creation projects more effective in terms of meeting species-specific habitat requirements, and more efficient in terms of overall costs to meet those requirements. In general, restoration research projects are those that have specific research questions and are supported by a robust, replicated study design where some level of analysis can be conducted and inferences can be made. These projects may include but are not limited to: research directed at habitat development to meet species needs, improving vegetation growth and survival, testing alternate propagation and habitat establishment techniques, determining habitat creation potential at identified sites based on current ecological functions, and evaluating technologies to assist in meeting specific habitat requirements. Work tasks E2, E4, E6, and E8 address specific research questions. In contrast, demonstration projects like E1, E3, and E7 assess a particular technique to determine if the technique might be feasible and effective for use in a habitat creation project. Demonstration projects are designed to evaluate techniques, effectiveness, and cost efficiency. These activities may mature into a land cover type that meets the specific performance criteria for created habitat for the covered species. Until that time, these projects will be referred to as research or demonstration projects. Both of these types of investigations increase knowledge of habitat creation and will be used to inform and guide future selection and implementation of habitat creation projects.

## Development/Management

Habitat development and management are strongly connected. As described previously, in many cases created habitat is achieved through the process of development, establishment, and modification of the site and growth (maturation) of the land cover type. Subsequent management of that land cover type either maintains the specific requirements necessary for that created habitat, or moves that land cover type towards achievement of those specific habitat requirements. Habitats, both aquatic and terrestrial, are dynamic. They are better described as a "continuum" rather than a "stage" of development or succession. By using knowledge gained from research, demonstrations, and experience, sites with the greatest potential for success can be identified, and the most effective designs and approaches can be employed to create the targeted cover type. In the context of current conditions, to achieve the desired habitat under the LCR MSCP calls for establishing and managing for a snapshot in time and ecological succession. This may require actively creating disturbance to "reset" or maintain the land cover type in the proper seral stage (in the case of some riparian habitat). For a backwater, it may involve removing organic matter from the bottom of that backwater to reduce biological oxygen demand and maintain acceptable levels of water quality. In any case, habitat creation does not end with the establishment of the proper vegetation type or isolation of a backwater.

Over the course of identification/selection, research/demonstration, and establishment/management of created habitats, information is gathered that affects and alters understanding of these processes. This feedback in turn, may serve to modify site selection or establishment approaches for future projects. It can also reveal needs not previously anticipated. For example, during collections for the Mass Transplanting Demonstration (E7), it became apparent that establishment of native plant nurseries would be needed to supply an adequate source of cuttings for future large-scale propagation and establishment of riparian vegetation. A centralized location with an easily accessible supply of riparian species would also reduce time and costs associated with collection. These nurseries were incorporated into the phased developments plans E4 and E5. Each site, whether it is identified as marsh, backwater, honey mesquite, or cottonwood-willow cover type, will have its own set of site-specific challenges to overcome.

# WORK TASKS
# SECTION A

# PROGRAM ADMINISTRATION

## Work Task A1: Program Administration

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $1,000,000 | $1,120,653 | $1,567,243 | $1,142,196 | $1,187,000 | $1,187,000 | $1,187,000 |

**Contact:** Lorri Gray, (702) 293-8555, lgray@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Program Administration

**Conservation Measures:** N/A

**Location:** N/A

**Purpose:** Program Administration

**Connections with Other Work Tasks (past and future):** N/A

**Project Description:** Provides senior staff and administration support to manage implementation of the LCR MSCP. The Program Manager will direct functions and activities associated with implementation of the HCP to ensure the completion of activities in accordance with the program documents.

**Previous Activities:** Established a new stand-alone LCR MSCP Office in the Lower Colorado Region of the Bureau of Reclamation. Established a new Steering Committee and recognized all participating entities in accordance with the Funding and Management Agreement (FMA). Finalized and received approval of the By-Laws for the Steering Committee. Developed a report format for the LCR MSCP Annual Work Plan. Developed a financial tracking system that allows users to track costs and audit expenditures.

**FY06 Accomplishments:** The focus for program administration in FY06 was on the development of processes for the program. A draft site selection guidelines process, draft science strategy process, and draft database management options for managing data, were developed and presented for comment to Steering Committee work groups. In addition, a program decision document describing how in-kind credit for land and water will be determined was approved by the Steering Committee at its April 2006 meeting. The Fiscal Year 2007 Implementation, Work Plan and Budget Report and Fiscal Year 2005 Accomplishment Report were presented to the Steering Committee and a work group meeting was held in May to receive comments. Other activities focused on educating Steering Committee members on the program. A river tour of the program area was conducted over a 3-day period in December 2005, with more than 50 Steering

Committee members participating. In FY06, Reclamation also developed a process to improve the issuing of grants and cooperative agreements. A Steering Committee work group meeting was held in April 2006 to determine additional funding options available to the LCR MSCP program through the use of grants.

**FY07 Activities:** Work in FY07 continues the development of processes for program implementation. One of the recommendations in the draft science strategy was for the development of 5-year science goals. These will be drafted and presented to the Steering Committee for review in 2007. Reclamation will be developing land use agreements and other mechanisms to secure resources. In addition, a program decision document for in-kind credit for services is being developed. In FY07, short field trips for the Steering Committee are being scheduled to highlight program components. A field trip for the Lake Mohave Fish Rearing Program was held in February 2007. An internal review of FY06 financial records was done to fine tune financial tracking, along with the establishment of a financial work group to review information once a year.

In an effort to expedite compliance activities for Reclamation-covered actions and LCR MSCP implementation, Reclamation is working on a Memorandum of Understanding with the U.S. Corps of Engineers that will lay out a process to develop a strategy for 404 compliance. Reclamation is also meeting with state resource agencies to examine compliance options under the Fish and Wildlife Coordination Act.

**Proposed FY08 Activities:** Program Administration for FY08 will continue the management of the LCR MSCP Program. This will include pursuing land and water resources opportunities and developing criteria for use of the Habitat Maintenance Fund. In conjunction with the USFWS, crediting methodology for habitat mosaics will be developed. In addition, the Implementation Report Fiscal Year 2009 Work Plan, and Budget and Fiscal Year 2007 Accomplishment report will be prepared. Financial tracking for the program will continue and an annual Financial Work Group Meeting will be held. The LCR MSCP Web site will also be maintained.

**Pertinent Reports:** *Implementation Report Fiscal Year 2007 Work Plan, and Budget, Fiscal Year 2005 Accomplishments, April 2006* are posted on the LCR MSCP Web site. *Draft and Final Implementation Report, Fiscal Year  Work Plan  and Budget, Fiscal Year 2006 Accomplishments* will be posted when available.

# WORK TASKS
# SECTION B

# FISH
# AUGMENTATION

## Work Task B1: Lake Mohave Razorback Sucker Larvae Collections

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $225,000 | $222,391 | $424,214 | $200,000 | $200,000 | $200,000 | $200,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY04

**Expected Duration:** FY55

**Long-term Goal:** Fish Augmentation

**Conservation Measures:** RASU3, RASU5, and RASU8

**Location:** Reach 2, Lake Mohave, AZ/NV

**Purpose:** Develop the razorback sucker (RASU) broodstock in Lake Mohave, maintain the broodstock, and harvest offspring for rearing as needed to accomplish the LCR MSCP Fish Augmentation Program.

**Connections with Other Work Tasks (past and future):** Work tasks B2, B4, B5, B6, and B7 are related to this Work Task, as the RASU to be reared under these work tasks originate from Lake Mohave.

**Project Description:** The RASU broodstock in Lake Mohave represent the remaining genomes for RASU and provide a level of genetic diversity found nowhere else in the world. This project captures wild-born RASU larvae from Lake Mohave, and delivers them to Willow Beach NFH for initial rearing. Work includes helicopter surveys every two weeks to locate spawning groups, night-time larvae collection, and maintaining the boat fleet and field station at Cottonwood Cove. These larvae are captured one at a time, making this a labor-intensive program. Hence, most expenditures are for salary, travel, and fuel.

Work normally commences in mid to late January. Equipment is delivered to and staged at Cottonwood Cove where a field station is established. The lake's shoreline is surveyed by helicopter, and locations of spawning aggregations of RASU are recorded. Crews of two to four staff meet at the field stations at sunset, gather batteries, lights, dip nets, and buckets, and set out by boat to the spawning areas. Razorback sucker larvae attracted to submerged lights suspended from the boat are captured by net and are counted. Crews return to the field station, label buckets of larvae, record their capture success and location, place batteries back on chargers, clean and stow other gear, and place air stones in buckets to maintain adequate oxygen levels. The next morning the larvae are transferred to Willow Beach NFH by either boat or vehicle, where they

are logged in as to date received, number collected, and location. This work is repeated four to six nights per week through mid to late April.

**Previous Activities:** This work is part of a program started by the Native Fish Work Group (NFWG) in 1989 to rebuild the adult stock of RASU in Lake Mohave so that these fish could be used as brood fish for RASU recovery. The goal of the NFWG was to develop a population of 50,000 adult RASU. Various rearing techinques were tried between 1991 and 1993; in 1994 it was determined that capturing wild larvae from the lake and rearing them in captivity offered the best chance to successfully complete the program.

**FY06 Accomplishments:** Sixty-three thousand nine hundred seventy-five (63,975) wild larvae were collected from four areas on Lake Mohave during 2006. Contribution of larvae from each zone by month of capture is presented in the following table.

| Zone | Jan | Feb | March | April | Total |
|---|---|---|---|---|---|
| Nine Mile | 0 | 1,620 | 4,329 | 0 | 5,949 |
| Tequila | 30 | 13,814 | 19,606 | 1,950 | 35,400 |
| Yuma | 1,060 | 6,815 | 8,219 | 5,563 | 21,729 |
| AOP | 0 | 0 | 525 | 372 | 897 |
| **Total** | **1,090** | **22,249** | **32,751** | **7,885** | **63,975** |

From 1994 through 2006, some 622,168 wild RASU larvae have been collected from Lake Mohave.

**FY07 Activities:** High survival for RASU larvae captured in 2005 and 2006, combined with concerns regarding quagga mussel infestation, have resulted in a target of only 20,000 larvae required for 2007. Capturing wild larvae is an issue of quality as well as quantity; no change in cost will be incurred since the same number of trips and helicopter surveys will be conducted. The RASU larvae for Bubbling Ponds SFH that normally come from this venture will be supplied by Dexter NFH until quagga mussel issues are resolved.

**Proposed FY08 Activities:** Larval RASU will be collected as needed for continued broodstock development/maintenance and for augmentation stockings. The numbers of larvae required will be determined in December 2007, but a tentative target of 50,000 larvae is used here to establish a budget estimate.

**Pertinent Reports:** *2006 Fish Augmentation Summary* will be posted to the LCR MSCP Web site.

## Work Task B2: Willow Beach National Fish Hatchery

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $200,000 | $206,486 | $386,486 | $225,000 | $235,000 | $235,000 | $235,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Fish Augmentation

**Conservation Measures:** RASU3, RASU4, RASU5, RASU6, BONY3, and BONY4

**Location:** Reach 2, Willow Beach, AZ

**Purpose:** Annually contribute RASU and bonytail (BONY) to the LCR MSCP Fish Augmentation Program.

**Connections with Other Work Tasks (past and future):** Much of the activity at Willow Beach NFH is related to other Work Tasks in Section B, because most of the RASU and BONY reared for the LCR MSCP Fish Augmentation Program spend time at Willow Beach NFH. (For further information, please see the Fish Augmentation Plan, which provides an overview of the program and shows the interrelationships between the various hatcheries). Some of the fishery research actions described in Section C are ongoing at this facility, including Pen Rearing Tests (C9), Bonytail Rearing Studies (C11), and Humpback Chub Monitoring Program (C14).

**Project Description:** Willow Beach NFH is managed by the USFWS. The hatchery receives funding from the LCR MSCP for rearing of RASU and BONY for the Fish Augmentation Program. There are three primary tasks at the hatchery:

1. Receive fish to be reared. Each year the facility is to receive wild RASU larvae collected from Lake Mohave by the Native Fish Work Group (NFWG). Also, the hatchery is to receive fingerling BONY (25-75 mm TL) from Dexter NFH.

2. Provide fish to other hatcheries. Each year Willow Beach NFH is to: provide fingerling RASU to Bubbling Ponds SFH to be further reared and ultimately stocked into reaches 3-5 of the lower Colorado River, provide fingerling RASU from wild-caught larvae to Dexter NFH for further rearing and eventual repatriation to Lake Mohave, and provide juvenile BONY to Achii Hanyo Rearing Facility for further rearing and ultimately for stocking into reaches 3-5 of the lower Colorado River.

3. Rear up to 5,000 subadult RASU to 500 mm TL for repatriation to Lake Mohave. (These fish are being reared to this large size in order to accelerate brood stock development and provide test fish for C12.)

**Previous Activities:** This coldwater trout hatchery began operation in 1962 to produce rainbow trout for recreational fishing. Between 1994 and 1997, USFWS and Reclamation cooperatively added solar heating systems to the hatchery, converting 50% of its rearing capacity to warmwater fish production. Each year since 1996, the hatchery has received wild RASU larvae, reared juvenile RASU, and repatriated fish back to Lake Mohave. Similarly, the hatchery has provided fry to Bubbling Ponds SFH every year since 1997 for rearing and ultimately for return to the lower Colorado River.

**FY06 Accomplishments:** A total of 63,975 RASU larvae were received from Lake Mohave, fingerling RASU were distributed to Bubbling Ponds SFH and Dexter NFH for further rearing, fingerling BONY were distributed to Achii Hanyo for further rearing; and RASU juveniles for repatriation back to Lake Mohave and fingerling BONY for future distribution to Achii Hanyo rearing facility are currently being reared. A total of 1,810 RASU juveniles (250 mm TL) were distributed to lakeside rearing ponds (B7). A total of 10,191 RASU (381 mm average TL) were repatriated into Lake Mohave (Reach 2), and 6,268 RASU were repatriated into three backwaters along a 40-mile stretch of river below Davis Dam (Reach 3). The majority of funds were for salary and consumable materials (fish feed, medicines, chemicals, etc.).

**FY07 Activities:** Willow Beach NFH will receive 20,000 RASU larvae from Lake Mohave. Facilities will continue to rear and distribute RASU and BONY that are currently on station for the LCR MSCP Fish Augmentation Program. This includes 6,059 RASU of the 2004 year class, 24,000 RASU of the 2005 year class, and 28,000 RASU of the 2006 year class. At the end of 2006 there were approximately 10,000 BONY of the 2006 year class and 40,000 BONY of the 2007 year class at the hatchery. Some of these fish will be transferred to Achii Hanyo for rearing and stocking to the lower Colorado River under the LCR MSCP program (B3).

Willow Beach NFH takes water directly out of the Colorado River. During October 2006, a severe, local thunderstorm deposited sand and gravel in the river above the intake, which subsequently resulted in reduced water passage through the intake system. Electricity costs for the pumps have increased by one third. Funding from the LCR MSCP will support repair and cleaning of this water intake system to restore operation to its previous level of efficiency.

During January 2007, the exotic quagga mussel was discovered in Lake Mead and Lake Mohave, and was subsequently found in both Lake Mead SFH and Willow Beach NFH. Larval RASU that were to be transferred to Bubbling Ponds SFH will not be collected (B1) and no RASU of any size or year-class will be delivered to waters outside the lower Colorado River corridor until fish transport protocols are developed and approved by cooperating resource agencies.

**Proposed FY08 Activities:** Facilities will receive RASU larvae from Lake Mohave and continue to rear and distribute RASU and BONY for the LCR MSCP Fish Augmentation Program. Protocols developed for addressing issues with quagga mussel during fish distribution will be incorporated into the stocking program.

**Pertinent Reports:** *2006 Fish Augmentation Summary* will be posted to the LCR MSCP Web site.

## Work Task B3: Achii Hanyo Rearing Station

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $25,000 | $13,190 | $113,190 | $50,000 | $50,000 | $50,000 | $50,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY04

**Expected Duration:** FY55

**Long-term Goal:** Maintain and operate fish rearing facility as an integral part of the LCR MSCP Fish Augmentation Program.

**Conservation Measures:** RASU3, RASU4, BONY3, and BONY4

**Location:** Reach 4, Colorado River Indian Tribes Reservation, Parker, AZ

**Purpose:** Operate and maintain fish rearing facility and annually contribute BONY to the LCR MSCP Fish Augmentation Program for stocking into Reaches 3-5 of the lower Colorado River.

**Connections with Other Work Tasks (past and future):** This work task was previously included in the FY04 work task as Achii Hanyo National Fish Hatchery (A1). This work is related to B2 and B4, as fish from both Willow Beach NFH and Dexter NFH may be transferred to Achii Hanyo Rearing Facility. Additionally, fish research for BONY may be accomplished at this facility.

**Project Description:** This project has two specific actions:

1. The development of Achii Hanyo Rearing Facility as a grow-out site for BONY.
2. The rearing of BONY for release into reaches 3-5 of the lower Colorado River.

Funds allocated to this work will be used for staff salary, facility operation and maintenance, fish feed and chemicals, and fish distribution.

This facility is located on the Colorado River Indian Tribes Reservation, and was formerly a privately owned hatchery, annually producing channel catfish and largemouth bass for sale to local growers and recreational fishing sites. The facility had been abandoned and unused for more than 5 years prior to being leased by the USFWS. Five earthen ponds are used for fish culture and receive Colorado River water from an irrigation canal. There are two house trailers and a storage shed on site, and drinking water is supplied by a shallow well.

The Achii Hanyo Rearing Facility will be used by the LCR MSCP Fish Augmentation Program for rearing BONY. The fish rearing operation is seasonal, producing one crop per year. Bonytail

are brought in from Willow Beach or Dexter NFH in the winter and stocked into the ponds. Ponds are monitored and fish are fed through the spring and summer. In the fall, the ponds are drained, and the fish are harvested, tagged, and released. Fish under target size (less than 300 mm TL) are returned to a pond for continued rearing. New fish are then brought onto the station from Willow Beach NFH or Dexter NFH and the process is repeated. The annual Fish Augmentation Program production goal is 4,000 BONY subadults of 300 mm TL for stocking into reaches 4 and 5 of the lower Colorado River.

**Previous Activities:** The USFWS and Reclamation have been cooperatively upgrading this facility through an interagency agreement initiated in FY04, which annually provides $50,000 for facility improvements. This agreement completes a commitment made under the SIA and will expire at the end of 2007. Prior to 2006, work completed included the purchase and assembly of a new metal building (tank house) and new fiberglass fish tanks. A concrete slab was poured for a new office, feed storage room, and restrooms. A total of 6,275 BONY were tagged and stocked into Lake Havasu (Reach 3) during 2005.

**FY06 Accomplishments:** During 2006, the feed storage room was completed along with most of the work for the new restroom. At the start of the year, 3,000 BONY were already on station and a total of 15,000 BONY were brought in from Willow Beach NFH. A total of 5,714 BONY were harvested and tagged in December. These fish were all wire tagged and distributed as follows: 1,708 BONY were stocked into Reach 3 and 4,006 into reaches 4 and 5. Out of the 5,714 BONY wire tagged, a total of 899 BONY were also PIT tagged for growth study purposes.

**FY07 Activities:** The BONY on station for 2007 include 3,000 fish at 225 mm TL and 5,000 fish less than 50 mm TL. Willow Beach NFH will transport 16,000 BONY (150 mm TL) to Achii Hanyo in February 2007. The production target for 2007 is a harvest of 8,000 BONY at greater than 300 mm TL for stocking into reaches 3, 4, and 5. Two-thirds of the proposed funding is for labor, fish feed, and prophylactic treatment. The balance of the funding is allocated for development of two small ponds from an existing larger pond (currently not in production) to provide holding and research areas.

**Proposed FY08 Activities:** Proposed activity for FY08 is similar to FY07 in that the majority of proposed funding is for fish rearing and routine operation. The balance of funding will be used for maintenance and for outfitting the workshop with benches and work areas for fish tagging and processing.

**Pertinent Reports:** An annual progress report will be posted to the LCR MSCP Web site. Fish production data is being incorporated into the annual *2006 Fish Augmentation Summary Report*.

## Work Task B4: Dexter National Fish Hatchery

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $110,000 | $127,628 | $249,628 | $125,000 | $130,000 | $130,000 | $130,000 |

**Contact:** Ty Wolters, (702) 293-8463, twolters@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Maintain fish-rearing capability to provide RASU and BONY for the LCR MSCP Fish Augmentaion Program.

**Conservation Measures:** RASU3, RASU4, BONY3, and BONY4

**Location:** Off-river, Dexter, NM

**Purpose:** Operate and maintain fish rearing facility; annually contribute RASU and BONY to the LCR MSCP Fish Augmentaion Program and maintain BONY broodstock through completion of the Fish Augmention Program for this species.

**Connections with Other Work Tasks (past and future):** This work is related to work tasks B2, B3, and B10 as fish from Dexter NFH will be delivered to Willow Beach NFH, Achii Hanyo Fish Rearing Facility, and Uvalde NFH. In addition, fish-rearing research activities outlined in C10 and C11 may be conducted at Dexter NFH.

**Project Description:** Dexter NFH is managed and operated by the USFWS. The facility maintains the only broodstock for BONY in the world, and maintains a backup broodstock of RASU. Funds provided will be used to maintain extant broodstock, produce fingerling BONY annually for distribution to other hatcheries, rear RASU to 500 mm TL for repatriation to Lake Mohave for broodstock replacement, and annually rear BONY to 300 mm TL for distribution within Reach 3.

**Previous Activities:** Reclamation and the USFWS have past and ongoing interagency agreements to support rearing and research for RASU and BONY at Dexter NFH.

**FY06 Accomplishments:** Bonytail — USFWS staff hand-stripped eggs and sperm from adult BONY females and males, producing 80,000 fry that were stocked into rearing ponds. After these fish grew to fingerling size, some 20,230 were transferred to Willow Beach NFH, and 18,000 were transferred to Uvalde NFH. The remaining fingerlings were held for rearing. Reclamation and USFWS staff tagged 2,397 subadult BONY (300+ mm TL), which were stocked into Reach 3. A total of 556 juvenile BONY under the 300 mm TL target size were placed into a pond to study PIT-tag retention.

Razorback Sucker — During June 2006, 2,200 juvenile RASU were transferred to Dexter NFH from Willow Beach NFH; average size of these fish was 230 mm TL. No RASU were stocked into Reach 2 due to the increase in stocking size (500 mm TL), as determined by the NFWG in April 2006.

**FY07 Activities:** The BONY broodstock will be maintained, and hatcheries will produce between 100,000 to 300,000 fingerling BONY for distribution depending upon various agency requests (including Willow Beach NFH and Achii Hanyo Fish Rearing Facility), 500 to 1,000 RASU will be reared to 500 mm TL for repatriation to Lake Mohave, and 4,000 BONY will be reared to 300 mm TL for distribution within Reach 3. Recapture of tagged fish will be analyzed and over-winter growth, survival, and PIT-tag retention will be evaluated.

Due to a recent invasion of exotic quagga mussels to lakes Mead and Mohave on the Colorado River, Dexter NFH will provide RASU larvae to Bubbling Ponds SFH from hand-spawned broodstock held on station. This is currently projected to be a one-time action. It is assumed that fish transportation protocols will be in place by FY08 so that wild RASU larvae from Lake Mohave will again be available from Willow Beach NFH.

**Proposed FY08 Activities:** The BONY broodstock will be maintained, up to 75,000 fingerling BONY will be produced for distribution to Willow Beach NFH and Achii Hanyo Fish Rearing Facility, 500 to 1,000 RASU will be reared to 500 mm TL for repatriation to Lake Mohave, and 4,000 BONY will be reared to 300 mm TL for distribution within reaches 3-5.

**Pertinent Reports:** The *2006 Fish Augmentation Summary* will be posted to the LCR MSCP Web site. Scope of work is available upon request from the LCR MSCP.

## Work Task B5: Bubbling Ponds Fish Hatchery

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $140,000 | $176,017 | $214,017 | $225,000 | $235,000 | $235,000 | $235,000 |

**Contact:** Ty Wolters, (702) 293-8463, twolters@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Maintain fish-rearing capability and provide RASU for the LCR MSCP Fish Augmentation Program.

**Conservation Measures:** RASU3 and RASU4

**Location:** Off-river, Cornville, AZ

**Purpose:** Operate and maintain fish rearing facility and annually contribute RASU to the LCR MSCP Fish Augmentation Program.

**Connections with Other Work Tasks (past and future):** Activities at Bubbling Ponds SFH are closely related to B2, as Bubbling Ponds SFH receives early life stages of RASU from Willow Beach NFH. In addtion, some of the fish-rearing research activities outlined in C10 will be conducted at Bubbling Ponds SFH. Funds ($60,000) were reallocated to a new work task (B10) following approval from the Steering Committee at the April 2006 meeting, and with the concurrence of USFWS.

**Project Description:** Bubbling Ponds SFH is managed and operated by AGFD. This is a warm-water rearing facility supplied by a continuous, year-round, 6 cfs spring flow of 68°F water. The facility has 10 acres of production ponds, a work shop, a storage shed, a small laboratory, and sufficient fish distribution equipment to meet the delivery requirements for the LCR MSCP. Program funds will provide for salary, fish feed and supplies, facility operation and maintenance, and delivery of fish. Production goals are to annually produce 12,000 RASU of 300 mm TL for release to reaches 3-5 of the lower Colorado River.

**Previous Activities:** Reclamation and AGFD have cooperatively worked to upgrade and renovate this warmwater fish-rearing facility since 1998. Prior to implementation of the LCR MSCP, more than 50,000 RASU were successfully reared at this facility and delivered to the lower Colorado River to complete a requirement of the 1997 BO. A subsequent BO was issued for the SIA in 2001, requiring the rearing and stocking of another 20,000 RASU into the lower Colorado River below Parker Dam. This work was also assigned to Bubbling Ponds SFH; in 2003, Reclamation contributed $225,000 for the work (all FY03 funds). Production and delivery

of RASU began in 2005 with a total of 4,814 RASU (330-360 mm TL) stocked to the river downstream of Parker Dam.

**FY06 Accomplishments:** A total of 28,000 fingerlings were received from Willow Beach NFH and 11,455 RASU were repatriated into Reaches 4 and 5 below Parker Dam; these fish averaged 360 mm TL. Fish on station as of December totaled 38,300. In addition to salary for this work, funds were expended to purchase feed, nets, materials for live-trapping river otters, and a contract for a professional trapper to assist with otter removal.

**FY07 Activities:** Bubbling Ponds SFH began 2007 with approximately 38,300 RASU on station, and all of these fish originated as wild-caught RASU larvae from Lake Mohave. In January 2007, a total of 3,743 RASU were tagged and repatriated into reaches 4 and 5, which completed the RASU production requirements for the SIA BO. Bubbling Ponds SFH expects to rear the remaining fish and repatriate the required 12,000 RASU each year for both 2007 and 2008.

Also in January 2007, adults and larvae of the exotic quagga mussel were discovered in lakes Mead and Mohave. Because the water for Willow Beach NFH comes directly from the Colorado River below Hoover Dam, the facility must be considered contaminated by this exotic animal. For the foreseeable future, no fish will be transferred from Willow Beach NFH to Bubbling Ponds SFH until new protocols for such transport are established, or until Willow Beach NFH is certified free of the quagga mussel. As a contingency plan, Dexter NFH will provide RASU larvae to Bubbling Ponds SFH for rearing and stocking into the lower Colorado River. These fish are expected to reach target size and become available for stocking in 2009. Under a Federal Grant Agreement between Reclamation and AGFD, an engineering firm was retained to design new production features that consolidate fish culture into a single-pass, serial-use system to improve bio-security (escapement and invasion) and predator avoidance/control, reduce pathogenic agents, and facilitate harvest. Construction of these new features will begin in 2007.

**Proposed FY08 Activities:** Razorback sucker larvae will be received from either Dexter NFH or Willow Beach NFH, RASU from the 2006 and 2007 year classes will continue to be reared, 12,000 RASU (300 mm TL) will be sorted, tagged, and delivered to reaches 3, 4, and 5 of the lower Colorado River, and annual progress reports will be produced. Construction of production design features will continue. As features are completed, normal fish culture activities will be dovetailed into the new systems.

**Pertinent Reports:** The *2006 Activity Report* is in review and will be available upon request from the LCR MSCP.

## Work Task B6: Lake Mead Fish Hatchery

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $45,000 | $101,713 | $133,713 | $55,000 | $50,000 | $50,000 | $50,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY16

**Long-term Goal:** Operate and maintain fish-rearing facility to provide RASU for the LCR MSCP Fish Augmentation Program.

**Conservation Measures:** RASU3, RASU4, RASU7, and RASU8

**Location:** Reach 1, Lake Mead, Boulder City, NV

**Purpose:** Support Lake Mead RASU studies, complete conservation measures identified in the ISG/SIA BO subsumed under the LCR MSCP, and contribute RASU to the LCR MSCP Fish Augmentation Program.

**Connections with Other Work Tasks (past and future):** Activities at Lake Mead SFH are related to C13 and B11. Razorback sucker larvae are captured from Lake Mead as part of the Lake Mead Razorback Study (C13) and reared at Lake Mead SFH. Once fish reach subadult size, they will be transferred to grow-out ponds at Overton WMA to complete the rearing process (B11).

**Project Description:** Lake Mead SFH is managed and operated by NDOW. Recent renovation of Lake Mead SFH allowed development and inclusion of dedicated facilities for rearing RASU and other natives. Reclamation, SNWA, and NDOW are cooperatively rearing RASU larvae captured from Lake Mead for future repatriation back to the lake. Funds from this work task will provide staff, equipment, feed, and chemicals to rear these fish and to complete SIA BO requirements.

In addition, space is available as a contingency to rear RASU for the LCR MSCP fish augmentation program. This additional rearing capacity is needed for years 6 through 10 (FY11-FY16), during which time the number of RASU needed annually for stocking into reaches 3-5 increases from 12,000 fish per year to 24,000 fish per year.

**Previous Activities:** Reclamation, SNWA, and NDOW have cooperatively been rearing RASU from Lake Mead in temporary outside tanks at the hatchery. In 2005, Reclamation assisted with the installation of a single 500-gallon fiberglass tank for the purpose of rearing RASU collected

from Lake Mead. Installation took place in the new native fish room and included plumbing for air and water delivery lines, standpipe and standpipe screen construction, and placement of a central drain line.

**FY06 Accomplishments:** Development of the native fish room at the Lake Mead SFH was completed. Construction was completed earlier than anticipated and is reflected in the increased cost. This work consisted of installation and plumbing for twenty-five 10-gallon aquaria, six 700-gallon fiberglass tanks, and four 240-gallon fiberglass troughs. The 1,716 larval RASU (1,613 from Echo Bay and 103 from Las Vegas Bay) were collected from Lake Mead during the course of the spawning season. An additional 850 larvae captured on Lake Mohave were also transported to the hatchery for rearing. Currently, 3,029 RASU are being reared at this facility.

**FY07 Activities:** The NDOW will continue to operate Lake Mead SFH for RASU production. Operation will include rearing of wild-caught larvae from 2007 and grow-out of sub-adult fish from the 2005 and 2006 year classes.

**Proposed FY08 Activities:** Continued rearing of RASU captured during previous years will occur, and RASU stock will be augmented with 2008 year-class RASU larvae from Lake Mead. Delivery of 2006 year-class RASU to Overton WMA will take place. Production capability at this site will be assessed and a cost estimate developed for rearing up to 6,000 RASU to 300 mm TL for fish augmentation program needs through 2016.

**Pertinent Reports:** Portions of this work are being conducted by NDOW under an agreement that includes activities of B11. The scope of work for this agreement is available upon request from the LCR MSCP.

## Work Task B7: Lake Side Rearing Ponds

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $200,000 | $205,641 | $435,641 | $150,000 | $175,000 | $175,000 | $175,000 |

**Contact:** Jon Nelson, (702) 293-8046, jnelson@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY16 decision point

**Long-term Goal:** Maintain fish-rearing capability, provide RASU and BONY for the LCR MSCP Fish Augmentation Program, and accomplish species research.

**Conservation Measures:** RASU3, RASU4, RASU5, RASU6, BONY3, BONY4, and BONY5

**Location:** Reach 2, Lake Mohave, AZ/NV

**Purpose:** Operate and maintain fish grow-out areas along the Lake Mohave shoreline to contribute to RASU broodstock development.

**Connections with Other Work Tasks (past and future):** Activities are related to B2 and B4, as fish for grow-out ponds will come from Willow Beach NFH and Dexter NFH. In addition, some of the fish-rearing research activities outlined in C10 and C11 may be conducted at these ponds.

**Project Description:** Lake Mohave is operated by Reclamation as a re-regulation reservoir. It operates annually within a 15-foot vertical elevation range, filling to an elevation of 645.5 feet msl by mid-May and lowering to an elevation of 630.5 feet msl in October. Desert washes, which flow into the reservior, deposit sediment and create wash fans. Wave actions have redistributed and shaped these sediment deposits into sandbars and in some areas these sandbars isolate the lower portions of the washes from the lake proper. There are at least 10 such sandbars that have ponds behind them when the lake is full. Reclamation and its partners in the Lake Mohave NFWG have been using these lakeside ponds since 1993 as rearing and grow-out areas for RASU and BONY. The ponds are stocked with juvenile fish as the reservoir fills in the spring (typically stocked in March). Reclamation staff monitor the fish throughtout the growing season. This includes periodic fertilization with alfalfa pellets and ammonium nitrates to sustain algae blooms and plankton production, removal of weeds and debris, installing and maintaining floating windmills or solar well pumps to mix the water and provide sufficient oxygen levels, and routine monitoring of physical, chemical, and biological parameters. The ponds are normally harvested in the fall as the lake elevation declines. The fish from these ponds are then released into Lake Mohave.

**Previous Activities:** These ponds have been in use since 1993 and more than 26,000 RASU have been reared and repatriated to Lake Mohave. The ponds have also been used to grow out BONY.

**FY06 Accomplishments:** There were 1,810 juvenile RASU stocked into eight ponds in March and 1,151 RASU were harvested and returned to Lake Mohave by the end of October. These fish were stocked at an average of 250 mm TL and were repatriated at an average of 389 mm TL.

**FY07 Activities:** In an effort to expedite development of RASU brood stock, the Lake Mohave NFWG has requested that the target size for repatriation be increased to 500 mm TL (approximately 20 inches). In response to this request, lakeside ponds will be receiving a total of 1,300 large RASU (375-425 mm TL) from Willow Beach NFH in February and March 2007. Fish harvest will be conducted in late May and again in October.

**Proposed FY08 Activities:** Lakeside ponds will continue to be used for rearing native fish in support of the LCR MSCP Fish Augmentation Program. The priority will be to utilize the ponds to accomplish RASU broodstock development. Should this no longer be necessary by 2008, the ponds will be used for rearing BONY or RASU (or both) to support fish augmentation and species research activities.

**Pertinent Reports:** The *2006 Fish Augmentation Summary* will be posted to the LCR MSCP Web site.

## Work Task B8: Fish Tagging Equipment

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $45,000 | $50,870 | $194,332 | $75,000 | $75,000 | $75,000 | $75,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY04

**Expected Duration:** FY19 decision point

**Long-term Goal:** Acquire and maintain supply of fish-tagging materials and equipment for marking fish to be released for research and for augmentation stockings.

**Conservation Measures:** RASU3, RASU4, RASU5, RASU6, BONY3, BONY4, and BONY5

**Location:** N/A

**Purpose:** Fish released into the lower Colorado River by the LCR MSCP will be marked for identification purposes in order to assess survival and distribution.

**Connections with Other Work Tasks (past and future):** This work task was previously listed in FY04 Work Tasks as PIT Tag (A2). Activities are related to all work tasks that result in fish stocking for augmentation, fish research, and fish monitoring. Work task C23 is evaluating new PIT-tag technology and results may influence future purchases.

**Project Description:** The LCR MSCP will rear and stock more than 1.2 million native fish into the lower Colorado River over the 50-year term of the program. Reclamation currently plans to mark these fish in order to assess distribution and survival and to provide for effective research and monitoring. This information is required for decision making under the adaptive management program.

Current marking techniques include PIT tagging, wire-tagging, fin clipping, radio tagging, and sonic tagging. Funds associated with this work task provide for both the tagging materials and for the detection equipment needed during monitoring and research. Costs are expected to be highest during the first 10 to 15 years of the LCR MSCP and decrease in later years as research actions transition to routine monitoring actions.

Under conservation measure RASU3, LCR MSCP will implement an experimental augmentation of 24,000 subadult RASU each year for 5 years (120,000 total) and conduct intensive follow-up monitoring. Under conservation measure BONY3, LCR MSCP will implement an experimental augmentation of 8,000 subadult BONY annually in the Parker-Imperial river reach (reaches 4 and 5) for 5 consecutive years within the 50-year program (40,000 total augmentation) and will

conduct intensive follow-up monitoring. Reclamation plans to conduct these two actions simultaneously during FY11-FY16, expects to PIT tag all of these fish, and plans to radio tag or sonic tag a subset of these fish. Following completion of ths work, Reclamation will evaluate monitoring results through the adaptive management process and assess the need for continuation of tagging of RASU and BONY through augmention stockings. This decision is expected to be made in FY19 after observations and analysis have been completed.

**Previous Activities:** Fish released into the lower Colorado River have been tagged with 400-kHz PIT tags (Lake Mead and Lake Mohave, reaches 1 and 2), 125-kHz PIT tags (Davis Dam to Parker Dam, Reach 3), and wire tags (Davis Dam to Imperial Dam, reaches 3, 4, and 5). Recaptured fish below Parker Dam have been retagged with 125-kHz PIT tags. In addition, both radio tags and sonic tags have been implanted in fish used for research on lakes Mead, Mohave, and Havasu. Fin clipping and spaghetti tags (or Floy tags) have been used for short-term survival studies in some rearing and grow-out ponds.

**FY06 Accomplishments:** A decision was made within the NFWG to begin use of the newest PIT-tag technology. This requires a change from the old 400-kHz and 125-kHz tags to the new 134.2-kHz frequency tags. These new tags have a greater detection range than the previously used tags (12 inches versus 2 inches away from fish) and will allow for testing and deployment of remote listening stations within spawning areas.

Sufficient numbers of the new PIT tags, tag readers, and antennae were purchased to mark fish during the year. A total of 29,061 RASU and 8,111 BONY were PIT tagged and released to the lower Colorado River during 2006.

**FY07 Activities:** Additional PIT tags, tagging equipment, and tag readers will be purchased as needed to mark fish for monitoring and research.

**Proposed FY08 Activities:** PIT tags, tagging equipment, and tag readers will be purchased as needed to mark fish for monitoring and research.

**Pertinent Reports:** N/A

## Work Task B9: Boulder City Wetland Ponds

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $570 | $4,370 | $0 | $0 | $0 | $0 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** Closed in FY 06

**Long-term Goal:** Develop and maintain off-site rearing areas for grow-out of RASU to augment production at state and federal hatcheries and provide areas for species research.

**Conservation Measures:** RASU3, RASU4, and RASU6

**Location:** Off-river, Boulder City, NV

**Purpose:** Provide additional rearing and grow-out areas for RASU that allow juvenile fish to adapt to a more natural feeding regime and experience ambient environmental condititons.

**Connections with Other Work Tasks (past and future):** In FY05 this work was related to Work Tasks B1, B2, B6, and C13. The FY06 funds were reallocated to Work Task B11.

**Project Description:** The Boulder City Wetlands Ponds were used to grow-out juvenile RASU for repatriation to lakes Mead and Mohave. Typically, fish were introduced as fingerlings in the spring and harvested in the fall. Following harvest, the ponds were drawn down for weed control. A brush fire during the fall of 2004 destroyed the liner of pond #4. Plans were made with the City of Boulder City to replace the liner during 2005. In the summer of 2005, mosquitoes bearing the West Nile virus were captured around these ponds. Following meetings with the City, it was concluded that the threat of West Nile virus was too great, and as the ponds were adjacent to Veterans' Park and numerous ball fields, the City opted to discontinue the program.

**Previous Activities:** The Boulder City Wetlands Ponds were first developed in 1996 as a cooperative effort to polish treated (gray water) for use at Veterans' Memorial Cemetery and Veterans' Park. Razorback sucker fingerlings were first introduced into the ponds in June 1997. Between 1997 and 2004 more than 10,000 RASU fingerlings were reared to the target size of 300 mm TL and returned to Lake Mohave.

**FY06 Accomplishments:** At the request of the City of Boulder City, fish-rearing activities at these ponds were terminated. All existing fish were relocated. After acquiring Steering Committee and USFWS concurrence, project funds were reassigned to Work Tasks B11.

**FY07 Activities:** Project Closed

**Proposed FY08 Activities:** Project Closed

**Pertinent Reports:** N/A

## Work Task B10: Uvalde National Fish Hatchery

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $60,000 | $57,122 | $57,122 | $260,000 | $60,000 | $60,000 | $60,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY16

**Long-term Goal:** Maintain fish-rearing capability to provide RASU and BONY for the LCR MSCP Fish Augmentation Program.

**Conservation Measures:** RASU3, RASU4, BONY3, and BONY4

**Location:** Uvalde, TX

**Purpose:** Provide backup source and rearing capacity for RASU and BONY as needed for Fish Augmentation Program, and provide a facility where species research can occur.

**Connections with Other Work Tasks (past and future):** This work task was added in April 2006 following approval by the Steering Committee, with concurrence from USFWS. Funds were allocated to this work task from B5. This work is related to B4, as RASU and BONY for Uvalde NFH will be supplied by Dexter NFH. The work is also related to B1 and B2, as Uvalde NFH may also rear RASU for repatriation to Lake Mohave. Finally, the work is related to C10 and C11, as species research relative to rearing and growth of BONY and RASU may be conducted at this facility.

**Project Description:** Uvalde NFH is a large warmwater fish culture facility established in southwest Texas in 1934. The facility has 47 ponds totaling more than 50 surface acres for fish production. Water is supplied by two deep wells, which provide 72°F water year-round. A third, undeveloped well (Wilson Well) will be developed to secure the long-term water supply for rearing ponds. The facility was shut down for renovation in 2001 following a major flood event and is now again ready for fish culture activities. Currently, 37 of the 47 ponds are available for fish culture.

The LCR MSCP and the San Juan River Recovery Implementation Program will share costs for upgrading water supply systems (rehabilitate Burkett Well and develop Wilson Well) and for rearing native fishes. The LCR MSCP will utilize the facility to assess rearing capacity for BONY, rear RASU for broodstock development at Lake Mohave, and conduct research on fish hauling and transportation.

The LCR MSCP has a requirement to stock 24,000 RASU and 12,000 BONY each year for 5 consecutive years. This is beyond the current capacity of the LCR MSCP Fish Augmentation Program. However, as described in the introduction to Section B, Reclamation is working with LCR MSCP partners to expand native fish-rearing capacity by FY10 to implement the accelerated augmentation stockings. Uvalde NFH is one of the facilities that may provide additional rearing capacity.

**Previous Activities:** Prior to being shut down for renovation, Uvalde NFH had 15 years of experience rearing native fishes, including Comanche Springs pupfish, paddlefish, Yaqui catfish, and fountain darters. During the 1990s, as many as six species were being cultured, producing 2.6 million fish (60,000 pounds produced). The facility was put back on line in 2005 following rehabilitation of the Spurgeon Well, one of two deep wells developed on station.

**FY06 Accomplishments:** During the first week of April 2006, 3,000 BONY fry were brought on station from Dexter NFH for initial rearing and to assess the growth rate and rearing capacity of Uvalde NFH for this species. The fish were from hand-spawning of broodstock on station at Dexter NFH. Fish were stocked into four 1-acre ponds; two ponds were at densities of 500 fish per acre and two ponds were at densities of 1,000 fish per acre. In late October, the fish were harvested from the ponds and hauled by tank truck to Dexter NFH. After a 2-week rest period, the fish were measured and tagged for distribution. Survival following the 180-day growing period, fish harvest, and transport was excellent at 92% (2,744 fish). Growth was remarkable, with 86% of the BONY having attained the target size of 300 mm TL or more in this short time period. A total of 2,358 BONY having an average length of 325 mm TL were PIT tagged and transported to the lower Colorado River. The fish were stocked into Reach 3 of the lower Colorado River at Park Moabi, south of Needles, California.

**FY07 Activities:** Uvalde NFH will continue rearing of BONY, growth and survival will be evaluated, and production loads and schedules for future work will be calculated. Wilson Well will be developed (new pump, well-head, motor, backup power supply, and alarm system). A research investigation regarding fish hauling techniques for BONY will be designed and implemented.

**Proposed FY08 Activities:** Uvalde NFH will continue rearing of BONY, and continue evaluation of fish hauling techniques.

**Pertinent Reports:** The scope of work is available upon request from the LCR MSCP.

## Work Task B11: Overton Wildlife Management Area

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $35,000 | $39,704 | $39,704 | $75,000 | $75,000 | $75,000 | $75,000 |

**Contact:** Ty Wolters, (702) 293-8463, twolters@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY16

**Long-term Goal:** Develop and maintain off-site rearing capability to augment production at state and Federal hatcheries.

**Conservation Measures:** RASU3, RASU4, RASU6, RASU7, and RASU8

**Location:** Reach 1, Overton, NV

**Purpose:** Provide additional rearing capacity for RASU, and complete RASU conservation measures identified in the 2001 BO.

**Connections with Other Work Tasks (past and future):** This work task was initiated in April 2006 following approval from the Steering Committee and concurrence by the USFWS. Funds were reallocated from B9. This work is closely related to B6 and C13. Once developed, the rearing ponds at the Overton WMA will receive juvenile RASU from Lake Mead SFH for grow out. Fish will then be released into Lake Mead to complete SIA BO conservation requirements. In future years, principally FY11-FY16, work at Overton WMA may include receiving and rearing fish from Willow Beach NFH (B2).

**Project Description:** Overton WMA is located in Clark County, Nevada, at the upper end of Lake Mead at the confluence with the Moapa and Virgin Rivers, 65 miles northeast of Las Vegas. The Overton WMA was established in 1953 under a joint agreement with Reclamation and the NPS. The wildlife area is managed solely for fish and wildlife and their habitats and has limited public access. The Overton WMA covers more than 17,000 acres, and includes three primary waterfowl management ponds, all of which are available for native fish culture.

The LCR MSCP activities for this site include rearing of RASU for repatriation to Lake Mead to complete the SIA BO requirements set out in 2001. Fish will be transferred to Overton WMA ponds from Lake Mead SFH.

After the SIA BO commitments are completed, LCR MSCP may utilize the grow-out ponds at Overton WMA to complete other LCR MSCP Fish Augmentation Program needs. These include, but are not limited to, rearing RASU received from Willow Beach NFH to 500 mm TL for

repatriation to Lake Mohave to maintain the adult broodstock, and rearing of RASU for reaches 3-5 of the lower Colorado River to affect accelerated stocking needs during program years FY11-FY16. Finally, Overton WMA may provide opportunities to conduct species research that may be required under the LCR MSCP adaptive management program.

**Previous Activities:** Originally planned as a 2007 start, this project was initiated in 2006 when funds became available from closure of another project (B9).

**FY06 Accomplishments:** Project accomplishments in FY06 included completion of the design for site improvements, including repair and improvement to water delivery infrastructure to facilitate managing Honyebee and Center ponds for native fish culture. The majority of materials necessary to complete site improvements were procured and stored at Overton WMA for installation in FY07.

**FY07 Activities:** Improvement to water delivery infrastructure for Honeybee and Center ponds will be completed in February 2007, following the end of waterfowl season, using materials acquired in FY06. Pond renovation, including removal of nonnative fishes, will be conducted prior to native fish stocking as needed. The RASU reared at Lake Mead SFH will be transferred to Overton WMA ponds prior to May 1, 2007, for further rearing, and periodic monitoring of ponds and fish will be conducted through the end of FY07. Depending on determined pond rearing capacities, additional RASU from Willow Beach NFH may be transferred to Overton WMA ponds for rearing.

**Proposed FY08 Activities:** Repairs to water delivery systems and outlet works of South Pond will be completed, and RASU from Lake Mead SFH or Willow Beach NFH will be stocked for rearing and repatriation to Lake Mead.

**Pertinent Reports:** The scope of work is available upon request from the LCR MSCP.

# WORK TASKS
# SECTION C

# SPECIES
# RESEARCH

## Work Task C1: Brown-Headed Cowbird Trap Assessment

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $85,000 | $73,525 | $125,989 | $0 | $0 | $0 | $0 |

**Contact:** Theresa Olson, (702) 293-8127, tolson@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** Closed in FY06

**Long-term Goal:** Species research to evaluate brown-headed cowbird (BHCO) control program.

**Conservation Measures:** MRM4

**Location:** Alamo Lake State Wildlife Area (SWA), Bill Williams River NWR, AZ

**Purpose:** Assess the effectiveness of BHCO trapping on the productivity and nest success of southwestern willow flycatcher (SWFL) and other neotropical birds.

**Connections with Other Work Tasks (past and future):** This study provides information necessary for managing created habitats proposed under work tasks outlined in Section E that target covered species susceptible to BHCO parasitism. This work task was completed in FY06. Additional BHCO trapping studies are being conducted at SWFL life history study sites under D2.

**Project Description:** Control of BHCO may become necessary to reduce parasitism rates for covered species, especially SWFL. The USFWS issued an SIA BO in 2001, which calls for initiation of a BHCO trapping program under Reasonable and Prudent Measure 5 (RPM 5) if:

1. Nest monitoring of SWFL nests found between Parker and Imperial Dams shows a 40% or greater parasitism rate in any one year or averages more than 20% in any two or more consecutive years.
2. No nesting SWFL can be detected at occupied sites due to poor sub-population stability.

In addition, the LCR MSCP states that research must be conducted to determine and address the effects of BHCO parasitism on reproduction of covered species. To effectively and efficiently conduct BHCO control, trapping effectiveness needs to be determined. Post-trap monitoring will be conducted until BHCO population numbers and parasitism rates reach pre-trap numbers. These data will enable Reclamation to determine potential BHCO trapping intervals to protect LCR MSCP covered species.

**Previous Activities:** From 1998 to 2001, Reclamation implemented a BHCO control program in accordance with the 1997 BO. The BHCO traps were placed at Alamo Lake SWA, Bill Williams River NWR, and Havasu NWR (1998 only). Trapping was suspended after the 2001 breeding season and post-trap monitoring was implemented in 2002 to measure the effectiveness of the control program and to determine when BHCO populations, parasitism rates, and host nest success reached pre-trap levels. Data obtained will help determine trapping interval for future BHCO control programs.

**FY06 Accomplishments:** Point counts were conducted at Alamo Lake SWA and Bill Williams River NWR to record density of BHCO and passerine species susceptible to BHCO parasitism. Monitoring nests of passerine species susceptible to BHCO parasitism, including the SWFL, was conducted throughout the breeding season. At Alamo Lake SWA, resident mean BHCO detection rates increased from 0.01 (2001) to 0.35 (2005) BHCO per point at Brown's Crossing and 0.01 (2001) to 0.38 (2006) at the Santa Maria River (Figure 6). However, due to damage caused by flooding, surveys were not conducted at Brown's Crossing in 2006.

At the Bill Williams River NWR, resident mean BHCO detection rates ranged from 0.06 (1999) to 0.38 (2006) BHCO per point. Unlike at Alamo Lake, BHCO detections actually increased during the trapping years from the first year of trapping. This increase continued into the post-trapping years, except for a decline in BHCO abundance in 2003. Finally, BHCO abundance increased to its highest level in 2006.

For Alamo Lake SWA during the study years, combined parasitism rates for Abert's towhee (ABTO), Arizona Bell's vireo (BEVI), yellow-breasted chat (YBCH), and SWFL ranged from 1% in 2001 to a high of 17% in 2004, with an increasing trend after the termination of the BHCO control program. The rate in 2006 was 15%, which is the second highest rate recorded during the study. Predation rates also increased during the post-trapping years.

For Bill Williams River NWR, parasitism rates for all species was zero during the 1999-2001 BHCO trapping years with an increasing trend after the termination of the BHCO control program. The combined rates for ABTO, BEVI, YBCH, and SWFL were 10% in 2002, 20% in 2003, 21% in 2004, 15% in 2005, and 16% in 2006. Nest predation also increased after 2001 from zero to 21% during the post-trapping years.

Study results indicate that BHCO control can reduce BHCO abundance and, consequently, parasitism rates on a local level. Impacts are dependent on isolation from BHCO population centers, agricultural areas, and migration corridors, such as the LCR. The BHCO populations at Alamo Lake and Brown's Crossing did not reach pre-trap levels until 5 and 6 years after trapping ceased, respectively. Parasitism rates for host species did not reach pre-trap levels until 3 years after trapping ceased. Trapping of BHCO can be considered as an option if parasitism is the primary threat to an individual species at a specific site. However, other threats, such as predation and habitat degradation, may be limiting host species populations at many sites. Landscape factors may also limit the effectiveness of BHCO control, including habitat patch size and proximity to BHCO population sources and migration corridors. These results will be used to evaluate potential management actions at existing and created habitats. If BHCO control is necessary at specific sites along the LCR, trapping intervals may extend between 3 and 6 years, depending on landscape factors.

**FY07 Activities:** Project Closed

**Proposed FY08 Activities:** None

**Pertinent Reports:** *Results of Brown-headed Cowbird Control Program Monitoring 1999-2006 Final Report* will be posted on the LCR MSCP Web site.

## Work Task C2: Sticky Buckwheat and Threecorner Milkvetch Conservation

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $25,000 | $10,000 | $10,000 | $11,000 | $11,000 | $11,000 | $11,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY30

**Long-term Goal:** Support existing conservation programs for covered plant species.

**Conservation Measures:** STBU 1 and THMI1

**Location:** Reach 1, NV

**Purpose:** Provide funding to support existing conservation programs for sticky buckwheat and threecorner milkvetch.

**Connections with Other Work Tasks (past and future):** These are stand-alone conservation measures described in the HCP.

**Project Description:** Sticky buckwheat and threecorner milkvetch are covered species within the Clark County MSHCP, as well as the LCR MSCP. Funding in the amount of $10,000 per year will be provided to the Clark County MSHCP Rare Plant Workgroup to support implementation of conservation measures for these two plant species, which are beyond the permit requirements of the Clark County MSHCP. Funding may be advanced for up to 5 years, depending on availability, to keep administrative costs at a minimum.

**Previous Activities:** This was a new start in FY06.

**FY06 Accomplishments:** In FY06, $10,000 was provided to the Clark County MSHCP Rare Plant Workgroup via a five year agreement between Reclamation and the NPS. Initial FY06 estimates were based on providing $20,000 per year; however, after reviewing language in the HCP and the cost feeder tables used to determine project costs, it was determined that $10,000 per year was required to fulfill this obligation. Funds were moved in August FY06, therefore the first accomplishment report will be provided in FY07.

**FY07 Activities:** Funds in the amount of $10,000 will be transferred to the NPS through a 5-year agreement. A report will be provided to Reclamation by September 30, 2007, summarizing monitoring of threecorner milkvetch and sticky buckwheat.

**Proposed FY08 Activities:** Funds in the amount of $10,000 will be transferred to the NPS through a 5-year agreement. A report will be provided to Reclamation by September 30, 2008, summarizing monitoring of threecorner milkvetch and sticky buckwheat.

**Pertinent Reports:** The scope of work is available upon request from the LCR MSCP.

## Work Task C3: Multi-Species Conservation Program Covered Species Profile Development

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $100,000 | $161,445 | $209,292 | $15,000 | $15,000 | $15,000 | $15,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Species Research

**Conservation Measures:** AMM1, AMM2, AMM3, AMM5, AMM6, MRM1, MRM2, MRM3, CLRA1, CLRA2, WIFL1, WIFL2, DETO1, DETO2, BONY2, RASU2, WRBA1, WRBA2, WYBA1, WYBA3, DPMO1, CRCR1, CRCR2, YHCR1, YHCR2, LEBI1, BLRA1, BLRA2, YBCU1, YBCU2, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, FTHL1, FTHL2, FLSU1, MNSW1, MNSW2, CLNB1, CLNB2, PTBB1, PTBB2, CRTO1, CRTO2, CRTO3, LLFR1, LLFR2, AND LLFR3

**Location:** System-wide

**Purpose:** Assess existing knowledge for each LCR MSCP covered species to determine research needs and habitat requirements for current and future habitat creation projects.

**Connections with Other Work Tasks (past and future):** Information collected during this literature review is currently being used to develop future work tasks, design monitoring programs, design habitat creation projects, and implement the adaptive management process. Information from this work task will be utilized under E15 and E16.

**Project Description:** To successfully create habitat for LCR MSCP covered species, species accounts have been developed. Extensive literature searches were conducted to accumulate existing knowledge on each covered species. Species accounts were written for both covered and evaluation species, including known habitat requirements and management concerns. Data gaps were identified to direct covered species research priorities.

**Previous Activities:** FY05 activities were designed to provide information for the development of backwater rating criteria for LCR MSCP covered species. These data and models were used to prioritize backwater restoration projects.

Species accounts were completed for nine LCR MSCP covered species that use backwater, marsh, or riparian/marsh interface habitats. Species accounts for razorback sucker, bonytail, and

flannelmouth sucker included sections on distribution, historical habitat modifications, systematics and morphometrics, hybridization, habitat, reproduction, diet, age, and growth.

Data on distribution, migration, habitat, nesting, food habits, and conservation and management were incorporated for California black rail, Yuma clapper rail, western least bittern, southwestern willow flycatcher, and western yellow-billed cuckoo. The species account for Colorado River cotton rat included data on distribution, systematics, habitat, nesting, food habits, and conservation and management.

**FY06 Accomplishments:** Species accounts for the 25 covered species and 5 evaluation species listed in the HCP that utilize terrestrial, marsh, and riparian habitats have been developed. A species account was not developed for humpback chub as there is neither critical habitat nor occupied habitat for this species within the LCR MSCP program area.

These species accounts were based on extensive literature searches for each species and include the most recent scientific information. These accounts include current knowledge about each species' legal status, life history, distribution, habitat requirements, behavior, and LCR MSCP Conservation Measures as it relates to the creation and management of the species' habitats. Reclamation will use these species accounts to identify information needed for the creation and management of covered species habitats, enabling the successful completion of Conservation Measures. The LCR MSCP research and monitoring data needs have been identified for each covered and evaluation species, where appropriate. These needs will be prioritized in a 5-year plan and will be completed according to importance, urgency, and cost. Other potential research and monitoring opportunities, either identified through this process or by other scientists or conservation programs, that are outside of the scope and purpose of the LCR MSCP have also been listed to further non-LCR MSCP conservation activities.

In FY06, additional staff time was necessary to complete literature searches, literature acquisition, data compilation, and cataloging information in a database.

**FY07 Activities:** Species accounts will be periodically updated as new information is collected through monitoring and research.

**Proposed FY08 Activities:** Each year, information gathered from recent literature will be incorporated into the species accounts.

**Pertinent Reports:** *Species Accounts for the Lower Colorado River Multi-Species Conservation Program Covered Species* will be posted on the LCR MSCP Web site.

## Work Task C4: Relict Leopard Frog

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $15,000 | $14,128 | $14,128 | $11,000 | $11,000 | $11,000 | $11,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY15

**Long-term Goal:** Support existing relict leopard frog conservation programs.

**Conservation Measures:** RLFR1

**Location:** Reach 1, NV

**Purpose:** Provide funding to support existing relict leopard frog conservation programs.

**Connections with Other Work Tasks (past and future):** This is a stand-alone conservation measure as described in the LCR MSCP.

**Project Description:** The LCR MSCP will assist and contribute to existing relict leopard frog research and conservation efforts initiated by the Relict Leopard Frog Conservation Team. Ten thousand dollars per year, for a period of 10 years, will be contributed to the Leopard Frog Conservation Team to implement planned, but unfunded, conservation measures. Funding may be advanced for up to 5 years, depending on availability, to keep administrative costs at a minimum.

**Previous Activities:** This was a new start in FY06.

**FY06 Accomplishments:** Funds in the amount of $10,000 were transferred to the NPS through a 5-year agreement. Funds were moved in August FY06, therefore the first accomplishment report will be provided in FY07.

**FY07 Activities:** Funds in the amount of $10,000 will be transferred to the NPS through a 5-year agreement. A report will be provided to Reclamation summarizing the monitoring of experimental and natural populations of relict leopard frogs, and frog rearing and relocation activities by September 30, 2007.

**Proposed FY08 Activities:** Funds in the amount of $10,000 will be transferred to the NPS through a 5-year agreement. A report will be provided to Reclamation summarizing the monitoring of experimental and natural populations of relict leopard frogs, and frog rearing and relocation activities by September 30, 2008.

**Pertinent Reports:** The scope of work is available upon request from the LCR MSCP.

## Work Task C5: Effects of Abiotic Factors on Insect Populations in Riparian Restoration Sites

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $90,000 | $8,584 | $8,584 | $90,000 | $90,000 | $90,000 | $0 |

**Contact:** Bill Wiesenborn, (702) 293-8699, wwiesenborn@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY09

**Long-term Goal:** Species Research

**Conservation Measures:** WIFL1, WIFL2, YBCU1, YBCU2, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, WRBA2, WYBA3, CLNB2, PTBB2

**Location:** Mass Transplanting Demonstration Site (E7) (Reach 4, Cibola NWR, AZ, 1/2 mile east of River Mile 97) and Cibola Valley Conservation Area (E5) (Reach 4, Reclamation, Hopi Tribe, and Mohave County, AZ, south of River Mile 103). Beal Riparian and Marsh (E1) (Reach 3, Havasu NWR, AZ, 0.5 miles east of river miles 238-239).

**Purpose:** Eight species of birds and four species of bats included in the LCR MSCP eat insects. Creating and maintaining habitat for these species requires providing an adequate supply of insects for food. This is especially difficult at the LCR MSCP habitat creation sites being developed, because riparian vegetation is being planted in non-riparian farmland. Growing plants will not by itself guarantee insect abundances large enough to feed and support bird and bat populations. Two abiotic factors, plant water content and plant nitrogen content, greatly influence abundances of plant-feeding insects. Both of these factors can be manipulated, depending on soil conditions, by controlling plant irrigation and fertilization.

**Connections with Other Work Tasks (past and future):** Work task C5 developed from Southwestern Willow Flycatcher Prey Base Study (C20). Work task C20, completed in 2006, identified insects and spiders eaten by the southwestern willow flyctacher. Work task C5 parallels Insect Population Biology in Riparian Restoration Sites (C6). Work task C6 currently is examining sources (riparian, upland, or aquatic) of insects eaten by riparian bird species covered under the LCR MSCP, and developing a method for monitoring populations of these bird species. Plant water and nitrogen contents also likely affect populations of MacNeill's Sootywing, being investigated in Survey and Habitat Characterization of MacNeill's Sootywing (C7). The same laboratory procedure will be used to measure plant nitrogen in C5 and C7. Information obtained in these studies will be used in the design and implementation of future habitat creation projects detailed in Section E.

**Project Description:** Insect densities will be estimated on different species of restored plants grown under different irrigation and fertilizer treatments. Water and nitrogen contents will be measured in tissue samples taken from insect-sampled plants. Relationships between plant water and nitrogen contents, plant species, and insect density will be determined. Field work will be performed at LCR MSCP habitat creation sites listed above.

**Previous Activities:** This work task is a new start in FY06.

**FY06 Accomplishments:** A technique for measuring amounts of nitrogen in plant tissue was developed based on a published method of measuring Total Kjeldahl Nitrogen in plant tissue; the technique was adapted to existing laboratory instrumentation for measuring nitrogen in water samples. Leaf samples were taken from 32 *Atriplex lentiformis* plants at Cibola NWR collected during work conducted under C7. Percent water of each plant was measured. Percent nitrogen (% of dry weight), measured in two samples from each plant, averaged 2.2%. Differences among plants accounted for 62% of variation in percent nitrogen, differences between subsamples accounted for 17% of variation, and interaction between subsamples and plants accounted for 21% of variation. Plant water and nitrogen contents were positively correlated. The procedure developed will enable comparison of plant nitrogen contents with insect abundances in created riparian habitats.

Once the technique for measuring plant nitrogen was developed, field trials were to be performed at Cibola Valley Conservation Area; however, these trials have been postponed due to delays in Phase 1 habitat creation efforts.

**FY07 Activities:** Two activities will be performed during FY07:

1. Effects of plant water nitrogen fertilizer on insect diversity and abundance will be examined in E7. Nitrogen fertilizer will be applied to 1-2 rows of riparian trees (coyote willow, Goodding's willow) monthly in May, June, and July. Insects will be collected on trees, sorted to order, and counted. Plant samples will be taken from trees in treated and non-treated areas and analyzed for percent water and nitrogen. Insect abundances and plant-nitrogen contents will be compared.

2. Effects of ponded water on insect diversity and abundance. This work will be performed at the Beal Lake Riparian Marsh (E1), where artificial liners are installed to create pools of water. Three insect (Malaise) traps will be placed in plots of mixed riparian trees: one trap above a water retention pool, one trap between two pools, and one trap away from the pools. The trap above the pool will collect insects attracted to, or emerging from, the moist soil within the pool. The trap between features will collect insects responding to increased relative humidity. The trap away from the pools will serve as a control. Insects trapped during May-August 2007 will be sorted by suborder (e.g., aquatic flies, terrestrial flies, wasps, bees), and counted. Insect abundance and diversity will be compared between traps within the channel and with pools and traps outside of the channel.

**Proposed FY08 Activities:** Effects of plant water and nitrogen content on insect abundance and diversity will be studied at LCR MSCP restoration sites as plants develop and opportunities for controlling irrigation and fertilizer-application arise.

**Pertinent Reports:** The study design is available upon request from the LCR MSCP.

## Work Task C6: Insect Population Biology in Riparian Restoration Sites

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $126,000 | $76,875 | $76,875 | $30,000 | $0 | $0 | $0 |

**Contact:** Bill Wiesenborn, (702) 293-8229, wwiesenborn@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY07

**Long-term Goal:** Species Research

**Conservation Measures:** WIFL1, WIFL2, YBCU1, YBCU2, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, WRBA2, WYBA3, CLNB2, PTBB2

**Location:** Topock Marsh (Reach 3, Havasu NWR, AZ, 3 miles east of River Mile 243), Beal Lake (Reach 3, Havasu NWR, AZ, 1 mile east of River mile 239), and Cibola Valley Conservation Area (Reach 4, Reclamation, Hopi Tribe, and Mohave County, AZ, south of River Mile 103).

**Purpose:** Eight species of birds and four species of bats included in the LCR MSCP eat insects. Creating and maintaining habitat for these species requires providing an adequate supply of insects for food. Growing plants will not by itself guarantee insect abundances large enough to feed and support bird and bat populations. In addition, earlier work has found that riparian birds feed on insects that have emigrated from non-riparian habitats such as marshland. Providing an adequate food supply for riparian birds and bats will require determining insect sources, developing techniques for increasing insect abundances, and developing methods for monitoring insect populations.

**Connections with Other Work Tasks (past and future):** This work task developed from Southwestern Willow Flycatcher Prey Base Study (C20). Work task C20, completed in July 2006, identifies insects and spiders eaten by the southwestern willow flycatcher. This work task, C6, parallels work task Effects of Abiotic Factors on Insect Populations in Riparian Restoration Sites (C5).

**Project Description:** The initial objectives of this project are to: 1) determine sources of insects eaten by LCR MSCP vertebrates, 2) recommend activities for increasing insect abundances, and 3) develop a method for monitoring insect populations. Sources of insects will be determined by sampling and identifying populations. Activities for increasing insect populations will be recommended by locating information on their biological requirements in the literature. A monitoring method will be developed by testing different trap designs at LCR MSCP habitat

creation sites, with the objective of developing a monitoring method that is specific to insect species eaten by LCR MSCP-covered birds and bats and is simple to use.

**Previous Activities:** This was a new start in FY06.

**FY06 Accomplishments:** The Southwestern Willow Flycatcher Prey Base Study (C20) determined diets of birds breeding in cottonwood and Goodding's willow at Pahranagat Lake, Nevada, in tamarisk and coyote willow along the Virgin River, Nevada, and in tamarisk at Topock Marsh, Arizona. Birds ate similar diversities (numbers of taxa), but different taxonomic compositions (abundances in orders), of spiders and insects among localities. Diets at all three sites were more closely related to abundances of spiders and insects swept from plants than trapped in flight. Similarity between flycatcher diet and abundances of insects on plants was least at Topock Marsh, suggesting that insects on tamarisk provide a small proportion of prey eaten by flycatchers. In general, flycatchers appear to be generalist feeders that exploit the spiders and insects available.

Previous research on feeding by SWFL at Topock Marsh found birds eating insects that may have been visiting tamarisk flowers. As a follow-up study, insects on tamarisk flowers at Topock Marsh were collected during May-August 2006, identified, and examined for pollen loads to estimate their reliance on tamarisk flowers. Fourteen genera or species were identified including plant bugs, ladybird beetles, paper wasps, sand wasps, leaf-cutting bees, western honey bees, and flower flies. Western honey bees and flower flies were most commonly collected. All insects collected carried high proportions (greater than 85%) of tamarisk pollen, indicating high reliance on tamarisk flowers as adults. Birds do not eat western honeybees (because of their sting) but do eat flower flies. Flower-fly larvae develop in wet, rotting vegetation. Rotting cattails in Topock Marsh appear to provide food for insects eaten by nearby, nesting SWFL.

**FY07 Activities:** A final report will be completed in FY07. Additional FY07 work may include refining the design of a trap for monitoring populations of insects eaten by birds, especially SWFL. Several trap designs may be tested at the Beal Riparian and Marsh (E1) site or at Cibola Valley Conservation Area (C5), if trees are large enough.

**Proposed FY08 Activities:** Closed in FY07

**Pertinent Reports:** Wiesenborn, W.D. and S.L. Heydon. In Press. *Diets of Breeding Southwestern Willow Flycatchers in Different Habitats.* Wilson Journal of Ornithology. The study plan is available upon request from the LCR MSCP.

## Work Task C7: Survey and Habitat Characterization for MacNeill's Sootywing

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $150,000 | $189,789 | $189,789 | $160,000 | $160,000 | $80,000 | $0 |

**Contact:** Bill Wiesenborn, (702) 293-8229, wwiesenborn@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY09

**Long-term Goal:** Species research

**Conservation Measures:** MNSW1 and MNSW2

**Location:** Floodplain of entire lower Colorado River, dependent on permission by landowners

**Purpose:** The purpose of this work task is to survey the MacNeill's sootywing distribution along the lower Colorado River and determine its habitat requirements. Results from MNSW1 will be used to accomplish MNSW2, which creates habitat for the species.

**Connections with Other Work Tasks (past and future):** Results of this study will be used in future work tasks to create habitat for MacNeill's sootywing under work tasks in Section E.

**Project Description:** The butterfly and its host plant, quailbush, will be surveyed within the LCR MSCP boundaries. Annual surveys will cover one third of the flood plain. In 2006, Parker Dam to Imperial Dam will be surveyed, in 2007 Imperial Dam to SIB will be surveyed, and in 2008 Lake Mead to Parker Dam will be surveyed. Surveys will record GPS coordinates of stands of quailbush and estimate the plant's area of coverage. Species will be detected as eggs, larvae, pupae, or adults on host plants and as adults on nearby nectar sources. Surveys will be conducted during April to October when adults are intermittently present (2-3 generations occur per season). Sootywings will be digitally photographed and their GPS coordinates will be recorded. Densities, recorded as individuals of each life stage per plant or plant area, will be estimated.

The species habitat requirements will be determined concurrent with surveys by measuring site factors affecting sootywing presence or absence and density. Possible site factors are:

a. plant water and nitrogen content
b. plant species used as nectar sources
c. availability of nearby nectar sources (distances, amounts)
d. area of *A. lentiformis* stands
e. elevation and latitude

**Previous Activities:** This was a new start in FY06.

**FY06 Accomplishments:** Surveys were conducted for host plants and sootywing eggs, larvae, or adults from Parker Dam to the northern boundary of Imperial National Wildlife Refuge, excluding the Colorado River Indian Reservation. Stands of host plants were found at 29 localities and GPS coordinates were entered into a Geographic Information System. Sootywings were found on host plants at 13 of the host plant localities. Numbers of adults and their behaviors (nectaring, oviposition, etc.) were counted on eight dates monthly from April to October at Cibola NWR. One flight of adults was observed, peaking at the end of June. The most common behavior observed was flying within quailbush plants. Adults were found feeding at flowers of six plant species: heliotrope, sea purslane, tamarisk, honey mesquite, alkali-mallow, and arrowweed. Heliotrope was the most frequent nectar source during spring, and tamarisk was the most frequent nectar source during summer. Females were more likely to oviposit on hostplants with higher water content. However, oviposition did not increase on acceptable plants as water content increased (i.e., plants were either acceptable or unacceptable to ovipositing female sootywings).

Information gathered during this work task will be used in accomplishing habitat creation goals targeted in conservation measure MNSW2.

**FY07 Activities:** Surveys will be conducted from the northern boundary of Imperial NWR to the Southerly International Boundary with Mexico. Additional plant species used as nectar sources will be identified. Additional data will be collected at Cibola Island examining the influence of plant water and nitrogen content on oviposition. Dispersal of adults will be examined by placing potted quailbush plants at various distances from an established sootywing population. Utilization of nectar (nectar abundance by plant species) will be examined in more detail.

**Proposed FY08 Activities:** Surveys will be conducted from the upstream end of Lake Mead NRA to Parker Dam. Additional plant species used as nectar sources will be identified. Sootywing habitat requirements, including requirements for nectar and shade, will be further defined. Adult dispersion (i.e., how readily sootywings move amoung clumps of quailbush shrubs) will be examined. Effects of predation and parasitism (by other insects) on populations of the butterfly may also be examined.

**Pertinent Reports:** The study plan is available upon request from the LCR MSCP.

## Work Task C8: Razorback Sucker Survival Studies

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $190,000 | $187,974 | $425,953 | $190,000 | $205,000 | $25,000 | $0 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY09

**Long-term Goal:** Assess overall effectiveness of stocking program and acquire data for adaptive management program.

**Conservation Measures:** RASU6

**Location:** Reaches 4-5, river miles 50-175, Imperial Dam to Parker Dam

**Purpose:** Assess survival and distribution of RASU released into the lower Colorado River.

**Connections with Other Work Tasks (past and future):** The work is connected to B5, as fish being studied are reared at Bubbling Ponds SFH and implanting of radio and sonic tags occurs at the hatchery prior to delivery to the river. Data collected during this work are utilized in Work Task D8.

**Project Description:** Reclamation has stocked more than 50,000 RASU into the Colorado River below Parker Dam since 1997. This project is an assessment of survival, growth, and distribution of these fish. The work is being performed by ASU in cooperation with Reclamation and AGFD. The work consists mainly of netting, electro-shocking, and radio/sonic tagging and tracking of stocked fish to determine survival and distribution. Field sampling is conducted monthly from September to May (nine trips). No sampling occurs during June, July, or August, because high water temperatures exceed safe handling protocols for these fishes. Trip reports are provided to Reclamation following each of the nine sampling trips, and these are summarized into an annual report covering the calendar year (January through December).

**Previous Activities:** Reclamation was required under the 1997 BO from USFWS to rear and stock 50,000 RASU into the Colorado River downstream of Parker Dam. During ESA consultations in 2002 aimed at extending the regulatory relief of the 1997 BO, Reclamation agreed to assess the survival of released fish. This study began in 2002, prior to implementation of the LCR MSCP. Results from work accomplished in 2002-2004 are summarized in a final report on file with Reclamation. Activities since then (FY05) are included as LCR MSCP accomplishments and reported upon in this document.

**FY06 Accomplishments:** Portions of the lower Colorado River from Parker Dam downstream to Imperial Dam were surveyed using a suite of standard fishery techniques including electro-fishing, trammel netting, gill netting, and hoop netting. The survey areas focused on RASU stocking locations and places to which the fish are known to disperse after stocking, and included the main channel and interconnected, watercraft-accessible backwaters and side channels. Also, sampling is suspended during hot summer months to avoid potential stress to native fishes.

Survey monitoring resulted in contact with a total of 14,782 fish representing at least 24 species and including 489 RASU capture events. All RASU were assumed to have originated as stocked fish. Although RASU larvae were captured in several backwaters there was no evidence of recruitment to the juvenile life stage. Among the 482 different RASU handled, 130 contained PIT tags, and tags were injected into all unmarked fish. Growth of marked fish was relatively rapid, and similar to that recorded for RASU of similar size at other locations including Lake Mohave.

A circular PIT-tag antenna installed into a 36-inch culvert connected to the river at A-10 Backwater was tended throughout the year, and results suggest that few fish moved from the backwater into the river. This contrasts with A-7 Backwater, which is open to the river via a broad channel, and from which tagged RASU were observed to disperse rapidly after stocking.

Radio-tags (12-month life) were affixed on 24 RASU to further examine post-stocking dispersal and confirm earlier findings with short-term tags. Fish were released in January 2006, 12 each into A-7 and A-10 backwaters, and will be monitored through February 2007. Fish departed rapidly from A-7 backwater. No fish departed from A-10 Backwater although they were free to do so. Apparently, RASU do not readily utilize the 36-inch culvert pipes that connect many backwaters to the main river channel. This result is consistent with studies that used a circular PIT-tag antenna placed within the culvert at A-10 backwater.

A study was initiated investigating RASU that imprint on surface feeding and remain near the surface (and are readily attacked by predatory birds) after stocking. A hatchery pond sample of RASU was parsed in two, and one sample was free to feed at the surface while a second sample was allowed access to feed only after the feed sank at least 6 feet through a special exclosure. Differences in behavior and observed mortality will be evaluated in the field.

**FY07 Activities:** Monthly monitoring of stocked RASU and BONY (stocked into the lower river during this fiscal year) will continue to target stocking areas, and also will examine adjacent sites that fish may occupy. Attempts will be made to locate potential main channel RASU spawning areas by affixing external radio transmitters to as many as 10 large (>500 mm TL) fish, and evaluate any sites that are located. Attempts will be made to evaluate the spatial extent of RASU spawning by making larval collections at selected backwater sites along the river channel. Post-stocking sample data plus additional radio telemetry information will be used to estimate rates of dispersal from stocking sites. Population abundance of RASU in lower river A-7 and A-10 backwaters and in the Parker Strip will be estimated using mark-recapture data as available. Abundance of nonnative fish predators in backwaters will be estimated. Predation risk studies (birds and nonnative fishes) and feed-training experiments will be concluded. Over-summer

water physico-chemistry in A-7 and A-10 backwaters will be evaluated as a potential source of stress or mortality to stocked RASU.

**Proposed FY08 Activities:** Some FY08 activities will depend on outcomes of field studies during the previous year. Routine site monitoring and associated evaluations (characterization of dispersal, abundance estimations, larval collections) will continue as before. If main channel spawning areas are identified, these will be evaluated. All sub-projects will be completed including assessment of long-term post-stocking RASU survival. A project final report will be processed, which will include an overall assessment of the success of the lower river RASU stocking program and specific recommendations to modify the program or to implement programmatic changes.

**Pertinent Reports:** An annual report is under development and will be posted to the LCR MSP Web site when finalized. Study plans are available upon request from the LCR MSCP .

## Work Task C9: Razorback Sucker and Bonytail Pen Rearing Tests

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $48,000 | $30,254 | $72,254 | $35,000 | $0 | $0 | $0 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY07

**Long-term Goal:** Continuosly seek measures to improve quantity and quality of fish reared and released under the Fish Augmentation Program

**Conservation Measures:** RASU3, RASU4, BONY3, and BONY4

**Location:** Reach 2, Lower Colorado River at Willow Beach, AZ

**Purpose:** Assess utility of pen-rearing of RASU and BONY in the LCR at Willow Beach NFH to increase rearing capability at the hatchery and as a means of conditioning fish to the river environment prior to release.

**Connections with Other Work Tasks (past and future):** The work is connected to B2, as work is being accomplished at Willow Beach NFH using fish reared at that facility.

**Project Description:** This project has two main objectives. The first objective is to determine whether juvenile and sub-adult RASU and BONY will continue to grow if placed into net pens in the Colorado River adjacent to Willow Beach NFH. Field studies have shown a direct positive relationship between survival in the lake and size of fish at time of release. Field studies also show that juvenile RASU released into Lake Mohave do exhibit some growth between October and March, the coolest period of the year. If RASU and BONY can increase in size in river water (routinely measured at 56°F), then net pens may provide additional rearing capacity at the hatchery. The second objective is to assess use of net pens to acclimate fish to ambient river conditions (temperature and flow) prior to release into Lake Mohave. Field data also suggest that post-stocking handling stress can be reduced by acclimation of fish to ambient water temperatures prior to release. This program will construct rearing pens in the river at Willow Beach NFH for the purpose of evaluating both of these objectives.

**Previous Activities:** Net pens and docking materials were purchased and delivered to Willow Beach NFH. The four-pen design was selected to provide long-term stocking space and structural stability in the river. Local purchases for miscellaneous hardware and materials (cement, cables, eyebolts, etc.) were made. Dive inspections of the river bottom for assessment of anchor

placements and test installations of docking materials were accomplished by the Reclamation Dive Team.

**FY06 Accomplishments:** Assembly and installation was completed and 2,500 RASU with an average of 340 mm TL were placed into the nets pens in April. Growth and survival were monitored between April and October. A subsample of 600 RASU was measured for growth at the end of June, and all RASU were measured at the end of October. In general, growth was poor, with an average growth of only 10.3 mm over the 6-month period. Survival was high, greater than 95%, and the fish were in excellent physical condition at the end of the test period. The fish were subsequently stocked at locations within Reach 3 on the lower Colorado River.

**FY07 Activities:** Lack of significant growth of net-penned fish during 2006 was sufficiently conclusive to terminate further growth studies, and no further research on net pens will be conducted during 2007. Net pens, however, will be used for holding fish for short-term research or for holding fish prior to stocking. Remaining funds for this work task will be reassigned to B2 and be used for any costs associated with operation and maintenance of the net pens and for repair of the water intake system damaged by the October 2006 thunderstorms (See B2). The net pens and docking materials will not be disassembled; however, they will be used to support activities at the hatchery in association with work task B2 over the life of the program.

**Proposed FY08 Activities:** Project Closed.

**Pertinent Reports:** A study report is in review, and will be available upon request from the LCR MSCP.

## Work Task C10: Razorback Sucker Growth Studies

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $125,000 | $63,518 | $63,518 | $125,000 | $125,000 | $125,000 | $125,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY11

**Long-term Goal:** Seek measures to improve quantity, quality, and cost effectiveness of RASU reared for the Fish Augmentation Program.

**Conservation Measures:** RASU3, RASU4, and RASU6

**Location:** Various locations including hatcheries, rearing ponds, universities, and private research facilities.

**Purpose:** Evaluate factors affecting growth of subadult RASU to maximize total length at release and reduce rearing time in hatchery.

**Connections with Other Work Tasks (past and future):** This work is similar to actions in C11 and shares some activities (concurrent studies at same locations.) Also, a workshop for fish culturists planned for FY07 will be held jointly for RASU (C10) and BONY (C11).

**Project Description:** Provides funding over a 5-year period for investigations into rearing and culture of RASU. The goal is to investigate ways to accelarate growth of RASU through manipulation of physical, chemical, and biological attributes of the rearing environment (e.g., manipulate feed, fish density, water temperature, water hardness, turbidity, lighting, presence/absence of cover). Current hatchery practices rear 250-300 mm TL fish in roughly 3 years. However, numerous observations during recent rearing and culture of RASU show a wide range in growth rates for this species, and it is possible to have 100, 200, and 300 mm TL fish from the same year class on station at the same time. In general, 25% of a RASU year class exhibit accelerated growth, 50% show moderate growth, and 25% demonstrate slow growth.

The species is a rare fish for which only limited life-history data exist, and data that exist are mostly for adults, not young life stages such as those being reared in hatcheries. As more fish are reared, released, and followed, more life-history data are being collected. Much of this information may be important to fish culturists. For example, the fact that young RASU were nocturnal was determined in 1992 by observations of biologists from the Lake Mohave NFWG. Even so, hatchery managers are just now testing night-time feeding regimes. Active culture of RASU is a young science; many of the techniques initially used for rearing this species

originated in the culture of rainbow trout, a species actively cultured for more than 50 years. Only during the past decade was it conclusively determined that a high-protein trout diet results in spinal deformities in fingerling RASU. As a final example, it was not recognized until the 1980s that adult RASU can feed successfully in open water areas on zooplankton. Much of the existing literature up to that time was for riverine population, and assumed that the adult RASU were only bottom feeders. This information may be vital in determining where feed should be introduced within the water column during the culturing process (sinking, floating, or suspension). These types of observations need to be recongnized, then hypotheses developed, and finally tests of the hypotheses designed and conducted.

Literature reviews will be conducted to compile information on rearing these fish. This will include site visits to facilities acitvely culturing RASU to document successes and failures. Also to be included are inquiries to field biologists and technicians to document behavior of fish in the wild (i.e., daily activities such as feeding, resting, and use of cover in wild habitat). And finally, ideas and hypotheses will be formulated into numerous small experiments, testing one variable at a time.

**Previous Activities:** This was a new start in FY06.

**FY06 Accomplishments:** Reclamation contracted with AGFD to begin work on this 5-year effort (actual award of the contract did not occur until late into the fiscal year). The first research objective was to collect background information regarding RASU rearing techniques in both hatcheries and natural rearing areas. A questionnaire was developed and sent out to facilities known to have reared RASU or currently rearing RASU. Testing-apparatus designs were reviewed for installation at Bubbling Ponds SFH.

**FY07 Activities:** Information from the questionnaire is being summarized and on-site visits to all RASU rearing stations are being conducted. Findings are being developed into a descriptive report to be shared among those conducting RASU culture. In cooperation with Reclamation, a workshop with RASU culturists is being facilitated to share information and ideas concerning improved production of species, particularly with regard to improving growth rate of RASU between 350 and 500 mm TL.

Also, polyculture tests are being conducted by the USFWS at Achii Hanyo Native Fish Rearing Facility, where RASU and BONY are being reared in the same ponds. These fish will be harvested in November 2007, and study results will be available in spring 2008. The USFWS is also conducting RASU growth studies at Willow Beach NFH to determine density levels and feeding rates for rearing RASU from 300 mm up to 500 mm TL to accelerate brood stock development in Lake Mohave.

**Proposed FY08 Activities:** Research investigations from a priority list of research needs developed at the fish culture workshop will be designed and conducted.

**Pertinent Reports:** The scope of work is available upon request from the LCR MSCP.

## Work Task C11: Bonytail Rearing Studies

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $165,000 | $95,301 | $95,301 | $165,000 | $165,000 | $165,000 | $165,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY11

**Long-term Goal:** Continuously seek measures to improve quantity, quality and cost-effectiveness of fish reared for the Fish Augmentation Program.

**Conservation Measures:** BONY3, BONY4, and BONY5

**Location:** Various locations including hatcheries, rearing ponds, universities, and private research facilities.

**Purpose:** Evaluate factors affecting growth of subadult BONY in order to maximize total length at release and reduce rearing time in hatchery.

**Connections with Other Work Tasks (past and future):** This work task is a companion study to C10 and may share some of the same locations, source data, and testing staff during implementation. A workshop planned for FY07 will focus on culture needs for both RASU (C10) and BONY (C11). Also, some of the investigations to be carried out under this work task may be conducted at hatcheries identified in Section B.

**Project Description:** This is a 5-year investigation into rearing and culture of BONY to determine cost-effective techniques to rear BONY to 300 mm TL for stocking into the lower Colorado River. Bonytail exhibit many of the same culture problems shown by RASU (see C10), especially the extremely varied growth in captivity, even for fish from the same family lot. However, BONY are even rarer than RASU, and have less culture history. Diet formulation, feeding rates, best time of day to feed, effects of temperature on food conversion, effects of day length on food conversion, effects of prophylatic treatments on food conversion, and effects of handling on food conversion are just some of the fish culture variables that need investigation. Like RASU, BONY exhibit some nocturnal tendencies both as juveniles and as adults. However, unlike RASU, subadult BONY will eat large insects like crickets, bees, and grasshoppers, and adult BONY will eat other fish and possibly are cannibalistic on their own young. If this is indeed a fact, it must be taken into consideration during the culturing process. It may be necessary to rear bait fish to feed the larger BONY or develop a different diet formulation for larger fish.

The extreme variation in growth presents another problem to the fish culturist. Because this is a protected species, fish culturists do not routinely kill off the small fish following sorting and tagging operations, but instead these small fish are returned to the pond to continue growing.

After a few such operations, the small BONY in the grow-out pond may be some of the oldest fish in the pond. Since it appears that age, not size, determines sexual maturity for this species and since 2-year-old males and 3-year-old females have been shown to sexually mature, the fish begin reproducing in the pond before they reach target size for stocking. Each spawning event results in thousands more fish in the pond, and upsets the food conversion balance (more mouths to feed). The end result is that very few of the initial stock reach target size in a reasonable period of time.

This work task evaluates the current culture practices for BONY through literature reviews, survey questionnaires, site visits to culture facilities, and interviews with fish culturists. A workshop will be held among fish culturists to review survey findings and prioritize research actions. Research hypotheses will be formulated for study designs and investigations will be carried out. Findings and results will be documented and reported.

**Previous Activities:** This is a new start in FY06.

**FY06 Accomplishments:** Dexter NFH developed an alternative rearing strategy to assist with BONY restoration in Lake Mohave. They investigated the potential for increased growth and resource conservation by rearing larval BONY within the same pond as adult broodstock, and determined the effect individual size variation has on growth within an intensive culture environment. Dexter staff spawned adult BONY and prepared ponds for fry production, and released 90 female BONY from broodstock in three ponds and stocked six ponds with 4,000 BONY fry. The ponds were sampled monthly and weight and length data were collected. The ponds were then harvested and total weight, survival, and length/weight data were collected. The female BONY were separated from the larvae and returned to the broodstock. Data were analyzed for growth indices, survival, size, and variation.

Arizona State University conducted a comprehensive review of available published and gray literature and compiled an annotated bibliography. Site visits were made to the following facilities, which are rearing BONY for release into the Colorado River Basin:

- Achii Hanyo – Located on CRIT Tribal land near Parker, AZ; operated by USFWS.
- Dexter NFH – Located near Roswell, NM; operated by USFWS.
- Willow Beach NFH – Located on Colorado River in Arizona, below Hoover Dam; operated by USFWS.
- John W. Mumma Native Aquatic Restoration Facility – Located in Colorado and operated by Colorado Division of Wildlife.
- Wahweap SFH – Located in Utah and operated by Utah Division of Wildlife.

Hatchery personnel were interviewed on their knowledge of facility characteristics and standard practices. Data from the literature review and site visits were collated and interpreted to determine if specific factors could be identified that contribute to rapid BONY growth and high survival. Investigations into handling stressors in BONY were initiated at Achii Hanyo.

**FY07 Activities:** Dexter NFH will continue the investigation into multi-year-class production. Staff will prepare four ponds for production fish. The BONY brood stock will be split between two ponds with a 1:1 ratio of male to female, and five pairs of fish will be held back from each pond to induce spawning. The larval BONY will be combined and each of the four ponds will be stocked with 5,000 larval BONY. The ponds will be monitored daily for water quality and sampled monthly for length and weight gain. The ponds will then be harvested and the brood stock combined into one pond. The larval BONY will be placed into a raceway for a final growth assessment. Data will be complied and an annual report will be written.

Also, a workshop will be convened during summer 2007 at which knowledgeable hatchery personnel and other qualified and interested professionals can exchange information on hatchery rearing of BONY and RASU (C10). The purpose of the workshop is to review final reports and survey findings, prioritize research needs, obtain expert advice on how to optimize hatchery production of BONY and RASU, and produce preliminary designs and a planning process for field and laboratory experiments to test hypotheses.

**Proposed FY08 Activities:** The planning process will be completed, field testing implemented, and procedures evaluated to examine relationships between BONY growth and physical, chemical, and biological characteristics of their hatchery rearing environment.

**Pertinent Reports:** The scope of work is available upon request from the LCR MSCP.

## Work Task C12: Demographics and Post Stocking Survival of Repatriated Razorback Suckers in Lake Mohave

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $185,000 | $173,576 | $173,576 | $185,000 | $215,000 | $30,000 | $0 |

**Contact:** Tom Burke, (702)293-8310, tburke@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY09

**Long-term Goal:** Species Research

**Conservation Measures:** RASU5

**Location:** Reach 2, Lake Mohave, AZ/NV

**Purpose:** Assess population structure for repatriated RASU, and develop a population demographic model for predicting survival and replacement rates to maintain broodstock for duration of the LCR MSCP

**Connections with Other Work Tasks (past and future):** None.

**Project Description:** This activity will support ongoing RASU conservation efforts at Lake Mohave to develop and maintain a population of 50,000 adult RASU as a genetic refuge. More than 100,000 fish have been reared and repatriated to date, yet brood stock population estimates remain below 5,000 fish. This work task initiates a 3-year study to assess the cause of this low population survival. The study will determine whether this low population estimate is real, and will assess causes for poor survival of stocked RASU and make recommendations for corrective actions.

Extensive radio and sonic tracking of fish will be used to assess distribution and survival. Demographic modeling will be used to assess population structure. The study is designed as a multi-year, iterative process. Observations and conclusions from first-year activities will provide direction for work in subsequent years.

**Previous Activities:** This is a new start for FY06.

**FY06 Accomplishments:** Rearing, stocking, and recapture data for RASU stocked into Lake Mohave since 1992 were collated and reviewed. Field investigations were implemented during spawning and post-spawning seasons to assess repatriate distribution. Telemetry work was initiated to examine post-stocking dispersal rates, habitat selection, and short-term mortality, and

to verify existing population models. A population model was refined using new data to estimate abundance and to describe critical, dynamic life table features such as mortality rates. Data are being acquired to assist in the quantitative assessment of fish predators as a mortality factor for newly stocked RASU.

**FY07 Activities:** Initial telemetry studies will be concluded and a new study implemented to assist in assessing mortality of larger (500 mm TL) fish now being stocked into Lake Mohave. Effects of surgical implantation of telemetry tags will be evaluated during a 3-month experimental study. Population monitoring will continue, to acquire new mark-recapture data that will support revised and refined models of mortality and population abundance. These models will contribute to a better understanding and assessment of current practices.

**Proposed FY08 Activities:** Activities during FY08 will continue investigations initiated in FY07, including determing survival of target fish released throughout Lake Mohave. Additional tasks will be determined on the basis of results obtained during the second year of the study. Population demographic modeling will be completed. After FY08 activities are complete, a draft comprehensive project report will be developed and finalized in FY09 that will present all study results and make recommendations for practical or programmatic adjustments for attaining the goals of the Lake Mohave RASU repatriation program.

**Pertinent Reports:** An annual report will be posted to the LCR MSCP Web site. The study plan is available upon request from the LCR MSCP.

## Work Task C13: Lake Mead Razorback Sucker Study

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $350,000 | $265,621 | $363,621 | $300,000 | $150,000 | $150,000 | $150,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY10

**Long-term Goal:** Determine conditions that allow for natural recruitment of RASU.

**Conservation Measures:** RASU7

**Location:** Reach 1, Lake Mead, NV/AZ

**Purpose:** Assess RASU population and recruitment in Lake Mead.

**Connections with Other Work Tasks (past and future):** This work task was previously included in the Draft FY05 Work Tasks as Lake Mead Razorback Study (D7). Larvae collected during this effort are to be reared at Lake Mead Hatchery (B6) and Overton WMA (B11).

**Project Description:** The LCR MSCP will continue to fund and support the ongoing studies of RASU in Lake Mead that were implemented under the SIA BO. The focus areas of the studies are to:

1. Resolve any remaining questions about the location of populations of RASU in Lake Mead from the lower Grand Canyon area downstream to Hoover Dam.
2. Document use and availablility of spawning areas at various water elevations.
3. Clarify substrate requirements for spawning.
4. Monitor potential nursery areas.
5. Continue aging of captured RASU.
6. Confirm recruitment events that may be tied to physical conditions in the lake.

These studies began in 1995 and were anticipated to be completed within a 5-10 year period. However, under RASU7, these studies may be followed by further research and monitoring within the adaptive management program of the LCR MSCP. Reclamation proposes that the current studies be completed in FY07, and then a reduced monitoring effort be initiated in FY08. However, this final decision on level of future monitoring activities has not been determined.

**Previous Activities:** The SNWA began a monitoring program for RASU in Lake Mead in 1995, partnering with NDOW and Reclamation. Between 1995 and 2004, some 200 adult and 30 juvenile RASU were captured. Aging data showed that a low-level of recruitment has occurred in at least 22 of the past 30 years. This remarkable recruitment has happened in the face of extensive non-native fish populations.

**FY06 Accomplishments:** Year 2006 was the tenth year of this cooperative study. Four-year sonic tags were implanted into 10 adult RASU that were acquired from Floyd Lamb State Park. The sonic-tagged fish were released into Las Vegas Bay, Echo Bay, and the Muddy River/Virgin River inflow area. Trammel-netting surveys captured 47 adult RASU (13 at Las Vegas Bay, 31 at Echo Bay, and 3 at Fish Island). Declining lake levels resulted in local shifts in spawning sites as RASU established new spawning sites in the vicinity of historical ones. Both the Las Vegas Bay and Echo Bay populations successfully adapted to these changes in water surface elevation. Collecting of RASU larvae was conducted during the spawning season, with larvae captured from all major spawning sites. In addition to fish from known spawning sites, five larvae were collected from the Muddy River/Virgin River inflow. This finding coupled with other data indicates that this area of Lake Mead may be important for RASU recruitment. Aging and growth data were again collected in 2006. Fin-ray aging of multiple sub-adult fish suggests recent recruitment in Las Vegas Bay. Evaluations of possible off-channel stocking sites, including Grand Wash Bay and Driftwood Cove, were also conducted.

**FY07 Activities:** A document summarizing the 10 years of research is being completed. Reclamation plans to initiate a Lake Mead RASU monitoring program based on this information. Program goals will include observation and identification of population trends, annual observations of spawning area use at known spawning sites, and continued confirmation of recruitment. Additional monies that do not count toward the LCR MSCP cost share will be received from SNWA to accomplish Lake Mead RASU activities.

**Proposed FY08 Activities:** Limited research and monitoring will be conducted on RASU ecology in Lake Mead, as desribed in the report, *Lake Mead Razorback Sucker Monitoring Recommendations*, available on the LCR MSCP Web site. An interagency team will be convened that will utilize the 10-year review to determine future need for management activities.

**Pertinent Reports:** The *Annual Lake Mead RASU Study* report for 2005-2006 is posted on the LCR MSCP Web site.

## Work Task C14: Humpback Chub Program Support

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $15,000 | $38,229 | $38,229 | $10,000 | $10,000 | $10,000 | $10,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY 05

**Expected Duration:** FY 55

**Long-term Goal:** Provide $10,000 per year to support humpback chub conservation.

**Conservation Measures:** HUCH1

**Location:** Grand Canyon, AZ; Willow Beach, AZ

**Purpose:** Provide financial support to the Glen Canyon Dam Adaptive Management Program (AMP) for conservation of humpback chub.

**Connections with Other Work Tasks (past and future):** This work is connected to B2 as money will be transferred to USFWS through an agreement for activities at Willow Beach NFH.

**Project Description:** The LCR MSCP will provide $10,000 per year for 50 years to the Glen Canyon Dam AMP, or other entity approved by USFWS, to support implementation of planned, but unfunded species conservation measures.

**Previous Activities:** This is a new start for FY06

**FY06 Accomplishments:** Based upon recommendations from the Glen Canyon Dam Adaptive Management Program, funds were provided to USFWS at Willow Beach NFH to support care of humpback chub from the Little Colorado River held on station. To reduce overhead and eliminate repetitive administrative costs, funds were provided for a 3-year period (FY06-08).

**FY07 Activities:** Monitor progress on agreement with USFWS.

**Proposed FY08 Activities:** Monitor progress on agreement with USFWS, and hold coordination meeting with GCAMP to identify new work tasks for FY09.

**Pertinent Reports:** At the end of the 3-year period a report will be developed and will be available upon request from the LCR MSCP.

## Work Task C15: Flannelmouth Sucker Habitat Use, Preference and Recruitment Downstream of Davis Dam

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $80,000 | $98,025 | $150,025 | $80,000 | $80,000 | $80,000 | $80,000 |

**Contact:** Jeff Lantow, (702) 293-8557, jlantow@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY11

**Long-term Goal:** Support flannelmouth sucker conservation

**Conservation Measures:** FLSU2 and FLSU3

**Location:** Reach 3, AZ/NV/CA

**Purpose:** Provide funding to support existing flannelmouth sucker (FLSU) conservation and research below Davis Dam, and to develop a management needs strategy for this species.

**Connections with Other Work Tasks (past and future):** Since FY06, the FLSU work is now being done under C15 and the RASU portion of the work has been included under D8.

**Project Description:** Conduct FLSU research efforts in Reach 3 below Davis Dam to determine habitat use, habitat preferences, and recruitment and support decisions on habitat management activities for river channel and backwater habitats in Reach 3. This support will be provided for 5 years. Once completed, research results will be used through the adaptive management process to assess main channel and backwater management needs and to develop management strategies to benefit the FLSU.

**Previous Activities:** Flannelmouth sucker were reintroduced into the Colorado River below Davis Dam by AGFD in 1976 by transfer of fish captured at the confluence of the Colorado and Paria rivers at Lee's Ferry, Arizona. This stock has persisted for three decades and now represents the only known population of this native species in the Colorado River downstream of Grand Canyon.

Spring field sampling was conducted in FY05; this work was combined with monitoring activities for RASU. Field work was led by Reclamation staff from the Denver Technical Service Center with support from the Lower Colorado Regional Office. Thirty-three nights of trammel netting yielded a total of 12,119 fish, including 124 FLSU. Specially designed low-profile fyke nets were tested in swift water habitats to increase FLSU captures. However, the FLSU spawning

season had passed by the time these tests were conducted. Results of this work are included in a report covering a 3-year period from 2003-2005, which is posted to the LCR MSCP Web site.

**FY06 Accomplishments:** Seven sampling trips were conducted from December 2005 through April 2006. Sampling consisted of trammel netting, fyke netting, seining, larval light trapping, and electrofishing. All life stages of FLSU were contacted: 6 larvae, 4 juveniles, and 350 adults. Electrofishing proved to be the most effective method for sampling adults in the main channel (263 fish). A population estimate of 2,437 adults was calculated based on trammel net and electrofishing contacts. Fyke netting proved ineffective, capturing only one adult, and will be discontinued for the remainder of the project. A synopsis of the fyke netting results will be included in the FY06 annual report.

Due to extreme water clarity in this reach of the Colorado River, Reclamation staff assessed both aerial photography and visual float counts as tools to help monitor population trends for FLSU adults. For the aerial photography work, still and video imagery were taken from the helicopter with digital camera equipment. Results from this effort were mixed, but generally poor due to problems with wind and glare. Making visual counts from boats floating along in the current was much more successful. A population estimate of 1,440 adult FLSU was attained from the float counts, and this number fell within the 95% confidence limits of the mark/recapture estimates from the trammel netting and electrofishing contacts.

Fifteen adult male flannelmouth were surgically implanted with 14-month sonic tags. These fish were followed throughout the sampling season and on a monthly basis the remainder of the year. Eleven fish were contacted on a regular basis throughout the year and provided information on movement and habitat use; this information also was useful in locating other congregations. All telemetry locations were representative of channel, near-shore, and eddy pool habitats. No tagged fish were encountered in backwaters or side channel habitats.

**FY07 Activities:** Continuation of sampling is planned, using larval traps, electrofishing, and trammel netting with smaller meshed nets to increase contacts with juvenile life stages. Beach seining and backpack electro-shocking will be incorporated to further assess numbers and distribution of juvenile life stages. Telemetry work will be continued using 36-month internal sonic tags. Sampling trips will be conducted throughout the year to provide more data on seasonality of habitat use. We will also begin modeling population structure and distribution to determine habitat preferences and needs, which will be incorporated into the baseline mapping of the physical habitat. Aerial photography/video work will be discontinued and a synopsis of findings will be included in the FY07 annual report.

**Proposed FY08 Activities:** Monitoring and research actions from FY07 will be continued, and model criteria will be developed and modified as data are compiled and analyzed. Stomach content analysis and macroinvertebrate sampling from known habitats where FLSU have been observed over the course of the study will be incorporated throughout the year.

**Pertinent Reports:** A draft annual report for FY06 is current under review and will be posted on Web site when available.

## Work Task C16: Evaluation of Past Bonytail Stockings

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $60,000 | $0 | $0 | $0 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY07

**Expected Duration:** FY07

**Long-term Goal:** Adaptively manage bonytail augmentation stockings.

**Conservation Measures:** BONY5

**Location:** Entire Colorado River Basin

**Purpose:** Develop an understanding of past bonytail (BONY) stockings in the Colorado River Basin.

**Connections with Other Work Tasks (past and future):** None

**Project Description:** This project is a review of past stockings of BONY throughout the Colorado River Basin. The study will document the size of fish released, locations stocked, physical and chemical conditions of receiving waters, results of post-stocking assessments, and related parameters that help determine the relative success of these events. There are only six facilities actively rearing BONY: Dexter NFH, Willow Beach NFH, Achii Hanyo NFF (CRIT), Wahweap SFH (Utah Division of Wildlife), Mumma SFH (Colorado), and Ouray NFH. It is expected that all facilities will be visited during this research.

**Previous Activities:** This is a new start in FY07.

**FY06 Accomplishments:** This is a new start in FY07.

**FY07 Activities:** Review agency stocking records and literature plus post-stocking assessments, identify factors that are associated with relative post-stocking success, make recommendations to improve existing programs, and identify areas for follow-up research and management investigation. The deliverable will be a final report that includes: 1) a compilation of all available bonytail stocking records for open waters throughout the Colorado River Basin, 2) a summary of information on locations stocked, numbers and size of fish released, physical and chemical characteristics of receiving waters, results of post-stocking assessments, and any related parameters that determine the relative success of bonytail stocking, 3) an analysis of information that identifies common elements associated with relatively greater stocking success, if any,

4) recommendations to the LCR MSCP Fish Augmentation Program for management practices that can be incorporated immediately, and 5) recommendations to the program for additional research or management data collection that will improve future bonytail stocking. It is expected that the report will summarize information and present recommendations to the LCR MSCP Fish Augmentation Program as to best management practices for stocking BONY.

**Proposed FY08 Activities:** None, project to be closed.

**Pertinent Reports:** The scope of Work is available upon request from the LCR MSCP.

## Work Task C23: Evaluation of Remote Sensing Techniques for PIT Tagged Fish

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $145,000 | $145,000 | $0 | $0 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY07

**Expected Duration:** FY08

**Long-term Goal:** Conduct long-term system monitoring and adaptively manage augmentation stockings of razorback sucker and bonytail.

**Conservation Measures:** BONY5 and RASU6

**Location:** Reaches 2 and 3 and Willow Beach NFH, AZ, NV, and CA

**Purpose:** Monitor augmentation stockings in a cost-effective and passive manner.

**Connections with Other Work Tasks (past and future):** This work migrated out of G3. This work task may determine future PIT-tag equipment purchases in work task B8.

**Project Description:** This is a 2-year evaluation of native fish monitoring equipment. Reclamation will purchase and test the effectiveness of flat plate, circular and directional antennae, and associated hardware and software for remote sensing of PIT tagged RASU and BONY. The project will evaluate designs for weir-type guided as well as non-guided systems for the detection of PIT-tagged fish at spawning areas, and methods for collecting, storing, and retrieving contact data. Current efforts to contact repatriated native fish are labor intensive and require direct handling of fish during the spawning season. Remote sensing may prove to be less costly, more efficient, and less stressful on these sensitive native fish species.

**Previous Activities:** This is a new start for 2007.

**FY06 Accomplishments:** None

**FY07 Activities:** Equipment will be deployed under a controlled laboratory application at Willow Beach NFH in conjunction with fish-tagging operations. Flat-plate PIT-tag antennae will be set in the bottom of holding tanks with tagged fish being introduced above the antennae. Netting will be set at known distances (0, 2, 4, and 6 inches) above the antennae. Individual detections will be recorded to determine maximum detection distance. In the field, flat-plate antennae will be deployed on the lake bottom at RASU spawning sites to detect PIT-tagged

RASU that swim over the antennae. Data will be evaluated in a final report with recommendations for final application to the system monitoring program.

**Proposed FY08 Activities:** Expanded field testing of remote detection equipment at known RASU and BONY spawning sites will be conducted. A final report will be developed documenting results of the 2-year evaluation.

**Pertinent Reports:** The study plan is available upon request from the LCR MSCP.

## Work Task C24: Avian Species Habitat Requirements

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $0 | $150,000 | $150,000 | $150,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY08

**Expected Duration:** FY12

**Long-term Goal:** Develop habitat suitability index models for covered avian species

**Conservation Measures:** AMM1, AMM3, MRM1, MRM2, CLRA1, CLRA2, LEBI1, BLRA1, BLRA2, WIFL1, WIFL2, YBCU1, YBCU2, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1

**Location:** System-wide

**Purpose:** Determine habitat requirements for covered marsh and riparian bird species, including Yuma clapper rail (CLRA), least bittern (LEBI), California black rail (BLRA), southwestern willow flycatcher (SWFL), yellow-billed cuckoo (YBCU), elf owl (ELOW), gilded flicker (GIFL), Gila woodpecker (GIWO), vermilion flycatcher (VEFL), Arizona Bell's vireo (BEVI), yellow warbler (YWAR), and summer tanager (SUTA).

**Connections with Other Work Tasks (past and future):** Information gained from this work task will be used to design, create, and maintain marsh and cottonwood-willow habitat described in Section E that targets covered bird species. Information will also be used to maintain existing habitat as described in H1. Data collected in work tasks D2, D3, D5, D6, D7, and F2 will be used to help define habitat requirements.

**Project Description:** The HCP requires the creation of 512 acres of marsh habitat for three covered marsh bird species. All 512 marsh acres should provide habitat for CLRA and LEBI, while 130 acres will provide habitat for BLRA. Created habitat must be designed in a mosaic to provide the characteristics required by each species. In addition, potential limiting factors such as water fluctuation, percent cover by plant species, minimum patch size, and selenium bio-accumulation need to be determined.

The HCP also requires the creation of 5,940 acres of cottonwood-willow habitat for nine covered riparian obligate bird species. Habitat requirements for these covered species are not fully understood. Habitat creation projects must provide habitat requirements for multiple covered species to effectively and efficiently complete these conservation measures.

**Previous Activities:** N/A

**FY06 Accomplishments:** N/A

**FY07 Activities:** This is a new start in FY08.

**Proposed FY08 Activities:** Data collected during avian system monitoring, pre-development monitoring, and post-development monitoring will be used, in conjunction with existing information gathered during the formulation of species accounts (C3), to define required habitat characteristics. These data will be used to develop habitat suitability index models for covered avian species. Habitat suitability index models will help define limiting factors and required habitat characteristics. Information will be used to develop habitat mosaics for habitat creation and to direct future research. Models will be validated through monitoring accomplished under work tasks D6 and F2. Further monitoring and research will refine these models through the adaptive management process.

**Pertinent Reports:** N/A

## Work Task C25: Imperial Ponds Native Fish Research

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $0 | $225,000 | $225,000 | $225,000 |

**Contact:** Jeff Lantow, (702) 293-8557, jlantow@lc.usbr.gov

**Start Date:** FY08

**Expected Duration:** FY11

**Long-term Goal:** Species research, backwater restoration

**Conservation Measures:** RASU2, BONY2

**Location:** Reach 5, Imperial National Wildlife Refuge, AZ

**Purpose:** Monitor six ponds created as native fish refugia on Imperial NWR to ascertain the overall success of each pond in producing viable populations of native fish, and evaluate the role and contribution of various structures and features developed within the ponds in attaining this success.

**Connections with Other Work Tasks (past and future):** The RASU and BONY to be stocked into the ponds are provided through B1, B2, B3, B4, and B5. Ponds were developed under E14, and additional monitoring support will be provided through F5.

**Project Description:** This activity will monitor and evaluate the development of native fish refugia in six newly constructed ponds on Imperial NWR. Pond construction incorporated design features such as riprap, spawning gravels, hummocks, and increased depth, all thought to provide suitable habitat for life cycle completion by BONY and RASU. The experimental design of this research program will evaluate the role and importance of each of these features toward accomplishing successful communities of native fishes. The design includes an initial fish stocking strategy for the ponds, and a monitoring program for selected features of the habitat and fish. The work will be directed by native fish experts who will interpret all field data and make recommendations as appropriate to guide the overall operation and future management of the ponds for native fish refugia.

**Previous Activities:** This is a new start for FY08.

**FY06 Accomplishments:** N/A

**FY07 Activities:** N/A

**Proposed FY08 Activities:** The initial year of the study will include monitoring the physical and chemical environment of the ponds, monitoring and documenting establishment of vegetation (fringe, emergent and submergent), and monitoring and documenting initial aquatic biology (plankton community, fish introductions and invasions) and other ecological factors that may impact the success of the ponds (piscivorous birds and mammals).

**Pertinent Reports:** A progress report will be developed annually and will be posted to the LCR MSCP Web site. The study plan is available upon request.

## Work Task C26: Evaluation of Raceway Rearing of Razorback Sucker at Lake Mead Fish Hatchery

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $0 | $100,000 | $100,000 | $100,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY08

**Expected Duration:** FY10

**Long-term Goal:** Rear RASU of sufficient quantity and quality to accomplish the LCR MSCP Fish Augmentation and Species Research Programs

**Conservation Measures:** RASU3, RASU4, and RASU8

**Location:** Reach 1, Lake Mead, Boulder City, NV

**Purpose:** Evaluate raceway rearing of RASU to improve physical conditioning prior to stocking.

**Connections with Other Work Tasks (past and future):** This research is complementary to work conducted under Work Task C10. If successful (i.e., shows benefit to fish and is cost effective), this action may be included in the Fish Augmentation Program (Section B) in the future. Other rearing of RASU is being conducted at this facility under Work Task B6.

**Project Description:** This project will investigate and evaluate rearing of RASU in flowing raceways at Lake Mead SFH. The study will investigate ways to deliver food, efficiency of food conversion, feeding rate, growth of RASU, and physical condition of fish. End-of-year results will be compared with similar parameters for RASU being reared for the LCR MSCP in non-flow facilities (Willow Beach NFH and Bubbling Ponds SFH).

This research is being proposed to take advantage of a unique opportunity at Lake Mead SFH. Research underway at Achii Hanyo by the USGS and USFWS is showing that RASU acclimated to flow have improved swimming performance. This may improve post-stocking survival for fish released by the LCR MSCP. Currently, there are no facilities rearing fish for the LCR MSCP using flowing raceways. Due to current water elevations of Lake Mead, intake water temperatures at Lake Mead SFH are too warm for rearing rainbow trout (summer water temperatures in 2006 exceeded 75°F). The NDOW is investigating ways to acquire water from deeper, cooler areas of Lake Mead. The current timeline projects that acquisition of a new water source is 3-5 years away. In the meantime, all or parts of the Lake Mead SFH will be idle. This work proposes to use RASU from lakes Mead and Mohave to examine and evaluate the

practicality and cost effectiveness of feeding and growing RASU in raceways at Lake Mead SFH.

**Previous Activities:** Reclamation, SNWA, and NDOW have cooperatively been rearing RASU from Lake Mead in tanks at the hatchery (See B6).

**FY06 Accomplishments:** N/A

**FY07 Activities:** N/A

**Proposed FY08 Activities:** Conduct rearing trials for juvenile and subadult RASU in flow-through raceways to evaluate such parameters as growth rate, condition factor, and food conversion efficiency.

**Pertinent Reports:** A final study plan will be available in August 2007.

## Work Task C27: Small Mammal Population Studies

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $0 | $65,000 | $65,000 | $65,000 |

**Contact:** Chris Dodge, (702) 293-8115, cdodge@lc.usbr.gov

**Start Date:** FY08

**Expected Duration:** FY10

**Long-term Goal:** System monitoring and research to determine distribution, habitat requirements, and genetics of covered small mammal species.

**Conservation Measures:** MRM2, DPMO1, CRCR2, and YHCR2

**Location:** System-wide along the Lower Colorado River below Hoover Dam.

**Purpose:** Implement distribution, habitat, and genetics studies for system monitoring of LCR MSCP covered small mammal species. These studies are being conducted to determine geographic range limits of the Yuma hispid cotton rat and the Colorado River cotton rat, and to determine habitat characteristics utilized by these species. Data will be used in the adaptive management process to coordinate surveys of habitat creation sites and design habitat for covered mammal species.

**Connections with Other Work Tasks (past and future):** Data collected as part of Small Mammal Colonization (F3) will also be analyzed as part of the effort to determine species distribution of the two cotton rat species found along the LCR. Previous work related to Small Mammal Populations was conducted under D10.

**Project Description:** Studies will be designed to determine the habitat usage, population status, genetic differentiation, and distributional range of two covered small mammal species: the Colorado River cotton rat and the Yuma hispid cotton rat. Reclamation will trap in various habitat types along the LCR to collect genetic samples from these species. Samples will be sent to a genetics laboratory for DNA analysis to determine the species of each animal sampled. Genetic differentiation data for animals captured along the LCR may also be compared with data from animals of different sub-species located within Arizona, east of the LCR MSCP planning area, to obtain genetic markers. These data will be used to compare and contrast specific subspecies. In conjunction with this work, Reclamation will also initiate a 3-year study to determine the general distribution and habitat usage of these species along the LCR. The 3-year study will better define the habitat characteristics utilized by the two species of cotton rats, and will be used to design future habitat creation projects.

**Previous Activities:** Cotton rats have been captured at the Pratt Agricultural and at the Cibola Nature Trail site in the previous 3 years during presence/absence surveys.

**FY06 Accomplishments:** See D10.

**FY07 Activities:** See D10.

**Proposed FY08 Activities:** Initiate a study to determine the genetic structure for Colorado River cotton rats and Yuma hispid cotton rats along the LCR. These data will be used to establish a molecular-based protocol to diagnose species-level taxonomy on specimens trapped and released in the field.

**Pertinent Reports:** The study plan is available upon request from the LCR MSCP.

# WORK TASKS
# SECTION D

# SYSTEM
# MONITORING

## Work Task D1: Marsh Bird Surveys

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $25,000 | $44,997 | $79,917 | $25,000 | $35,000 | $35,000 | $35,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** System monitoring for marsh birds.

**Conservation Measures:** AMM1, AMM3, AMM6, MRM1, CLRA2, and BLRA2

**Location:** Havasu National Wildlife Refuge, AZ and CA.

**Purpose:** Monitor Yuma clapper rail (CLRA), California black rail (BLRA), and western least bittern (LEBI) along designated reach of the LCR as part of the inter-agency system monitoring program.

**Connections with Other Work Tasks (past and future):** Data obtained from F2 will also be used in the marsh bird system monitoring program described in D1. Protocol developed for D1 will also be used for F2.

**Project Description:** Yuma clapper rail surveys have been conducted annually since the 1980s. Prior to implementation of the LCR MSCP, U of A conducted a study to determine if CLRA surveys could be expanded to a multi-species protocol without compromising CLRA detection rates. Information obtained from this study has produced a new multi-species protocol for all marsh birds, including the LCR MSCP covered species (CLRA, BLRA, and LEBI). Marsh bird surveys will continue at designated survey points to track detections of covered species utilizing the multi-species protocol.

**Previous Activities:** Reclamation has monitored CLRA within Topock Gorge since 1995.

**FY06 Accomplishments:** Marsh bird surveys were conducted between the I-40 bridge, near Needles, California, and Lake Havasu during March, April, and May 2006. Total CLRA detections ranged from 19 to 31 individuals per survey period. Total LEBI detections ranged from 8 in March to 37 during the May survey period. No BLRA were detected during these surveys. Data was compiled and sent to the USFWS in August 2006.

The FY06 costs exceeded estimates due to replacement costs for two boat motors and maintenance costs associated with boats needed to conduct the marshbird surveys.

**FY07 Activities:** Marsh bird surveys are being conducted in Topock Gorge and the upper reaches of Lake Havasu using the multi-species marsh bird survey protocol. Data will be submitted to the USFWS. Information obtained through this work task may be used in planning future marsh bird habitat creation activities. Also, Reclamation will enter historical CLRA survey data, currently stored by the USFWS, into the LCR MSCP database.

**Proposed FY08 Activities:** Marsh bird surveys will be conducted in Topock Gorge and the upper reaches of Lake Havasu using the multi-species marsh bird survey protocol. Data will be submitted to the USFWS. Information obtained through this work task may be used in planning future marsh bird habitat creation activities.

**Pertinent Reports:** *Yuma Clapper Rail Surveys along the LCR at Topock Gorge, 2006* will be posted on the LCR MSCP Web site.

## Work Task D2: Southwestern Willow Flycatcher Presence/Absence Surveys

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $880,000 | $848,505 | $1,633,099 | $925,000 | $575,000 | $575,000 | $575,000 |

**Contact:** Theresa Olson, (702) 293-8127, tolson@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** System monitoring for southwestern willow flycatcher.

**Conservation Measures:** AMM1, AMM2, AMM3, AMM5, AMM6, MRM1, MRM2, MRM4, and WIFL2

**Location:** Reaches 1-7 along the LCR, the Virgin River between the Virgin River Gorge and Lake Mead, NPS lands in the Grand Canyon below Separation Canyon, and Pahranagat NWR. Life history study sites are located at: 1) Pahranagat NWR in east-central Nevada, 2) along the Virgin River at Mesquite, Nevada, 3) along the Virgin River, near Mormon Mesa, Nevada, and 4) Topock Marsh, Havasu NWR, Arizona.

**Connections with Other Work Tasks (past and future):** Information gathered under this work task, and C19, D3, and D4 provide data on SWFL population numbers and demographics along the LCR. Information provided from C1 will be used in connection with this work task for future analysis of brown-headed cowbird trapping.

**Project Description:** Reclamation has been conducting extensive SWFL surveys and studies along the LCR since 1996, in accordance with the 1997 and 2001 BOs. In 2003, Reclamation entered into a 5-year contract to conduct presence/absence surveys along the LCR from the Southerly International Boundary with Mexico (SIB) to Separation Canyon in the Grand Canyon (excluding Hualapai tribal lands), including the lower Virgin River, lower Bill Williams River, and lower Gila River, and conduct life history and cowbird control studies at four known population areas.

**Previous Activities:** Presence/absence surveys and life history studies for SWFL have been conducted along the LCR since 1996.

**FY06 Accomplishments:** Presence/absence surveys were conducted at 101 sites along the Lower Colorado River and its tributaries in 2006. Life history studies were conducted at four sites, including Pahranagat NWR, Nevada; Mesquite, Nevada; Mormon Mesa, Nevada; and Topock Marsh, Arizona. Studies included banding, nest monitoring, extensive vegetation

analysis, and microclimate analysis. Brown-headed cowbird trapping studies were also continued at all life history sites.

Willow flycatchers were detected on at least one occasion at 73 sites. Resident, breeding SWFL were detected at 13 sites within the following seven study areas: Pahranagat NWR, Mesquite, Mormon Mesa, Muddy River, Grand Canyon, Topock Marsh, and Bill Williams. No flycatcher detections were recorded at any sites south of Bill Williams after June 21, 2006.

A total of 28 new adult flycatchers were color-banded, and 25 recaptured individuals were banded in previous years at the four life history study areas and at Muddy River, Grand Canyon, and Bill Williams River. A total of 55 nestlings from 29 nests were banded, and 3 unbanded fledglings were banded. A total of 85 territories were recorded in these areas with 66 territories consisting of paired flycatchers and 19 consisting of unpaired individuals. Of the 80 adult flycatchers identified to individuals in 2005, 48 (60%) were located in 2006. Of the 65 banded juveniles from 2005, 10 were recaptured and identified in 2006.

Nest success was calculated for 77 SWFL nests observed at the four life history study sites, Muddy River, Grand Canyon, and Bill Williams. Thirty-three (43%) nests were successful and fledged young, 41 (53%) failed, and 3 (4%) were of undetermined fate. Depredation was the major cause of nest failure, accounting for 48% of all failed nests and 54% of nests that failed after flycatcher eggs were laid. Brown-headed cowbird brood parasitism was observed in 11 (15%) of 71 nests monitored. Trapping occurred at three life history sites, as access and placement problems excluded Mormon Mesa. The proportion of flycatcher nests parasitized during the pre-trapping and post-trapping periods did not statistically decline at Topock Marsh or Mesquite, but a significant decline was shown at Pahranagat NWR after 4 years with a zero parasitism rate.

Vegetation and microhabitat data were collected from occupied and non-use habitats to further define habitat characteristics. Comparison of microclimate characteristics tends to show that on average, nests were located in areas that exhibited greater soil moisture and higher relative humidity.

**FY07 Activities:** Presence/absence SWFL surveys will be conducted at approximately 100-120 sites, in 15 study areas, along the Virgin River, Pahranagat NWR, Grand Canyon below Separation Canyon (excluding Hualapai tribal lands), and the LCR to the Southerly International Boundary. Life history studies are being conducted at Pahranagat NWR, Nevada; Mesquite, Nevada; Mormon Mesa, Nevada; and Topock Marsh, Arizona. Studies include banding, nest monitoring, extensive vegetation analysis, and microclimate analysis. The brown-headed cowbird trapping study is also continuing at all life history sites, except for Mormon Mesa. Change in funding between FY06 and FY07 is specifically related to contract costs. The current contract extends through 2007. Reclamation conducted a meeting with species experts in January, 2008 to evaluate the level of effort needed for future studies and surveys to ensure that necessary data is collected in an efficient and effective manner.

**Proposed FY08 Activities:** Reclamation received input from species experts on the present level of monitoring and research effort being conducted on SWFL along the LCR. A determination was made that Reclamation will continue to conduct presence/absence SWFL

surveys along the Virgin River, Pahranagat NWR, Grand Canyon below Separation Canyon (excluding Hualapai tribal lands), and the LCR to the SIB. Surveys will occur annually; however, fewer visits per site will be conducted. Presence/absence surveys will be conducted in approximately 15 sites.

Life history data will continue to be collected at four sites, including Pahranagat NWR (Nevada), Mesquite (Nevada), Mormon Mesa (Nevada), and Topock Marsh (Arizona). Monitoring activities will concentrate on collecting demographic data including banding and nest monitoring, and habitat data including vegetation and microclimate. Existing brown-headed cowbird control will be discontinued and post-trap data will be collected and analyzed.

**Pertinent Reports:** *Southwestern Willow Flycatcher Surveys, Demography, and Ecology along the LCR and Tributaries, 2006* is posted on the LCR MSCP Web site.

## Work Task D3: Southwestern Willow Flycatcher Habitat Monitoring

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $90,000 | $74,346 | $234,315 | $90,000 | $90,000 | $90,000 | $90,000 |

**Contact:** Theresa Olson, (702) 293-8127, tolson@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** Five years after implementation of all water transfers covered under the SIA BO.

**Long-term Goal:** Monitor the effects of reduced flows and the associated reduction in groundwater table, specifically associated with the SIA, on southwestern willow flycatcher (SWFL) breeding habitat between Parker and Imperial Dams.

**Conservation Measures:** AMM1, AMM3, MRM1, MRM2, and WIFL 2

**Location:** Reaches 4 and 5, CA and AZ.

**Purpose:** Continue to monitor SWFL habitat condition 5 years after implementation of all water transfers covered under the SIA.

**Connections with Other Work Tasks (past and future):** This work task, in conjunction with surveys conducted under D2, will provide information necessary for the Existing Habitat Maintenance (H1). Data collected may also be used in future habitat creation projects listed under Section E.

**Project Description:** In 2005, Reclamation began monitoring 372 acres of SWFL breeding habitat to document changes in habitat conditions specifically attributable to covered SIA activities, and will continue to do so until 5 years after implementation of all water transfers covered under the SIA.

**Previous Activities:** In 2001, Reclamation received a BO on the SIA for the change in point of diversion of up to 400,000 acre-feet of water between Imperial and Parker Dams. This work is being implemented through the LCR MSCP. Reduced river flows, created by the change in the point of diversion, may affect SWFL breeding habitat located between these two dams.

In 2004, Reclamation identified 372 acres of SWFL habitat between Parker and Imperial Dams to monitor for the SIA BO requirements. In each identified site, three to five temperature/humidity data loggers and one groundwater observation well were installed. Soil moisture measurements were collected at each data logger location during each flycatcher survey period. Vegetation data were also collected after the surveys were completed.

**FY06 Accomplishments:** The previously identified 372 acres of SWFL breeding habitat at 11 sites, along with two control sites, were monitored between Parker and Imperial Dams by collecting and analyzing microclimate data, groundwater monitoring, and vegetation monitoring, using similar protocols to those in place for the life history studies. Analyses of groundwater data indicate a strong correlation between well levels and releases from Parker Dam. Data did not show strong correlations between well water levels and either soil moisture or absolute humidity with the habitat. Most microclimatic variables at combined habitat monitoring sites differed significantly from those at Topock Marsh, with Topock Marsh being cooler and exhibiting higher relative humidity.

**FY07 Activities:** To allow comparison of data, the 372 acres of SWFL breeding habitat between Parker and Imperial Dams will be monitored by collecting and analyzing microclimate data, groundwater monitoring, and vegetation monitoring utilizing similar protocols as those in place for the life history studies. Data will be analyzed and results will be provided in the 2007 annual SWFL report.

**Proposed FY08 Activities:** The 372 acres of SWFL breeding habitat between Parker and Imperial Dams will be monitored by collecting and analyzing microclimate data, groundwater monitoring, and vegetation monitoring utilizing similar protocols as those in place for the life history studies. Data will be analyzed and results will be included in an annual report.

**Pertinent Reports:** *Southwestern Willow Flycatcher Surveys, Demography, and Ecology along the LCR and Tributaries, 2006* is posted to the LCR MSCP Web site.

## Work Task D4: Southwestern Willow Flycatcher Presence/Absence Survey — Hualapai Tribal Lands

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $68,000 | $66,046 | $130,703 | $76,000 | $78,000 | $0 | $0 |

**Contact:** Theresa Olson, (702) 293-8127, tolson@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY08 decision point

**Long-term Goal:** System monitoring for the SWFL on Hualapai tribal lands within the Grand Canyon.

**Conservation Measures:** AMM1, AMM3, MRM1, MRM2, and WIFL2

**Location:** Hualapai Tribal Lands in the Grand Canyon downstream of Separation Canyon; AZ.

**Purpose:** Conduct SWFL surveys on Hualapai tribal lands in the Grand Canyon as part of the system monitoring program. Identify SWFL population, breeding sites, and specific threats to SWFL habitat on tribal lands.

**Connections with Other Work Tasks (past and future):** Surveys conducted under this work task provide system monitoring coverage for SWFL in areas not covered by D2. Protocols used in D2 are replicated under this work task to provide comparable data.

**Project Description:** Reclamation provided the Hualapai Tribe funding to conduct presence/absence surveys for SWFL on tribal lands within the Grand Canyon. These surveys are conducted on sensitive tribal lands not included in the system-wide SWFL monitoring program. These surveys enable the Tribe to manage occupied SWFL by avoiding and minimizing disturbance to nesting SWFL, as well as providing data to the system monitoring program.

**Previous Activities:** Reclamation has funded SWFL surveys on Hualapai tribal lands since 1997.

**FY06 Accomplishments:** The Hualapai Tribe surveyed 11 sites on tribal lands within the Grand Canyon between Separation Canyon and the river delta with Lake Mead. Important recreational areas, such as Spencer Creek, were surveyed and appropriate management actions have been undertaken to minimize impacts to SWFL breeding sites (limiting visitor access, changing helicopter flight patterns). Surveys were conducted from May 9 to July 20, 2006. Three pairs and two additional singing males were located during the breeding season. Although habitat has

declined in quality in many areas, suitable habitat was still present in 2006. However, areas nearer to Lake Mead have developed into denser higher quality habitat.

**FY07 Activities:** Hualapai Tribal biologists will conduct presence/absence surveys on sensitive Hualapai tribal lands below Separation Canyon and will continue to coordinate with other banding and nest-monitoring activities.

**Proposed FY08 Activities:** Hualapai Tribal biologists will conduct presence/absence surveys on sensitive Hualapai tribal lands below Separation Canyon. The current agreement between Reclamation and the Hualapai Tribe extends through 2008. Reclamation will re-evaluate the need for future studies and surveys.

**Pertinent Reports:** *Southwestern Willow Flycatcher Surveys in Lower Grand Canyon, FY2006* is available upon request from the LCR MSCP.

## Work Task D5: Monitoring Avian Productivity and Survivorship

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $300,000 | $245,205 | $539,050 | $300,000 | $300,000 | $300,000 | $300,000 |

**Contact:** Chris Dodge, (702) 293-8115, cdodge@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** System monitoring for avian covered species by conducting intensive monitoring of habitat creation sites and sites that typify current conditions along the LCR.

**Conservation Measures:** MRM1 and MRM2.

**Location:** Cibola NWR and Havasu NWR.

**Purpose:** To collect data on avian species demographics, physical condition, species composition and diversity, and site persistence at existing and created habitat sites for the system monitoring program.

**Connections with Other Work Tasks (past and future):** Data from this work task is used in conjunction with data collected from the system-wide bird monitoring program (D6) to monitor overall bird use of the LCR. Data collected at MAPS stations located at habitat creation sites may also be used for post-development monitoring.

**Project Description:** This project intensively monitors habitat creation sites and sites that represent habitat typically found along the LCR for avian use. Banding collects more detailed information about actual use patterns and demographics of avian species collected. This site-specific data can be used to characterize habitats and, along with less intensive, widespread monitoring methods, is used to monitor habitat use, population trends, and demographics of avian species along the LCR.

The MAPS program monitors avian populations, using a standardized protocol, throughout the United States, Canada, and Mexico. Long-term population trend data is collected by conducting intensive banding throughout the breeding season. Data collected are analyzed by the Institute for Bird Populations (IBP), and long-term population trends are determined on a regional and continental level. Population trends can be more readily determined by using a national database as larger databases have increased statistical power that can not be economically duplicated at a site specific level.

In 2002, prior to LCR MSCP implementation, Reclamation established a MAPS station at the Cibola Nature Trail Demonstration site on Cibola NWR. In 2005, an additional MAPS station was established on Havasu NWR, near South Dike, in mixed cottonwood-saltcedar habitats. These sites provide data from different reaches of the LCR and from different habitat types to allow comparisons between habitat creation sites and other areas more typically found along the LCR. The IBP recommends conducting MAPS stations a minimum of five years to acquire site specific data. The MAPS station located at the Cibola Nature Trail site will be run through at least 2007. The Havasu MAPS station will continue through at least 2009. After five years, each site will be evaluated and a decision will be made to continue, discontinue, or move each MAPS site.

Data on fall migration and winter use are also being recorded at the Cibola Nature Trail site, Havasu NWR site, and the Pratt restoration site, using an adapted MAPS protocol similar to protocols from migration banding projects throughout the west and the MOSI protocol used in Mesoamerica. Data from these surveys will help define habitat use by birds during the non-breeding season.

**Previous Activities:** Winter banding was conducted from 2002 through 2005 at the Pratt restoration site, at the Cibola Nature Trail site since 2002, and at the Havasu NWR site since 2005. Summer MAPS banding has been conducted at the Cibola NWR site since 2002 and at Havasu NWR since 2005. In addition, a MAPS station was run for 5 years on Colorado River Indian Tribe lands, near Headgate Rock Dam (2000-04), in mixed native and non-native habitat.

**FY06 Accomplishments:** During the winter, banding was conducted at all three sites, for 2 days per month, from October to February. Banding was conducted for 6 hours a day, using twelve 12-meter nets at each site. During the summer, banding was conducted at Cibola Nature Trail and Havasu NWR using the MAPS protocol. Banding was conducted once every 10-day period, at each site, for a total of 10 days of banding. Banding was conducted for 5 hours a day, beginning one half-hour before sunrise. For the winter banding period, there were 368 captures at the Cibola site, 187 captures at the Havasu site, and 159 captures at the Pratt site. During the breeding season, there were a total of 254 captures at Cibola and 174 captures at Havasu. At the Cibola site, ash-throated flycatcher and house finch were the most commonly captured species. At the Havasu site, Bewick's wren, yellow-breasted chat, and Lucy's warbler were the most commonly captured species. Four LCR MSCP covered species were captured, including Gila woodpecker (1 at Cibola), summer tanager (1 at Havasu), willow flycatcher (1 unknown sub-species at Cibola), and yellow warbler (8 at Cibola and 6 at Havasu).

**FY07 Activities:** Winter banding will be continued in 2007 at the Cibola Nature Trail and Havasu NWR sites. The MAPS banding stations will be continued at both sites during the 2007 breeding season.

**Proposed FY08 Activities:** Intensive winter and breeding season monitoring will continue in 2008. Information obtained will be used for the system monitoring program and to inform habitat creation projects listed in Section E.

**Pertinent Reports:** *Operation of Two Monitoring Avian Productivity and Survivorship (MAPS) Stations Along the LCR, 2006*, and *Operation of Two Winter Banding Stations along the LCR, 2005-6* will be posted to the LCR MSCP Web site.

## Work Task D6: System Monitoring for Riparian Obligate Avian Species

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $100,000 | $158,961 | $158,961 | $100,000 | $135,000 | $135,000 | $135,000 |

**Contact:** Matthew Voisine, (702) 293-8123, mvoisine@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY55

**Long-term Goal:** System monitoring for avian covered species

**Conservation Measures:** MRM1 and MRM2

**Location:** System-wide

**Purpose:** Monitor riparian obligate bird species covered under the LCR MSCP to document long-term population trend and habitat use.

**Connections with Other Work Tasks (past and future):** Sample transects, completed under C18, were used to design this monitoring program. Information obtained through this work task will be used in conjunction with data from D5 to conduct system monitoring for avian covered species. Data collected during post-development monitoring of habitat creation sites listed in Section E may also be used in this work task.

**Project Description:** The LCR MSCP includes conservation measures for 26 covered species and 5 evaluation species, including 9 neo-tropical migratory bird species. It is inefficient to monitor every covered species individually throughout the entire LCR MSCP planning area. Many bird populations can be monitored effectively using multi-species survey protocols.

Reclamation has worked with the GBBO, USGS, and other state and federal agencies to develop a point-count system monitoring design for the state of Nevada, through Partners-in-Flight. By utilizing the GBBO monitoring system, data from the LCR can be incorporated into a larger, regional database, which makes the data more powerful during analysis. Population trends can be derived over time, thus enabling Reclamation to monitor existing avian populations.

**Previous Activities:** In FY05, 18 point-count transects were conducted. Vegetation classification was characterized using the Anderson and Ohmart classification system.

**FY06 Accomplishments:** Twelve point-count transects were conducted in 2006. Five transects began in mixed saltcedar-mesquite stands, three transects began in monotypic saltcedar, and four

transects began in mixed cottonwood-willow-saltcedar stands. Transects crossed several vegetation classifications due to the small patch size typically found along the LCR. Sixty-three avian species, totalling 1,936 individuals were observed, including six LCR MSCP covered species. Data collected from these sample transects were used to create a draft monitoring plan.

Costs for FY06 included conducting sample transects in the field and developing the monitoring plan for this system monitoring activity; therefore, expenditures were higher than anticipated.

**FY07 Activities:** The monitoring plan will be finalized in the winter of 2006-2007. Implementation of the system monitoring for avian species will begin in May 2007. Up to 600 individual points will be selected. Ten territories for each of the six breeding covered species (gilded flicker, Gila woodpecker, vermilion flycatcher, Arizona Bell's vireo, Sonoran yellow warbler, and summer tanager) will be delineated. Habitat measurements within covered species territories will be collected and analyzed.

**Proposed FY08 Activities:** Point counts, territory delineation of the six breeding covered species, and habitat measurements will be conducted. Data will be analyzed to assess the covered species breeding habitat requirements.

**Pertinent Reports:** The study design is available upon request from the LCR MSCP. The 2006 annual report will be posted on the LCR MSCP Web site.

## Work Task D7: Yellow-billed Cuckoo Presence/Absence Surveys

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $500,000 | $454,775 | $454,775 | $500,000 | $500,000 | $500,000 | $500,000 |

**Contact:** Gregory Clune, (702) 293-8635, gclune@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY55

**Long-term Goal:** Acquire yellow-billed cuckoo data as part of the system monitoring program.

**Conservation Measures:** AMM1, AMM2, AMM3, AMM6, MRM1, MRM2, and YBCU2

**Location:** General presence/absence surveys are conducted in 55 sites of suitable habitat within the LCR MSCP project boundary.

**Purpose:** Conduct surveys to determine existing yellow-billed cuckoo (YBCU) populations along the LCR from the Grand Canyon to the Southerly International Boundary with Mexico and monitor long-term trends.

**Connections with Other Work Tasks (past and future):** Information obtained from C21 and C22 in FY05 was used to develop the monitoring protocol currently being utilized in D7.

**Project Description:** Yellow-billed cuckoo utilize mature cottonwood-willow habitat and may act as an umbrella species for other covered avian species that use these mature habitats. Existing YBCU populations and habitat are being determined along the LCR as systematic surveys are conducted over the project area. This work task assesses existing YBCU populations and evaluates required habitat characteristics. Data collected on vegetation characteristics of occupied sites enables Reclamation to design habitat creation sites for YBCU and recommend future demographic studies necessary to understand more about the YBCU populations along the LCR.

**Previous Activities:** This project is a new start for FY06.

**FY06 Accomplishments:** Yellow-billed cuckoo surveys were conducted at 55 sites, within 17 areas, between June 11 and September 13, 2006. In 2006, field biologists conducted 243 visits and recorded 180 YBCU detections. Cuckoos were detected at 27 of 55 sites, primarily at the Bill Williams River NWR (117 detections) and the Grand Canyon National Park/Lake Mead NRA sites (29 detections). There were also YBCU detections at the Colorado/Gila River Confluence, AZ (9 detections), Overton Wildlife Management Area, NV (7 detections), and Limitrophe Division North, AZ (6 detections). In 2006, five breeding events were confirmed, including one nesting observation and sightings for four juveniles; all confirmed breeding events

were recorded on the Bill Williams and the Lake Mead delta sites. There were also 17 probable breeders detected (e.g., carrying nesting material or food) and 40 possible breeders (e.g., detected in same area during repeated surveys).

Preliminary analysis of vegetation data collected at occupied and unoccupied sites in 2006 focused on general patterns of the distribution and abundance of woody species within riparian habitats of the study region. The dominant tree species at YBCU survey sites were cottonwood, willow, and tamarisk. Tamarisk was the most common tree due to the abundance of small individuals. When occupied and unoccupied sites were compared, occupied sites tended to have greater canopy cover, attributable to the mid and low canopy. Microclimate variables (temperature, relative humidity, soil moisture) were also measured at occupied and unoccupied sites.

**FY07 Activities:** Presence/absence surveys, vegetation measurements, and microclimate data collection will continue for the 2007 field season. Existing survey effort will be evaluated and recommended changes will be implemented during FY08.

**Proposed FY08 Activities:** Presence/absence surveys will be conducted at approximately 55 sites along the LCR. Habitat characteristics will be recorded, including vegetation measurements, for micro-habitat creation projects targeting YBCU. Demographic studies will be conducted on detected YBCU populations. Survey effort, protocols, and studies will be modified following FY07 evaluation.

**Pertinent Reports:** *Yellow-billed Cuckoo Distribution, Abundance, and Habitat Use Along the Lower Colorado and Gila Rivers — 2006 Annual Report,* will be posted to the LCR MSCP Web site.

## Work Task D8: Razorback Sucker and Bonytail Stock Assessment

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $285,000 | $306,624 | $472,624 | $325,000 | $300,000 | $300,000 | $300,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Conduct long-term system monitoring of RASU and BONY.

**Conservation Measures:** RASU6 and BONY5

**Location:** Lower Colorado River within the LCR MSCP planning area, including reservoirs and connected channels, from Lake Mead downstream to Imperial Dam.

**Purpose:** Supplement and maintain sufficient knowledge and understanding of razorback sucker (RASU) and bonytail (BONY) populations within the LCR MSCP planning area to have an effective Adaptive Management Program.

**Connections with Other Work Tasks (past and future):** Monitoring data for RASU and BONY have been or will be gleaned from work accomplished under C8, C12, C13, C15, and C23.

**Project Description:** This project collects and organizes RASU and BONY population and distribution data to maintain up-to-date, system-wide, stock assessments for these species. Data acquisition work will be accomplished by application of two strategies: 1) gleaning information from ongoing fish monitoring and fish research activities, and 2) direct data collection through field surveys within the LCR MSCP planning area not covered by other work tasks. These data will be organized to show current, end-of-year status for distribution and abundance for each LCR MSCP river reach.

Under the first strategy, LCR MSCP staff will gather and organize data from existing monitoring programs. For example, sport-fish surveys and native-fish surveys are conducted annually on lakes Mead, Mohave, and Havasu by multi-agency teams, with LCR MSCP fishery staff participating in each survey. In each survey, the lake is divided into different zones with one survey group assigned to each zone. All zones are sampled within a set time period using similar equipment. When the survey is complete, each participating agency receives information for the entire lake at a reduced cost incurred by only needing to survey a portion of the whole system.

Also under the first strategy, data will be gleaned from ongoing species research actions. For example, a RASU study is being conducted on Lake Mead (C13) and another study is being conducted in the lower river below Parker Dam (C8). Data for RASU population status and distribution will be gathered from these studies.

Under the second strategy, areas not being sufficiently surveyed through ongoing activities will be surveyed either by LCR MSCP fishery staff or another entity hired via contract, grant, or agreement. For example, the current surveys for RASU between Davis and Parker dams are being conducted jointly by USGS and Reclamation and are financially supported through D8. Another major monitoring action funded by this work task is the survey work conducted by Reclamation on Lake Mohave to assess survival and distribution of repatriated RASU. Areas along the lower two-thirds of the lake are netted monthly between October and May. The upper third of the lake, including the area above Willow Beach and up to Hoover Dam are electro-fished and netted during the June to September period (due to cool water releases from Lake Mead).

In some cases, LCR MSCP fishery staff conducted native fish surveys to fill in seasonal gaps left by other research activities. For example, USGS surveys for RASU between Davis Dam and Lake Havasu are only conducted during the January to April spawning period. Staff from the LCR MSCP monitor sonic-tagged fish in this reach during the summer and conduct electro-fishing in the fall, to provide a more complete assessment of the fishery.

Work routinely includes trammel netting and electro-fishing, but visual surveys using Reclamation's helicopter are also conducted within different river reaches throughout the year. Other specialized equipment and techniques are periodically utilized for monitoring, such as aerial and underwater photography and video recordings.

All project costs described under this work task are for salary, travel, and materials necessary for Reclamation staff to accomplish this work. In cases where Reclamation staff assist contractors or researchers, or conduct work in similar areas or at similar times, Reclamation’s presence allows for improved quantity and quality of observations (i.e., additional effort, additional spatial coverage, additional temporal coverage). Project costs include all costs associated with conducting field surveys, gleaning or capturing data from ongoing research actions and monitoring programs (both internal and external to the LCR MSCP), transfer of these data into record archives, and organizing these data into a cohesive report.

**Previous Activities:** Reclamation has cooperatively conducted fish surveys with Nevada and Arizona on Lake Mead each fall since 1999, and has provided funding and support to the Lake Mead Razorback Study (C13) since 1995. Interagency cooperative native fish roundups have been occurring since 1987 on Lake Mohave and since 1999 on Lake Havasu (including the river reach below Davis Dam). Fish monitoring on reaches 4 and 5 has been conducted by Reclamation and ASU as part of the Razorback Sucker Survival Study (C8) annually since 2003. Reclamation financially supports the Colorado River Fishes database maintained by ASU through G1.

**FY06 Accomplishments:** Accomplishments for this work task have been summarized by river reach for clarity.

Reach 1 (Lake Mead) — Reclamation participated in annual fall netting and electro-fishing surveys on Lake Mead. This lake-wide effort (totaling over 140 net nights) was completed in cooperation with AGFD and NDOW; no native fishes were captured. Collection of RASU larvae was conducted over the course of the spawning season, capturing a total of 1,716 larvae while sampling all major spawning sites. These larval fish are being reared at Lake Mead SFH (B6). Evaluations of new off-channel repatriation stocking sites were completed, which included Driftwood Cove and Grand Wash Bay (C13). Evaluations consisted of netting for existing species, collecting water quality data, and bathymetry. A rough population estimate for RASU generated from contacts made during FY06 investigations is 250 adults (no BONY occur in Lake Mead.)

Reach 2 (Lake Mohave) — Reclamation repatriated 11,344 RASU into Lake Mohave in 2006. Lake-wide surveys for native fish were conducted monthly and included both trammel netting (99 total net nights) and electro-fishing (18,230 seconds), which resulted in the capture of 130 and 166 RASU, respectively. All native fish capture data were provided to ASU, and used to derive a current population estimate of 4,221 adult RASU (C12). Reclamation also assisted with tracking sonic-tagged RASU in accordance with the ASU telemetry study.

Annual spring BONY round-up and spring and fall RASU round-ups were conducted. The LCR MSCP partners and cooperators for these efforts included NPS, USFWS, AGFD, NDOW, and ASU. Biweekly helicopter surveys to verify the presence of RASU on known spawning beds and to search for new spawning congregations were completed during the spawning season. A total of 64,000 RASU larvae were collected and delivered to Willow Beach NFH for rearing (B2).

Reach 3 (Davis Dam to Parker Dam or Lake Havasu) — Reclamation participated in the ongoing multi-agency native fish round-up, and collected data from LCR MSCP partners fall electrofishing surveys. The first field season of FLSU surveys associated with work task C15 was completed, and the RASU population was monitored through work task G3. Data were collected using dive surveys, seines, trammel nets, hoop nets, and electrofishing. Electrofishing proved most effective in sampling riverine populations of native suckers and will provide increased accuracy in the development of mark/recapture population estimates in 2007.

The FLSU population estimate based on netting and electrofishing was 2,437, calculated based on more than 350 contacts between Davis Dam and RM 257. The RASU population was congregated near Needles, California, during the spawning months and a population estimate of 3,431 fish was calculated based on more than 200 contacts. The majority of the BONY contacts for the year were recently stocked fish, thus not allowing for the generation of a population estimate. The nonnative fish community did not show any significant changes and was represented by 15 different species.

Reaches 4 and 5 (Parker Dam to Imperial Dam) — Reclamation and ASU conducted fish surveys from Parker Dam to Imperial Dam, with the exception of CRIT Reservation (C8). Surveys included a suite of standard fishery techniques including electro-fishing, trammel netting, gill netting, and hoop netting and resulted in 489 RASU captured. A circular PIT-tag antenna installed into a 36-inch culvert connected to the river was tended throughout the year,

and results suggest that few fish moved from the backwater into the river. A radio telemetry study was initiated to examine post-stocking dispersal. Studies were initiated to determine possible effects of RASU that imprint on surface feeding and remain near the surface after stocking. Reclamation repatriated 4,185 RASU in Reach 4, and 7,270 RASU in Reach 5; also, 4,006 BONY were repatriated in Reach 5.

Status Report for RASU and BONY — Due to the seasonality of fish surveys, the development of a comprehensive status report for RASU and BONY in the LCR MSCP program area will cover a calendar year. The report for calendar year 2006 will be available in mid-2007.

**FY07 Activities:** Monitoring data will continue to be collected for RASU and BONY from reaches 1 through 5, including the stretch of river from Headgate Rock Dam downstream to Palo Verde Diversion Dam. This area encompasses the CRIT Reservation and was not surveyed in 2006. An agreement has been reached with CRIT to allow for incorporation of this stretch into the fishery monitoring program. A comprehensive status report for RASU and BONY in the LCR MSCP program area will be completed.

**Proposed FY08 Activities:** Monitoring data will be collected for reaches 1 through 5. A comprehensive status report for RASU and BONY in the LCRMSCP program area will be completed.

**Pertinent Reports:** The status report for RASU and BONY in the LCR MSCP program area for calendar year 2006 is in production and will be posted on the LCR MSCP Web site.

## Work Task D9: System Monitoring and Research of Covered Bat Species

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $110,000 | $99,887 | $154,887 | $100,000 | $100,000 | $100,000 | $100,000 |

**Contact:** Theresa Olson, (702) 293-8127, toloson@lc.usbr.gov

**Start Date:** FY04

**Expected Duration:** FY55

**Long-term Goal:** System monitoring and species research will be conducted for LCR MSCP bat species to determine distribution and to evaluate habitat implementation success.

**Conservation Measures:** AMM1, AMM6, MRM1, WRBA1, WYBA1, CLNB1, PTBB1, WRBA2, and WYBA3

**Location:** System-wide along the lower Colorado River below Hoover Dam.

**Purpose:** Conduct system monitoring and research for the distribution of covered bat species utilizing roost surveys, acoustic survey techniques, and capture techniques following a protocol developed in FY06.

**Connections with Other Work Tasks (past and future):** System monitoring data will be used in conjunction with post-development monitoring (F4) to determine habitat needs and characteristics of covered bat species. Data collected will be used in future habitat creation projects listed in Section E.

**Project Description:** Several survey techniques will be utilized to detect covered species or provide equivalent data using indicator species. Acoustic surveys, conducted with Anabat or Sonabat technology, will be used to identify foraging behavior in native riparian stands for covered bat species. Roost surveys will be conducted to track bat populations and to survey species that are not readily detected by acoustic technology, such as Townsend's big-eared bat and California leaf-nosed bat. Individual bats will be captured using techniques such as mist netting to obtain reference calls for bat identification.

**Previous Activities:** Indigenous bat species were surveyed annually along the LCR from 2001-2006. A Lower Colorado River Bat Monitoring Protocol was produced to assist in the development of a system-wide distribution and demography monitoring plan for covered bat species.

**FY06 Accomplishments:** Through coordination with state and Federal resource agencies and other interested parties, an LCR system-wide distribution and demography monitoring plan and

protocol was developed for the LCR MSCP covered bat species. This protocol was initiated in FY06. Four field trips were conducted: May 5-12, 2005, January 18-25, 2006, May 27-June 2, 2006, and September 19-24, 2006. Acoustic monitoring was done at multiple sites during most visits, as well as at Cibola Valley Conservation Area. Other recording sites were Davis Dam, LCR along the Parker Strip, LCR south of Imperial Dam, the All American Canal, Lost Lake, and Lake Havasu. During warm-season surveys, mist nets were set in the cottonwood revegetation sites at Havasu, Cibola, and Imperial NWR. Pallid bats and California leaf-nosed bats were the only species captured.

To census and monitor bat populations, exit counts were conducted twice per year (winter and spring) at mines along the LCR from Davis Dam to Yuma: Homestake (Lake Mead NRA), Jackpot (Havasu NWR), Islander and Californian (Lake Havasu BLM), Mountaineer and Stonehouse (Palm Springs BLM), Hart and 3C (Yuma BLM), and Golden Dream and Eureka (Imperial NWR). The Stonehouse Mine lower adits had been gated in fall 2005, and May was the first warm-season census. The cave *Myotis* maternity colony has accepted the gates, as have male California leaf-nosed bats. No female cave *Myotis* were captured at the Mountaineer Mine in the harp trap. However, one lactating Townsend's big-eared bat was found, along with several lactating big brown bats, California leaf-nosed bats, and pallid bats. The September surveys of the Hart and Californian mines demonstrated that they are used as breeding display sites by California leaf-nosed bats.

**FY07 Activities:** Acoustic surveys will continue for covered bat species at Havasu NWR, Bill Williams River NWR, Cibola NWR, and Imperial NWR. Preliminary mist netting will be completed at cottonwood-willow restoration sites on Imperial NWR, or a similar habitat creation site, to determine best net placement for netting LCR MSCP covered species or riparian indicator species. Bat populations continue to be monitored at maternity sites to determine abundance and distribution of covered bat species. Maternity sites include the Homestake, Jackpot, Islander, Californian, Mountaineer, Stonehouse, Eureka, and 3C mines, and the Palo Verde Bridge. Guano from the mine roosts may be collected for future studies.

**Proposed FY08 Activities:** Acoustic surveys will continue for covered bat species. Mist netting, in conjunction with post-development monitoring (F4), will take place at least twice at both mature cottonwood/willow stands and in more mature restoration areas. Bat populations will continue to be monitored at maternity sites to determine abundance and distribution of covered bat species.

**Pertinent Reports:** *Annual Report: Baseline Surveys and the Development of Monitoring Protocol for Lower Colorado River Bat Species, Survey Period Between April 1, 2005-September 30, 2006* will be posted on the LCR MSCP Web site.

## Work Task D10: System Monitoring and Studies on Small Mammal Populations

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $60,000 | $19,344 | $19,344 | $65,000 | $0 | $0 | $0 |

**Contact:** Chris Dodge, (702) 293-8115, cdodge@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY07

**Long-term Goal:** System monitoring and research to determine distribution, habitat requirements, and genetics of covered small mammal species.

**Conservation Measures:** MRM2, DPMO1, CRCR2, and YHCR2

**Location:** System-wide along the Lower Colorado River below Hoover Dam.

**Purpose:** Implement distribution, habitat, and genetics studies for system monitoring of LCR MSCP covered small mammal species. These studies are being conducted to determine geographic range limits of the Yuma hispid cotton rat and the Colorado River cotton rat, and to determine habitat characteristics utilized by these species. Data will be used in the adaptive management process to coordinate surveys of habitat creation sites and design habitat for covered mammal species.

**Connections with Other Work Tasks (past and future):** Data collected as part of Small Mammal Colonization (F3) will also be analyzed as part of the effort to determine species distribution of the two cotton rat species found along the LCR.

**Project Description:** Studies will be designed to determine the habitat usage, population status, genetic differentiation, and distributional range of two covered small mammal species: the Colorado River cotton rat and the Yuma hispid cotton rat. Reclamation will trap in various habitat types along the LCR to collect genetic samples from these species. Samples will be sent to a genetics laboratory for DNA analysis to determine the species of each animal sampled. Genetic differentiation data for animals captured along the LCR may also be compared with data from animals of different sub-species located within Arizona, east of the LCR MSCP planning area, to obtain genetic markers. These data will be used to compare and contrast specific subspecies. In conjunction with this work, Reclamation will also initiate a 3-year study to determine the general distribution and habitat usage of these species along the LCR. The 3-year study will better define the habitat characteristics utilized by the two species of cotton rats, and will be used to design future habitat creation projects.

**Previous Activities:** Cotton rats have been captured at the Pratt Agricultural and at the Cibola Nature Trail site in the previous 3 years during presence/absence surveys.

**FY06 Accomplishments:** After completion of species accounts (C3), data gaps were identified for Colorado River cotton rat and Yuma hispid cotton rat. Preliminary work was completed to design system monitoring and research studies to provide information on habitat use, population status, and distribution range of these covered species. Presence/absence surveys were conducted at several sites to gather data on distribution and to refine protocols. A notable observation during these surveys was that one cotton rat was detected at the Beal Lake (see E1) site.

Cost estimates for FY06 assumed implementation of life history, habitat use, and distribution studies would begin in 2006. These studies are now expected to begin in 2007.

**FY07 Activities:** Studies on cotton rat genetics, distribution, and habitat characteristics will be initiated in 2007.

**Proposed FY08 Activities:** Moved to C27.

**Pertinent Reports:** The study plan is available upon request from the LCR MSCP.

# WORK TASKS
# SECTION E

# CONSERVATION AREA DEVELOPMENT AND MANAGEMENT

## Work Task E1: Beal Lake Riparian Restoration

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $200,000 | $272,378 | $1,897,645 | $358,000 | $150,000 | $265,000 | $275,000 |

**Contact:** Barbara Raulston, (702) 293-8396, braulston@lc.usbr.gov

**Start Date:** FY04

**Expected Duration:** FY09 decision point

**Long-term Goal:** Restoration research

**Conservation Measures:** WIFL 1, WRBA 2, WYBA 3, CRCR 2,
YBCU 1, ELOW 1, GIFL1, GIWO 1, VEFL 1, BEVI 1, YWAR 1, SUTA 1, MNSW 2

**Location:** Reach 3, Havasu NWR, AZ, 0.5 miles east of river miles 238 and 239

**Purpose:** Backwater habitat creation along the Colorado River typically involves excavation or dredging of large quantities of material. Placement and reuse of the excavated material is often a limiting factor when estimating the total cost of creating a backwater. This research project addresses that issue by tracking the process and costs associated with clearing, blending dredge material with existing soils, leveling, and planting various native plants. In addition, the reclaimed area has been divided into cells or small fields with independent flood irrigation capabilities, which allows testing of various planting and seeding methods while potentially creating habitat. Results of this project are expected be used elsewhere on the LCR in the creation and management of backwater and riparian habitats.

**Connections with Other Work Tasks (past and future):** Dredge material from Beal Lake Native Fish (E2) was leveled in 2001 to create the substrate for planting the riparian habitat adjacent to Beal Lake. Vegetation and species monitoring are being addressed under F1-F4.

**Project Description:** Reclamation has partnered with the USFWS to conduct restoration research at Beal Lake until FY09. In FY09, a decision will be made to continue research activities, manage any habitat created during the research for the life of the program, or discontinue funding. In this restoration research project, planting, irrigation, and management techniques, coupled with vegetation and species monitoring, are being demonstrated along with the creation of more than 100 acres of native riparian land cover types. Planning includes clearing, root plowing, and leveling areas previously consisting of sparse arrowweed and saltcedar, and replanting these areas with cottonwood, willow, and mesquite. Irrigation, as needed, is through a pump, pipe, and valve system with dates and amounts documented and reported to Reclamation monthly. The site provides an opportunity to test various methods of seeding combined with flood irrigation such as direct “hand seeding”, “whole branch” seeding,

hydro-seeding, and perimeter seeding. Trees are planted around the perimeter of the field to block wind-borne weed seeds, and to naturally seed the center of the field when mature. Monitoring will determine if these methods can produce the desired results:

1. Produce densities of cottonwood and willow high enough to shade out competing non-native vegetation and provide habitat for SWFL.
2. Provide habitat for other LCR MSCP targeted species.

Future management of any created habitat for targeted species such as SWFL and YBCU may include increased irrigation to specific areas and cutting and clearing to re-establish and maintain high vegetation density. Monitoring vegetation and irrigation will provide guidance on future riparian establishment and management procedures.

**Previous Activities:** Restoration began in 2001. Site preparation and planting for Phase 1 (57 acres) and site preparation for Phase 2 (50 acres) are completed. Phase 3 (80 acres) was cleared and has developed into a mix of screwbean mesquite, saltgrass, tumbleweed, arrowweed, and sparse saltcedar. In FY04-05, honey mesquite seed was collected and placed in piles in Phase 3 for possible scarification and distribution by resident wildlife.

**FY06 Accomplishments:**

Maintenance/Restoration/Management — Approximately 107 acres in Phases 1 and 2 were irrigated throughout the growing season. An irrigation schedule and further details on management are in *Beal Riparian and Marsh Restoration Development Plan, 2006* and *Beal Riparian and Marsh Restoration Annual Report, 2006*.

Plans for management of the site include two areas of approximately 15 acres each, which will be managed for SWFL as the habitat progresses from cottonwood-willow (CW) III and IV to CW I and II. In December 2005 and January 2006, water retention features were installed to maintain wet or moist soils within these areas to create the micro-habitat characteristics preferred by SWFLs: higher humidity and lower temperatures. In FY06, 15 acres were irrigated one time per week throughout the growing season.

Approximately 15 acres, which were planted with a perimeter of cottonwood and willow trees, will be allowed to seed naturally. Clearing and irrigating the centers of these areas will occur when the trees around the areas mature and begin to seed. Once this area develops into CW III and IV, it will be irrigated weekly.

Monitoring — In FY06, post-development monitoring of abiotic and biotic habitat components was conducted. Initial survivorship of trees planted on approximately 20 acres in December 2005, was determined in March 2006, and ranged from 40% to 95% per field.

Herbaceous cover was monitored on approximately 90 acres in April 2006. Herbaceous species present were crinklemat, Russian thistle, heliotrope, Bermuda grass, and blue grass. The density of herbaceous species present was low; percent cover characterized as bare ground and leaf litter averaged 85%.

Trees planted or seeded on approximately 45 acres in 2005-06 were monitored for survivorship in November 2006. Growth was determined for a subsample of trees by measuring height and DBH. Fixed radius plots were established on approximately 57 acres planted prior to 2005. Density, basal area, canopy cover, and vertical foliage density were recorded. Results are described in *Beal Riparian and Marsh Restoration Annual Report, 2006*.

Soil samples were taken in March 2006, at 30 locations evenly distributed throughout phases 1 and 2. Samples were analyzed for percent saturation, soil salinity, texture, pH, ortho-phosphate, ammonia, and nitrate. Microclimate data, including relative humidity, temperature, and soil moisture, were collected at eight locations. Water depth was measured monthly at four wells that were installed in October 2005.

The site was classified, using Anderson and Ohmart vegetation classifications, in November 2006. Eight acres were classified as cottonwood/willow (CW) III, 22 acres as CW IV, 21 acres as CW V, 6 acres as saltcedar/screwbean mesquite (SM) III, 15 acres as SM IV, 3 acres as SM V, and 5 acres as arrowweed (AW). Twenty-seven acres were classified as bare ground or undeveloped, including cover crops and other unplanted areas.

Post-development avian point counts and southwestern willow flycatcher surveys were conducted during the 2006 breeding season. One migratory willow flycatcher was detected at the site. The only LCR MSCP covered avian species detected at the site was the yellow warbler, which comprised 1% of the avian population. The three most abundant species detected at the site were the house finch, great-tailed grackle, and Abert's towhee. Post-development monitoring for small mammal species was conducted at the site during the spring and fall. One cotton rat was detected, species undetermined. Other small mammal species detected at the site were deer mouse, desert pocket mouse, Merriam's kangaroo rat, and brush mouse. Post-development monitoring for bat species was also conducted, but no covered bat species were detected.

**FY 07 Activities:**

Management/Maintenance — The SWFL management areas will be irrigated at least once per week to provide moist micro-climate conditions that may encourage SWFL use during the breeding season. The habitat will be evaluated through monitoring to determine if additional management is required, such as weed control and replanting. Cover crops that have been planted will be replanted and irrigated as needed. Saltcedar and other weed control may be conducted. This site has also been used as a source for plant material used at the Colorado River Indian Tribes' 'Ahakhav Tribal Preserve (E3), Palo Verde Ecological Reserve (E4), Cibola Valley Conservation Area (E5), and the Needles-Topock bankline stabilization project (E19).

Monitoring — Post-development monitoring of abiotic and biotic habitat characteristics will be conducted. In recently planted or seeded plots, tree survivorship and growth will be monitored after the first and second growing season. After three growing seasons, habitat characteristics will be monitored using fixed radius plots. Soil samples will be taken in Phase 1 and 2 and analyzed for percent saturation, soil salinity, texture, pH, ortho-phosphate, ammonia, and nitrate. Microclimate, including temperature, relative humidity, and soil moisture, will be monitored at the site from April to September. Water depth at four wells will be measured once per month.

Land cover type will be classified using the Anderson and Ohmart classification system. Post-development monitoring for avian, small mammal, and bat species will be conducted.

**Proposed FY08 Activities:**

Management/Maintenance — Management through irrigation, weed control, and cover crop maintenance will continue as in FY07. If perimeter trees are mature and seeding, the inner portions of those areas will be managed to encourage germination. The site will be evaluated to determine if structural management or replanting is needed.

Monitoring — Post-development monitoring for habitat, avian species, small mammal species, and bats will continue as in FY07. Data will be obtained, analyzed, and utilized to make on-site management decisions.

**Pertinent Reports:** *Beal Lake Habitat Restoration, April 2005*; and *Beal Riparian Restoration, Annual Report 2005* are posted on the LCR MSCP web site; *Beal Lake Riparian Restoration Development and Monitoring Plan*; and *2006 Beal Lake Riparian Annual Report* are posted on the Web site.

## Work Task E2: Beal Lake Native Fish

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $210,000 | $270,840 | $485,412 | $100,000 | $50,000 | $70,000 | $70,000 |

**Contact:** Gregg Garnett, (702) 293-8644, ggarnett@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Habitat Creation

**Conservation Measures:** BONY2 and RASU2

**Location:** Reach 3, Arizona, Havasu NWR, one-half mile east of River Mile 237

**Purpose:** Reclamation intends to maintain the backwater created for native fishes under the 1997 BO. Reclamation is simultaneously making improvements to the backwater and conducting restoration research at the site. Information from this research will be used to adaptively manage the backwater and increase efficiency and effectiveness in future backwater habitat creation projects.

**Connections with Other Work Tasks (past and future):** Monitoring of native fish is being addressed under F5.

**Project Description:** Beal Lake was approximately 225 acres of shallow, low-quality aquatic habitat that was dredged, beginning in 2001, to create a functioning backwater dedicated to native fish. The Beal Lake restoration project is a continuation of the commitment to construct habitat for protected native fish under the 1997 BO. Continued maintenance and management of Beal Lake and research and development of the backwater as native fish habitat have been included in LCR MSCP activities.

The restoration research and management of Beal Lake included the installation of a cylindrical wedge wire screen system. Beal Lake was initially isolated from Topock Marsh with a passive rock filtration system. After the filtration system performed poorly for several months (the system was unable to keep up with evaporative losses in Beal Lake), Reclamation decided to test a new technology that would supplement water flow into Beal Lake and would be effective in excluding all life stages of non-native fishes. A cylindrical wedge-wire screen system was selected because of ease of maintenance and long-term performance. Because cylindrical wedge-wire screen technology had never been used for this application, information was needed to estimate the hydraulic capacity of the system and its true exclusion capabilities. A two-phase investigation, including in situ hydraulic testing and a laboratory exclusion evaluation, was

contracted to provide these data. Results from these studies will provide a clearer picture of the appropriateness of this technology in this situation and for future applications.

To increase efficiency, a number of the existing water control structures at Beal Lake were replaced during the screen system installation. The existing features performed poorly and were not adequately sized to supply the necessary water volume to the irrigation pump or to Beal Lake.

Additional improvements have been proposed to allow for more effective management of water in Beal Lake. A water management system that would enable large-scale water removal, water level control for fisheries management, and large-scale water circulation capabilities is preferred. The system would consist of a permanent platform, ramp, and discharge pipe that allow for the intermittent deployment of various pumps, depending on the specific management need. The water management system will be used to assist the irrigation pump in lowering the water level in Beal Lake for lake renovation (this process includes pre-treatment fish salvage, chemical treatment of the water to kill remaining non-native fish, post-detoxification sampling, and restocking with native fish). In addition, the system will be used as a regular management tool to circulate water from the south end of Beal Lake and induce freshening flows into Beal Lake from Topock Marsh to maintain adequate levels of water quality to support native fish. Without the ability to provide water exchange, native fish populations and their associated biological communities in Beal Lake may be impacted. To maintain adequate water quality in Beal Lake over the long term, there must be a mechanism for large-scale water circulation.

**Previous Activities:** The costs of initial backwater creation, including dredging and isolating the backwater with a semi-permeable rock structure were incurred prior to FY05 and implementation of the LCR MSCP.

**FY06 Accomplishments:** In March 2006, a water management system was constructed on the south end of Beal Lake and a 50-cfs hydraulic pump was deployed. Due to successful installation and testing of the water management system, promising performance of the screen system (previously installed at Beal Lake), and availability of native fish for stocking, renovation plans for Beal Lake were accelerated under the direction of the USFWS. Immediately after installation, the water management system was used to lower water levels in Beal Lake in preparation for renovation. A salvage effort was led by USFWS to remove any remaining RASU and significant game species and was conducted prior to renovation with cooperators from AGFD, USFWS, and Reclamation.

In two treatment events on April 6 and April 20, rotenone was applied to Beal Lake by helicopter. The two applications were performed to increase the likelihood of complete removal of nonnative fish. The treatments appeared to be effective; immediately after the first treatment, cooperating agencies patrolled the entire lake surface (areas accessible by boat) and collected any affected remaining native or game species. No native fishes were observed. All live game species were returned to Topock Marsh. Immediately after the second treatment, cooperating agencies thoroughly searched the entire lake surface (areas accessible by boat) to determine if any addition fish were killed by the treatment. No additional native or nonnative fishes were observed alive or dead in Beal Lake during the second treatment.

Prior to stocking, USFWS conducted sampling to ensure that nonnative fishes were not present in Beal Lake, post-renovation. On June 14, 2006, approximately 1,844 untagged bonytail were stocked into Beal Lake by USFWS. On June 15, 69 razorback sucker were transferred by USFWS to Beal Lake. During razorback stocking, USFWS and Reclamation personnel observed approximately 30 largemouth bass ranging from 25 to 75 mm in length. This was the first observation of nonnative fish presence in Beal Lake since renovation in April.

Additional schools of nonnative fishes were observed near the rock structure and near the water management system ramp on June 19. On June 16, a USFWS refuge employee identified an area of flow on the south (Beal Lake) side of the rock structure that appeared to have water moving from the Topock side of the rock structure into the Beal Lake side of the structure. No breech could be found on the Topock Marsh side of the rock structure; however, the structure has been identified as a possible vector for invasion of Beal Lake by nonnative fishes.

During winter 2006-2007, the USFWS surveyed the entire lake to assess native and nonnative species composition. The USFWS is currently monitoring for water quality and fisheries at Beal Lake.

During FY06, biological evaluations of the screen system at Beal Lake were conducted. These biological evaluations included:

1. Determining if there were differences in bio-fouling/bio-accumulation in two screen materials: 304 stainless steel (304 SS) and Z-Alloy.

2. Determining the effectiveness of the screen system in excluding small life stages (eggs and larvae) of selected species of nonnative fishes.

Screen material evaluations were conducted in-situ at two sites on the LCR and screen exclusion trials were conducted in a laboratory setting. For the evaluations that compared screen materials, the Z-Alloy samples had much less biofouling than was observed on the 304 SS samples. This suggests that the Z-alloy screen material would be superior to 304 SS in terms of lower maintenance for long-term deployment at these sites. A final report is posted on the LCR MSCP Web site.

The screen system was effective in excluding the eggs and larvae of fathead minnow, smallmouth bass, and blue catfish at all of the velocities tested during laboratory trials. A portion of the gizzard shad eggs and larvae were entrained during the testing. It was concluded that the screen system was not effective in excluding gizzard shad eggs and larvae and that this type of screen system would also not be effective in excluding 100% of threadfin shad eggs and larvae in situ. Presence of threadfin shad is not considered to have a major impact on native fishes. Shad are not a predatory species and in their small life stages may provide forage for bonytail. These preliminary results suggest that screen systems with these slot sizes can, however, effectively exclude all life stages of nonnative fishes that are larger than the representative species successfully tested in this study. These results also suggest that these types of screen systems may be an effective means of protecting backwaters for native fishes in future projects.

**FY07 Activities:** No major construction projects are anticipated for Beal Lake in FY07. Activities covered under this work task in FY07 will be limited to continued coordination with USFWS regarding future construction (including rehabilitation of the rock structure) and maintenance of the features in place at Beal Lake. Other expenditures in FY07 will include continuation of the restoration research component at Beal Lake. Funding in FY07 will allow for upgrading and maintaining the water level sensors at Beal Lake and for the preparation and submission of a manuscript on the screen system research to a peer-reviewed journal for publication.

**Proposed FY08 Activities:** Coordination with resource agencies will continue to determine future operations and maintenance of existing features at Beal Lake. Long-term monitoring of the screen system's hydraulic performance will continue using the installed water level sensor system. Real-time data will be transmitted from the remote data loggers and is expected to be available on a Web site by summer of FY07. This work task also covers the routine maintenance of the screen system and water level sensors. This work will include regular flushing and manual cleaning of the screen system and periodic calibration and maintenance of the sensor system. Water quality and fisheries monitoring activities will be coordinated with USFWS and are covered under F5.

**Pertinent Reports:** *Evaluation of a Cylindrical Wedge-Wire Screen System at Beal Lake, Arizona, 2005;* and *Evaluation of a Cylindrical Wedge-Wire Screen System at Beal Lake, Arizona, 2006 Phase II Testing* is posted on the LCR MSCP Web site.

## Work Task E3: ‘Ahakhav Tribal Preserve

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $120,000 | $53,580 | $1,135,299 | $60,000 | $145,000 | $145,000 | $195,000 |

**Contact:** Barbara Raulston, (702) 293-8396, braulston@lc.usbr.gov

**Start Date:** FY04

**Expected Duration:** FY09 Decision Point

**Long-term Goal:** Restoration Research

**Conservation Measures:** CLRA, WIFL1, WRBA2, WYBA-3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2.

**Location:** Reach 4, Colorado River Indian Tribes, river miles 173-174, AZ

**Purpose:** This demonstration project is designed to test planting, maintenance, and irrigation methods on fallow agricultural fields while developing more than 200 acres of cottonwood, willow, and mesquite.

**Connections with Other Work Tasks (past and future):** Vegetation and species monitoring are being addressed in F1-F4.

**Project Description:** In September 2004, Reclamation finalized a 5-year agreement with the CRIT to conduct habitat restoration at the ‘Ahakhav Tribal Preserve (Preserve), located just south of Parker, Arizona. This agreement expires in FY09 at which point a decision will be made to continue restoration activities, manage created land cover types for the 50-year term of the LCR MSCP, or discontinue funding.

In 1995, the CRIT established the Preserve to protect fish, wildlife, and plants in the riparian areas along the river. Reclamation began assisting the Preserve with restoration activities in 2003, prior to implementation of the LCR MSCP. A variety of methods and techniques such as seeding, planting cuttings of various sizes, etc. are being used to create approximately 200 acres of cottonwood-willow and mesquite land cover types on out-of-production agricultural areas dominated by tumbleweed and sparse saltcedar. All work is done in an effort to evaluate efficient and cost-effective methods for various re-vegetation projects. Maintenance and management of approximately 135 acres of riparian land cover types created since 2003 is ongoing, and an additional 120 acres of restoration are planned.

**Previous Activities:** Work began in 2003 by restoring CRIT 9 (154 acres) with native riparian plant species including cottonwood, willow, and mesquite. This involved site preparation (clearing, root-ripping, leveling), soil testing, installation of irrigation infrastructure, and

planting. Monitoring of irrigation and maintenance of planted areas has been on-going throughout the process.

**FY06 Accomplishments:** Maintenance/Restoration/Management — Previously established cottonwood-willow and mesquite land cover types totaling 154 acres (CRIT 9) were irrigated. No additional planting occurred. General maintenance of CRIT 9 included clearing canals of debris, repairing ditches and gates, and re-establishing berms between irrigated sections. To improve the movement of water across each field, small trenches were dug from the irrigation gates to the opposite side of each irrigated section.

Plans outlined in FY05 for CRIT 10 and 11 (disking, burning of debris piles, purchase and installation of irrigation infrastructure, lining of canals) were delayed until FY07, resulting in approximately half of the projected funds expended. Some saltcedar control of re-sprouts was implemented in CRIT 11. Preserve staff consulted with the local USDA Natural Resource Conservation Service (NRCS) office in Parker, Arizona, and Reclamation to re-evaluate irrigation infrastructure and planting designs in CRIT 10 and 11. Site preparations planned for CRIT 10 and 11 were delayed due to staff shortages and personnel changes at the Preserve. Firm dates for completion of these tasks have been set. Reclamation and CRIT are in discussions regarding a future 50-year land use agreement. This agreement will solidify which areas on the Preserve will be included in the LCR MSCP, roles and responsibilities of each partner, and management plans for all created habitat.

Monitoring — Post-development monitoring of habitat components was conducted at the CRIT 9. Herbaceous cover was monitored in April 2006, at 22 locations. Herbaceous species present were Bermuda grass, sandbur, alfalfa, mustard, bursage, Russian thistle, crinkle mat, pygmy grass, palofox, and desert sunrise. Fixed radius plots, which measured habitat characteristic such as density, basal area, canopy cover and vertical foliage density, were measured at 62 points throughout the site. The site was classified into Anderson and Ohmart vegetation classifications in November, 2006. Forty-seven acres were classified as CW II, 28 acres as CW III, 29 acres as CW IV, 19 acres saltcedar/screwbean mesquite (SM) III, and 11 acres as honey mesquite (HM) III in CRIT 9. The remaining 17 acres within the irrigated areas were either bare ground or unclassified.

Post-development avian point counts, southwestern willow flycatcher surveys and yellow-billed cuckoo surveys were conducted at the site during the 2006 breeding season. One migratory willow flycatcher was detected at the site. No yellow-billed cuckoos were detected. A small population of vermilion flycatchers were the only LCR MSCP covered avian species detected at the site. The four most abundant species detected were the brown-headed cowbird, western kingbird, mourning dove, and Bullock's oriole.

Further information on irrigation and management are in '*Ahakhav Tribal Preserve Restoration Development Plan, 2006* and '*Ahakhav Tribal Preserve Annual Report, 2006.*

**FY07 Activities:** Maintenance/Restoration/Management — Reclamation is assisting CRIT with management plans for CRIT 9. Areas that can be kept wet between irrigations are being inter-planted with cottonwood and willow poles to create dense patches of vegetation. Small plastic pools have been buried throughout these areas to maintain a moist, humid micro-climate within

the vegetation. Vegetation adjacent to the irrigation ditches will be flooded at least once per week during the SWFL breeding season.

The lined irrigation ditches for CRIT 10 were installed in January 2007. Once irrigation infrastructure is in place, a cover crop will be planted on the 60 acre site in order to begin conditioning the sandy soils for the eventual planting of riparian vegetation. It is expected that approximately half of CRIT 10 (in areas furthest from the irrigation source) will be planted with honey mesquite seed in 2007. This will be a demonstration project to determine if drilling mesquite seed is a viable alternative to using container plants. Areas closest to the irrigation ditch will be maintained with a cover crop throughout 2007. Various mulching materials that may increase the water holding capacity of sandy soils are being investigated. For example, during the growing season of 2007, CRIT and Reclamation will be experimenting with cotton-gin waste from a nearby cotton gin for mulch. The material will be analyzed for herbicide and pesticide content as well as for the presence of weed seeds before use on a large scale.

Possible planting designs for CRIT 11 will be explored during FY07. This area spans roughly 3 tiers of elevation that could be used to simulate a natural "tiered" riparian corridor. The site will be surveyed, an excavation plan will be developed, and soil sampling will be conducted. Based on this information, a Restoration Development Plan for this project will be developed.

Monitoring — Post-development monitoring of abiotic and biotic habitat characteristics will be conducted. In recently planted or seeded areas, tree survivorship and growth will be monitored after their first or second growing season. After three growing seasons, habitat characteristics will be monitored using fixed radius plots. Microclimate data, including temperature, relative humidity and soil moisture, will be recorded at the site from April to September. The CRIT 9 site will be classified by land cover type using the Ohmart and Anderson vegetation classification system. Post-development monitoring for avian species will be conducted in 2007.

**Proposed FY08 Activities:** Maintenance/Restoration/Management — CRIT 9 and 10 will continue to be irrigated and maintenance activities will be implemented as needed. Additional cottonwood and willow will be planted in CRIT 10 on areas adjacent to the irrigation source. Methods of planting these areas (poles, container plants, or seed), mulch materials and/or water retention features that may be utilized have yet to be determined. Installation of irrigation infrastructure and planting of an appropriate cover crop may be implemented at CRIT 11 in FY08.

Monitoring: (CRIT 9 and 10) — Post-development monitoring of habitat characteristics and avian use will be continued. Data will be obtained, analyzed, and utilized to make on site management decisions.

**Pertinent Reports:** *'Ahakhav Tribal Preserve, CRIT 9 Restoration, June 2006*; *'Ahakhav Tribal Preserve Restoration Development Plan, 2006* and *'Ahakhav Tribal Preserve Annual Report, 2006* will be posted to the LCR MSCP Web site.

## Work Task E4: Palo Verde Ecological Reserve

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $310,000 | *$590,486 | $657,231 | $976,000 | $1,185,000 | $1,460,000 | $2,000,000 |

*FY06 actual reflects the advance purchase, propagation, and planting of trees and shrubs in FY07 as Phase 2. Future estimates reflect this advance purchase strategy.

**Contact:** Gail Iglitz, (702) 293-8138, giglitz@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Habitat creation

**Conservation Measures:** CLRA1, WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2

**Location:** Reach 4, CDFG, river miles 129-133, CA

**Purpose:** Create and manage a mosaic of native land cover types for LCR MSCP covered species.

**Connections with Other Work Tasks (past and future):** Vegetation and species monitoring are being addressed under F1-F4. Insect populations are being evaluated under C5 and C6.

**Project Description:** The Palo Verde Ecological Reserve (PVER) encompasses more than 1,300 acres. This property (formerly known as the Travis Ranch) has been made available to the LCR MSCP for habitat restoration activities by CDFG.

The eastern boundary of the property (more than four miles) is adjacent to the Colorado River; the western boundary is adjacent to active agricultural fields. The PVER has an extensive infrastructure consisting of miles of lined irrigation ditches, roads, and a pump. Currently, the acreage is leased to a contract farmer and is planted with crops of alfalfa and wheat. Each year a portion of the active crop acreage will be taken out of production to develop the next phase of native habitat. The intent is to create as much riparian habitat as practical. Generally, all phases at PVER are targeted for SWFL, YBCU, and other covered species.

To date, standard farming practices are an efficient and effective way to convert agricultural cropland to habitat. Costs for development and maintenance of the habitat include such farming methods as land leveling, disking, irrigation of crops, repair and maintenance of the irrigation system, fertilizer, and herbicide. Palo Verde Irrigation District provides water to PVER. The

costs associated with irrigation, electricity, and water are proportional to the amount of acreage that has been converted to habitat.

The mass transplanting demonstration (E7) has proven to be a cost-effective method for planting riparian trees and shrubs. This method includes the collection of plant material, propagation, and planting of native species.

It is essential to have a mosaic of habitats that contain areas of riparian species (including mesquite), and ground covers or open areas. Ground cover is an effective method of controlling nonnative species and provides another layer of vegetation for habitat. Ground covers are planted with transplants or by seed; costs vary by methods of planting used. Mesquite trees are generally planted by the use of a tree planter or auger. Typically, mesquite costs are based on a 1-gallon planted tree.

Agricultural areas have irrigation systems in place that are conducive for water management of riparian species. However, standing or saturated soil areas for covered species may need to be created or amended, and managed throughout the term of the program.

**Previous Activities: N/A**

**FY06 Accomplishments:** *The Palo Verde Ecological Reserve Development Plan: Overview, Phase 1 and Phase 2* documents were reviewed and approved by CDFG. A 50-year restoration agreement with CDFG describing each party's responsibilities was developed.

In the spring of 2006, a total of 31 acres were developed for the nursery as Phase 1 to provide native plant material for future phases at PVER and other restoration sites in the LCR floodplain. More than 2,200 trees and shrubs were planted in two fields; Field A encompasses 20 acres and Field B 11 acres. Each field was planted with native species according to water requirements. Field A is dedicated to plantings with higher water requirements: cottonwood, coyote willow, Goodding's willow, and mule's fat. Vegetation with lower water requirements such as *Atriplex*, saltgrass, and honey mesquite were planted in Field B.

Field A had an existing alfalfa crop, which was incorporated as a ground cover to limit invasive weeds and add nitrogen. The field was disked using a tractor with GPS capability. The GPS was set for every 20 feet in two-dimensional x-y coordinates, creating an exact grid pattern in the field. The trees were planted at the intersection of the disking, ensuring consistent space between the trees for future access for plant material collection.

Field B was an abandoned agricultural field that required root plowing, clearing, and burning prior to disking. The entire 11 acres was prepared and mass transplanted with saltgrass, which will provide soil stabilization and future seed stock. Approximately 1 acre of *Baccharis* and *Atriplex* species were planted over the salt grass base. Unfortunately, a week after planting, an aggressive wind storm passed through the area, damaging and burying most of the *Baccharis* and a portion of the saltgrass. Approximately 50% of the saltgrass and 100% of the *Baccharis* was lost. Saltgrass is a spreading crop, so there is a strong chance the remaining saltgrass will significantly increase in 2007.

The honey mesquite trees were planted in October through existing grasses. Two treatments were installed to discourage rabbits from damaging the trees. Chicken wire and garlic clips were placed around and on the trees.

The opportunity to pre-purchase the collection, propagation, and planting of trees for Phase 2 arose and was completed in FY06; therefore, expenditures in FY06 were more than anticipated.

At the end of the year, cottonwood and willow species were noted to be greater than 6 feet tall and in some cases greater than 9 feet with significant branching. A small amount of morning glory was found in the cottonwood-willow trees. Initiation of an invasive weed management program will begin in the spring.

Pre-development monitoring was conducted for targeted covered species, including neotropical migratory birds, small mammals, and bats. Monitoring for small mammals and bats was conducted on Phase 2. Neotropical migratory bird monitoring was conducted on the entire reserve utilizing a point-count protocol. The Arizona Bell's vireo was the only targeted covered species observed. Two observations were made during separate survey dates in different areas.

Implementation monitoring of the vegetation was conducted for the native plant nursery (Phase 1). Year-1 survivorship was measured at 95%. Additional information can be found in the *Palo Verde Ecological Reserve Annual Report, 2006.*

**FY07 Activities:** The development of Phase 2 (80 acres) is the focus in FY07. The ground will be prepped for Phase 2 planting, which includes disking, laser leveling, and plowing as needed to mass transplant the trees and shrubs. Because a small amount of morning glory was found in 2006 (less than 10 plants) in the nursery, a heavy application of ground cover seed will be applied prior to planting of Phase 2 to help reduce any infestation of morning glory. A matting of vegetative ground cover has proven effective on other restoration sites for reducing invasive weeds. Mass transplanting of approximately 60 acres of riparian species (approximately 128,000 of cottonwood, willow, saltgrass, and *Baccharis*) will take place in March. Spacing will be increased to 6-foot inline with 40 inches between rows to reduce cost and still provide the structural density required by the species. A 1-acre area has been dedicated as an open area and will be mass transplanted with saltgrass on 1-foot inline spacing. *Atriplex* will be planted using the same technique in the spring. Mesquite trees typically need one growing season prior to planting; as a result, mesquite trees will be planted in October. More than 17,000 coyote willow, Goodding's willow, and cottonwood will be hand planted to complete the development of the remaining lands.

Vegetation plantings will take advantage of proximity to irrigation gates and be planted in areas between borders where irrigation schedules can be controlled. Irrigation will be monitored to keep the root balls moist during the first crucial few weeks. A diligent approach will be taken to monitor and eliminate morning glory. Hand picking, along with the use of herbicides, will be used to manage the weed.

The plan and design for Phase 3 development of approximately 87 acres will be drafted. In Phase 3, cottonwood-willow land cover type will be established to provide habitat for SWFL, in accordance with the SIA BO obligation being accomplished by the LCR MSCP.

The planting will integrate a random mixing of Goodding's willow and coyote willow with edges of cottonwood. Open areas will be incorporated along the borders, allowing the flexibility to rework the borders if needed, without disturbing the trees and shrubs.

Pre-development monitoring for targeted covered small mammals and bats will continue for Phase 2 and begin for Phase 3. Pre-development neotropical migratory bird monitoring will continue reserve-wide, utilizing the point-count protocol. Implementation monitoring of vegetation for Phase 2 will commence in the spring after the trees are planted. Monitoring for bats and neotropical migratory bird use will begin for Phase 2. Additional information can be found in the Phase 2 development plan posted on the LCR MSCP Web site.

**Proposed FY08 Activities:** Field preparation and planting of Phase 3 will be conducted to create as much riparian habitat as practical with the intent to target habitat for SWFL, YBCU, and other covered species. Previous phases will be monitored and adaptively managed for the targeted species. Site preparation for mass transplanting of riparian trees and shrubs on approximately 87 acres will be conducted. The plan and design for continued development of riparian habitat will be included in Phase 4.

Pre-development monitoring for targeted covered small mammals and bats will continue for Phase 3 and begin for Phase 4. Pre-development neotropical migratory bird monitoring will continue reserve-wide, utilizing point counts. Monitoring of vegetation will continue for Phase 2 and begin for Phase 3. Monitoring for bats and neo-tropical migratory birds will continue for Phase 2. Monitoring for small mammals will begin for Phase 3.

**Pertinent Reports:** The *Palo Verde Ecological Reserve Restoration Development Plan: Overview*, which outlines the general development of the property, the *Palo Verde Ecological Reserve Restoration Development Plan: Phase 1*, which described the restoration activities planned for FY06, and the *Palo Verde Ecological Reserve Restoration Development Plan: Phase 2*, which described the restoration activities planned for FY07 are posted on the LCR MSCP Web site. *Acoustic Bat Surveys Lower Colorado River Pilot Study*: *April 2006*, and *Palo Verde Ecological Reserve Annual Report, 2006* will be posted when available.

## Work Task E5: Cibola Valley Conservation Area

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $1,633,000 | *$1,292,929 | $1,410,645 | $2,656,000 | $1,703,000 | $1,800,000 | $1,950,000 |

*FY06 actual reflects the advance purchase, propagation, and planting of trees and shrubs in FY07 as Phase 3. Future estimates reflect this advance purchase strategy.

**Contact:** Bill Singleton, (702) 293-8159, wsingleton@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Habitat creation

**Conservation Measures:** CLRA1, WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1 and MNSW2

**Location:** Reach 4, river miles 99-104, AZ

**Purpose:** Create and manage a mosaic of native land cover types for LCR MSCP covered species.

**Connections with Other Work Tasks (past and future):** Vegetation and species monitoring are being addressed under F1-F4. Insect populations are being investigated as described in C5.

**Project Description:** Mohave County Water Authority (MCWA) owns and manages 1,309 acres of land in Cibola Valley, of which 1,019 acres are active agricultural lands serviced by the Cibola Valley Irrigation and Drainage District. The MCWA has made the lands available for restoration by the LCR MSCP. These lands are referred to as the Cibola Valley Conservation Area (CVCA).

Cibola Valley Conservation Area is located in southwestern La Paz County, Arizona, about 15 miles south of Blythe, California. The valley encompasses the land inside an engineered bend of the lower Colorado River and a remnant oxbow on the west side of the river (Palo Verde Oxbow). It is farmed primarily for cotton and alfalfa. It is bordered to the south by Cibola NWR and on the east by unimproved land under the jurisdiction of BLM. The river forms the north and west boundaries, except for the Palo Verde Oxbow, from river miles 98.8 to 104.9.

Reclamation has an option to secure up to 1,381 ac-ft per year from the MCWA and up to 1,500 ac-ft per year from the Hopi Tribe. The one-time fee to secure this fourth-priority Colorado River Water is $1,400 per ac-ft adjusted for inflation. In addition, Reclamation already maintains a fourth-priority entitlement of 118.94 ac-ft per year at CVCA.

Work is underway in conjunction with U of A to determine the optimal quantity of irrigation water that should be supplied during native tree establishment. This research is exploring the relationships between soil water supply and tree physiological response and will conclude in February 2009.

**Previous Activities:** Environmental compliance activities were completed to allow for planting of Phase 1 and included a class III cultural resources inventory for the entire 1,309 acres owned and managed by MCWA.

**FY06 Accomplishments:** The *Cibola Valley Conservation Area Restoration Development Plan: Overview, Phase 1, Phase 2, and Phase 3* were completed and will be posted on the LCR MSCP Web site in FY07. Planning for development and creation of habitat on CVCA continued. Documents for ensuring long-term commitments of all parties and securing interest in land and water were initiated. Further discussions on land ownership, water issues, and management options are ongoing.

Environmental compliance was initiated, signed, and approved for the 1,309 acres owned and managed by MCWA. This allows for further development activities throughout the entire Cibola Valley Conservation Area.

In March 2006, more than 150,000 coyote willow, Goodding's willow, and Fremont cottonwood were mass transplanted on 59 acres in less than 5 days in accordance with the Phase 1 restoration development plan. Initial survivorship (30 days) was greater than 95%. By June 2006, survivorship was still extremely high and many of the trees had already reached 6 feet in height. In response to an invasion of morning glory, a farm advisory board meeting was held. The advisory board was formed to address farming issues, tap into local resources, and provide information to the local communities. Control measures for morning glory were researched and discussed by the group. Unfortunately, the invasion was too widespread to use herbicide without damaging the existing tree crop. The decision was made to conduct a review of control approaches and available herbicides, monitor the site, mow areas with heavy infestation for future redevelopment, and formulate a morning glory control plan for management of Phase 1 and development of future phases. It is not uncommon for native trees established to have to compete with other invasive plant species, and the prognosis for controlling the outbreak is positive.

Phase 1, an 86-acre parcel, was planted using a vegetable mass transplanter, creating 64 acres of future SWFL habitat. Field B-2 (4.8 acres) was not planted due to a shortage of Goodding's willow stock and was left as alfalfa. All the fields were planted with an alfalfa cover crop, after which the trees were planted. A 22-acre native plant nursery was planted. The nursery will provide plant material for future restoration activities. A local farmer was contracted to prepare the fields for planting, irrigate as required, and provide repairs as required to the irrigation system infrastructure.

Ivyleaf morning-glory invaded the fields beginning in May. This aggressive plant can establish a strong foothold and will smother whatever plants it can climb; if nothing is available to climb, it simply covers the ground in a dense mat. By June, more than half of the fields were covered, and

by late summer, the alfalfa cover crop was unsuccessful in keeping out the morning glory and was threatening the growing native trees. Some fields were invaded with morning glory to a much lesser extent. Approximately 17 acres were mowed in an attempt to stop the invasive morning glory. Plans are currently ongoing to combat the invasive morning glory next season both mechanically and with herbicides.

Irrigation regime research was conducted in Phase 1 to gather soil moisture and irrigation data for future sites. This 3-year field experiment will evaluate the response of three native tree species to two different surface irrigation regimes and fertilization. Phase 1 fields were thoroughly mapped using electromagnetic induction, which allows for spatial mapping of soil texture and salinity. Whole plant measurements were made including plant height, diameter, and leaf area index. During the growing season, leaf water potential and leaf gas exchange was measured monthly. Unfortunately, the invasive morning glory affected the data gathering for all the intended sites, limiting scientific conclusions that could be drawn.

Reclamation conducted an analysis of the CVCA irrigation system for Phases 1 through 3 to assess the current status of the irrigation infrastructure, and to recommend alternatives for irrigation rehabilitation/improvement. As a result, contract negotiations were initiated for concrete lining of approximately 6,000 feet of irrigation canals.

The opportunity to pre-purchase the collection, propagation, and planting of trees for Phase 3 arose and was completed in FY06. Costs estimated to secure land and water for long-term program use were not completed during the fiscal year. The overall results of these two actions was a reduction in FY06 actual costs.

Pre- and post-development monitoring was conducted at Phase 1, Phase 2, Phase 3, and the control site on CVCA. Soil samples were obtained, and all nutrients and salinity were within normal parameters. Vegetation survivorship data was collected on Phase 1 two weeks after planting and was collected again in October 2006. Survival varied between and within fields. After one growing season, estimated percent survival for all species planted ranged from 31% for Field A to 43% for Field C. Within-field transects ranged from zero to 71% survival. Survivorship was influenced by the morning glory infestation, either through direct mortality or as a result of methods initiated to control the infestation (mowing sections of Fields A, B, and D). In areas heavily infested with morning glory, survivorship was difficult to measure. More accurate survivorship data will be available after FY07 monitoring has been completed. The nursery was not monitored for percent survival.

Avian point counts were conducted on Phase 1, Phase 2, and at the control site. Approximately 24 species were observed at all sites, with the control site having the greatest species diversity and richness. Small mammal trapping occurred on Phase 1 and at the control site. Only four field mice were caught at both sites. Acoustic bat surveys were conducted utilizing Anabats in April 2006 and October 2006. In April, 13 bat passes, accounting for 5 bat species/bat groups, were recorded on Phase 1, while 9 bat passes, accounting for 5 bat species/bat groups, were recorded on the control site. Data has not been analyzed for the October visit, and will be presented with 2007 data analysis.

**FY07 Activities:** Phase 2, originally scheduled for planting in FY07, will be postponed due to morning glory concerns. However, Phase 2 fields will be mechanically disked and treated with herbicides in an attempt to control morning glory propagation prior to planting in FY08. Phase 2 fields are scheduled for planting in FY08. Phase 3 will be planted, converting approximately 105 acres of active agricultural fields to cottonwood-willow land cover type, which is designed to eventually duplicate the native vegetation mosaic documented in occupied SWFL habitat. Automated mass planting techniques will be employed to plant the trees within all the fields. The fields will be prepared for planting and irrigated as required, and repairs will be provided as needed to the irrigation system infrastructure. A crop consultant may be utilized to recommend schedules for water and fertilizer applications. During the growing season, the crop consultant may sample and analyze plant tissue for nitrogen levels and other nutrients as necessary.

Phase 1 will be replanted as required as a result of morning glory infestation and the shortage of native plants in Field B-2 (approximately 4.8 acres). Additionally, portions of the 17 acres that were mowed will be replanted with native plant species. The irrigation infrastructure for phases 1 and 2 will be modified to provide irrigation water for the next 20-30 years. Main access roads will be graveled with Type-II base to control dust, in accordance with local regulations.

Irrigation research conducted by the U of A will continue in the Phase 1 location to gather data for future sites. Soil moisture content, drainage, and tree response will be measured with distance from the irrigation ditch in single plots of each irrigation-treatment tree/species combination. Measurements at varying distances from the irrigation ditch allow for monitoring along gradients of water availability. Additional sub-plots will receive periodic nitrogen fertilization, and plant response will be measured. Tentatively, two water regimes (6 acre-feet per year and 9 acre-feet per year) will be applied. By measuring soil water content in near real-time and measuring tree response to irrigation treatments on several temporal scales, the study will determine tree response to irrigation. Soil/water content, drainage, and plant response are being measured for three growing seasons. The research and results will allow estimation of an appropriate irrigation regime for successful habitat restoration.

Pre- and post-development monitoring will continue on phases 1-4 and the control site at CVCA. Habitat, avian, small mammal, and bat monitoring will continue.

**Proposed FY08 Activities:** Planting and field preparation of Phase 2, designed to create 76 acres of SWFL habitat, is located south of Phase 1, and is scheduled for FY08. Planting of Phase 2, combined with trees planted in Phase 1, will form a larger block of native vegetation with the intent of creating an integrated mosaic of habitats. All the acreage will be developed and maintained for riparian habitat targeting SWFL. Research being conducted by the University of Arizona, which began in FY06, would continue throughout FY08. Irrigation and management of 86 acres of native plant species in Phase 1 and 105 acres in Phase 3, as described in the *Cibola Valley Conservation Area Restoration Development Plan: Overview* will be conducted. A document titled, *Cibola Valley Conservation Area Restoration Development Plan: Phase 4*, will be created that includes design and planting plan of Phase 4 that would be established in FY09. Approximately 64 acres of honey mesquite will be planted. Pre- and post-development monitoring will continue on completed and anticipated phases and the control site at CVCA. Habitat monitoring and monitoring for covered species will continue.

**Pertinent Reports:** *Soil-Plant-Water-Nutrient Relationships of Populus Fremontii, Salix gooddingii, and Salix exigua During Native Habitat Restoration*, the study plan from the Department of Soil, Water, and Environmental Science, University of Arizona, is available upon request. *Cibola Valley Conservation Area Draft Report for Phase 1; Cibola Valley Conservation Area Restoration Development Plan: Overview; Cibola Valley Conservation Area Restoration Development Plan: Phase 1; Cibola Valley Conservation Area Restoration Development Plan: Phase 2*; *Cibola Valley Conservation Area Restoration Development Plan: Phase 3;* and *Cibola Valley Conservation Area Annual Report, 2006* will be posted on the LCR MSCP Web site.

## Work Task E6: Cottonwood Genetics Study

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $25,000 | $23,438 | $243,369 | $15,000 | $15,000 | $0 | $0 |

**Contact:** Gregg Garnett, (702) 293-8644, ggarnett@lc.usbr.gov

**Start Date:** FY04

**Expected Duration:** FY09

**Long-term Goal:** Restoration Research

**Conservation Measures:** WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, and SUTA1

**Location:** Reach 4, Cibola National Wildlife Refuge, ½ mile east of River Mile 97, AZ

**Purpose:** This research project is designed to determine the relative levels of genetic diversity in the 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. Previous research indicates that diversity in cottonwoods can have a direct effect on associated trophic communities and can lead to increases in wildlife diversity. A benefit of genetically diverse stands of trees in dominant riparian communities is increased plasticity to varying environmental perturbation including disease, insect outbreaks, and climate change. Reclamation will use the information gained from this study to increase knowledge and success in creating functional wildlife habitat, and to insure that adequate genetic diversity of dominant riparian plants are included in habitat creation projects.

**Connections with Other Work Tasks (past and future):** All work tasks in Section E that target cottonwood-willow habitat. Starting in FY09, operation and maintenance costs for E6 will be included in Cibola NWR Unit 1 (E24).

**Project Description:** Reclamation has entered into a 5-year land use agreement with the USFWS to conduct restoration research in Unit 1 at Cibola NWR. Information is lacking regarding the relative levels of genetic diversity within the remaining cottonwoods along the LCR and the impact of this genetic diversity as it pertains to community structures and ultimately, wildlife diversity within restoration sites. In an effort to increase knowledge and success in creating functional wildlife habitat, Reclamation solicited the scientific community for proposals to investigate these relationships. The 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 throughout the Southwest 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. Sampling will be conducted to indicate species diversity and richness at multiple trophic levels with respect to soil microbes, invertebrates, and vertebrate communities associated with specific cottonwood genotypes. The experimental garden will be located at Cibola NWR on agricultural land with water and irrigation infrastructure.

**Previous Activities:** None

**FY06 Accomplishments:** Baseline arthropod data were collected through September 2006, and additional genetic data are being gathered for the remaining primer combinations for all 56 cottonwood genotypes. A number of publications have been generated based partially on these preliminary data (see pertinent reports).

Initial spring 2006, survival surveys indicated that mortality was approximately 30% in the experimental garden; however, follow-up fall 2006 surveys indicated that mortality had increased to approximately 90%. Researchers suspect that fall planting may have influenced this high mortality. Trees were planted dormant in fall of 2005 (FY06), but warm temperatures induced early bud break using up important food reserves for the trees' growth in the following spring. Without these reserves, the trees may not have been able to adequately compete with an already tall and vigorously growing cover-crop and other weedy species. This experience has been recognized as an important lesson that will influence all future LCR MSCP plantings with respect to planting season.

**FY07 Activities:** The cottonwood genetics experimental garden will be replanted in spring of FY07. The design and composition of the garden will be identical to the original garden as detailed in the study plan. Reclamation is assisting with field preparation and personnel for planting; however, the majority of the replanting and labor costs (recollection, propagation, transportation, and planting) are being assumed by NAU. This replanting will necessarily mean a delay in information from the experimental research, but it is not expected to impact budget projections for this work task. Additional measures are being used (spring planting season, rigorous field preparation, and weed management) to ensure successful establishment of the experimental garden.

**Proposed FY08 Activities:** Data collection including recording trophic responses and measuring physical parameters will continue through FY08. These data will include samples of soil microbes, invertebrate communities, and monitoring growth and development of trees. This information is necessary to determine if genotype differences important for restoration are being expressed. The majority of this portion of the study will be funded through NAU cost share. Support from Reclamation will be limited and may include staff time for agreement coordination and administration, equipment purchase or rental, and minor field support.

**Pertinent Reports:** *Nature Reviews*, July 2006; *Science Daily***,** July 2006; U.S. Dept of State *Washington File*, August 2006; and Ecological Society of America *Frontiers in Ecology and the Environment*, October 2006, are posted on the LCR MSCP Web site.

## Work Task E7: Mass Transplanting Demonstration

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $10,000 | $12,309 | $319,309 | $15,000 | $15,000 | $0 | $0 |

**Contact:** Gail Iglitz, (702) 293-8138, giglitz@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY09

**Long-term Goal:** Restoration Research

**Conservation Measures:** WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, and SUTA1

**Location:** Reach 4, Cibola NWR, one-half mile east of River Mile 97, AZ

**Purpose:** This research 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.

**Connections with Other Work Tasks (past and future):** Beginning in FY09, operation and maintenance costs for this work task will be included in Cibola NWR Unit 1 (E24).

**Project Description:** Reclamation has entered into a 5-year land use agreement with the USFWS to conduct restoration research in Unit 1 at Cibola NWR. This work task demonstrates automated mass transplanting techniques using native riparian species. The intent is to investigate the feasibility and effectiveness of using this technique for creation of land cover types in existing agricultural fields. The cost benefit of this method will be evaluated along with its effectiveness and appropriateness in the creation of native habitat to meet LCR MSCP goals. The technique involves mechanized, rapid, dense planting of up to 4,500 seedlings per acre to inhibit growth of non-native plant species and to achieve dense growth of native tree species. Up to 36 acres of cottonwood-willow land cover type may be created as a result of the demonstration.

**Previous Activities:** See FY05 accomplishments.

**FY06 Accomplishments:** Due to the unusual amount of rain and early warming in spring 2005, the collection time (dormancy) was narrowed for the first contractor. This limited the amount of

plant material from cottonwood and willow collected in 2005; as a result, only 8.5 acres were planted, which left a remaining 11.5 acres to plant in 2006. Plant material was collected in December 2005 for propagation. In April 2006, the field was prepared by disking and pre-irrigation for mass planting. This field was planted predominately with willow and cottonwood trees in a 4-hour period. The trees were spaced at 6-foot inline spacing with rows 38 inches apart.

In November, the trees appeared to be at the same growth stage as the previous years' planting. As in the previous year, grasses have keep other invasive weeds out while somewhat limiting the trees' growth. It is anticipated that the trees will respond quickly in the spring of 2007 and achieve good growth during their second growing season.

The mass transplanting method has demonstrated a feasible option for planting trees at a high density over large acreage in a short period of time. Using 2006 cost comparison, mass transplanting significantly reduced the cost of plantings trees on active agricultural fields.

This technique can be appropriate for most agricultural conversions for the creation of habitat; however, the genetic diversity is minimal because of the current collection method of cuttings. A possible choice may be growing the plantings from seeds. Seed propagation for mass transplanting is not an option at this time. Mass transplanting is limited to level ground conversion. Mass transplanting on contoured fields has not yet been demonstrated.

**FY07 Activities:** We anticipate irrigating the mass transplanted trees until FY09, at which point operation and maintenance of the site will be included under E24.

**Proposed FY08 Activities:** We anticipate the same activities as FY07.

**Pertinent Reports:** The final report, *Work Task E7: Mass Transplanting Demonstration, Final Report, Cibola National Wildlife Refuge: 2005 & 2006* has been drafted and will be posted to the LCR MSCP Web site.

## Work Task E8: Seed Feasibility Study

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $150,000 | $488,610 | $492,610 | $160,000 | $65,000 | $210,000 | $0 |

**Contact:** Barbara Raulston, (702) 293-8396, braulston@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY09

**Long-term Goal:** Restoration Research

**Conservation Measures:** WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, and SUTA1

**Location:** Reach 4, Cibola NWR, one-half mile east of River Mile 97, AZ

**Purpose:** This research project documents the feasibility of establishing native riparian habitat (cottonwood, willow, and other native groundcovers and shrubs) from seed to potentially increase the cost effectiveness and quality of future habitat creation projects.

**Connections with Other Work Tasks (past and future):** Beginning in FY09, operation and maintenance costs for this work task will be included in Cibola NWR Unit 1 (E24).

**Project Description:** Through a series of laboratory and field experiments, this study will document the necessary steps involved in using seed to create dense mosaics of native riparian land covers. Steps in the process include seed collection, storage, treatment, planting, germination, and seedling growth and survival. Using seeds in lieu of, or in conjunction with, cuttings 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 nonnative to native vegetation resulting from using seed for restoration will also be an important factor in determining the feasibility of this method. The preferred outcome of this study will be a series of protocols developed from careful documentation, which can be used to create native riparian habitat. Reclamation has entered into a 5-year land use agreement with the USFWS to conduct restoration research in Unit 1 at Cibola NWR.

**Previous Activities:** N/A

**FY06 Accomplishments:** Fremont cottonwood, coyote willow, and Goodding's willow seeds were collected from Cibola NWR, and a series of greenhouse and laboratory experiments determined germination rates, growth, and survival, as affected by seed collection, storage, seed treatment, planting method, planting density, soil type, irrigation, and soil treatments. Seeds of

these species that were dried, cleaned of all fibrous material, and kept at 70°F continued to germinate at high rates 8-10 weeks after collection. Seeds that were dried, cleaned of all fibrous material, and stored in a freezer have maintained a germination rate of at least 80% up to 28 weeks after collection. Previously reported data on longevity of cottonwood and willow seeds indicated that seeds remain viable for only 1-5 weeks after collection. This new information will greatly improve the logistics of using seed in restoration projects.

Tests conducted in the greenhouse indicated high-density seeding of cottonwood and willow had successful growth and survivorship in the presence of natives and nonnatives in the soil transported from Cibola NWR. Shrub seeds had a lower success rate in competition with non-targets present in the seed bank.

Expenditures in FY06 were significantly higher than anticipated as all 3 years of the contract were awarded rather than an annual obligation, which results in lower obligations in FY07 and possibly FY08.

**FY07 Activities:** As planned, small test plots will be planted on-site at Cibola NWR to measure and document numerous variables that may affect successful germination, growth, and survival of seeded riparian species under more natural, existing conditions. However, this phase of the study will be conducted with modifications based on results of greenhouse testing. Germination tests will continue as long as seeds remain viable. Testing of additional shrub species will be conducted in the greenhouse to determine salinity tolerance and germination/survival requirements. These shrubs are being examined for use in restoration activities because not all soils on the LCR can support cottonwood, willow, and mesquite. Unless a native plant is established, saltcedar and other invasive plants will take its place. Additional seed collection, processing of seed, testing of seed dispersal techniques, and testing of irrigation techniques will be included in this phase of the research. The small-scale test plot study results will help determine the optimum seed treatment, seed application, seeding rate, seed placement (relative to other seeds in the plot) and initial irrigation treatment. Results of this phase will subsequently provide Reclamation with initial engineering cost estimates for riparian habitat restoration using seed. Expenditures in FY07 are anticipated to be less than $60,000 as the award for year 1 of the study was obligated in FY06.

**Proposed FY08 Activities:** Results from 2006 and 2007 will determine the exact planting plan for large test plots at CNWR in 2008. Expenditures in FY08 are anticipated to be less than $65,000 as the award for year 2 of the study was obligated in FY06.

**Pertinent Reports:** *Year 1 Research Plan, Feasibility Study using Native Seeds in Restoration, July 17, 2006; Technical Proposal, Feasibility Study using Native Seeds in Restoration,* and the 2006 annual report, *Feasibility Study using Native Seeds in Restoration*, will be posted to the LCR MSCP Web site.

## Work Task E9: Hart Mine Marsh

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $100,000 | $117,539 | $170,859 | $125,000 | $250,000 | *$1,000,000 | *$1,250,000 |

*The estimated cost of FY09-FY10 construction is based on 100 acres of created habitat using the LCR MSCP guidelines of $22,500 per acre. The estimated cost will be revised upon completion of final design in FY08.

**Contact:** Gregg Garnett, (702) 293-8644, ggarnett@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY08 decision point

**Long-term Goal:** Habitat creation

**Conservation Measures:** CLRA1, LEBI1, and CRCR2

**Location:** Reach 4, Cibola NWR, River Mile 92, AZ

**Purpose:** Create and manage marsh habitat for Yuma clapper rail, least bittern and Colorado River cotton rat.

**Connections with Other Work Tasks (past and future):**

**Project Description:** Hart Mine Marsh is a decadent marsh located on Cibola NWR. Currently, drainage water from the Refuge's agricultural fields enters Hart Mine Marsh through gated structures in the Arnett Ditch. Previous management practices have not allowed any outflow from the marsh, therefore the drain water terminates in the marsh to evaporate and stagnate. The result is poor water quality, limited marsh habitat, and saline upland areas, some completely devoid of vegetation or dominated by saltcedar.

In general, habitat requirements for marsh-covered species include areas of permanent open water and larger areas of adjacent emergent marsh vegetation with water depths ranging from 1 inch to12 inches. For estimating purposes, approximately 20 acres of the marsh will be deepened by dredging or excavating. At least 80 acres adjacent to the deepened areas will be re-graded to provide more suitable marsh areas, adjacent permanent open water, and controllable water levels. This would provide permanent open water adjacent to emergent vegetation. By managing water levels and providing appropriate vegetation, suitable habitat for covered marsh species can be created. Water, diverted by gravity from the Arnett Ditch, would be used to flood leveled fields and create marsh habitat conditions. Water levels would be managed by a series of small water control structures such as culverts or stop logs.

To refine the cost estimates and project the quantity of created habitat, a detailed topographic survey will be necessary. The survey will allow estimates of the amount of material to be excavated and determine the acreage that can be flooded and managed for rail species. The cost of these improvements, estimated from the topographic survey and conceptual design, would then be used to decide if habitat creation is cost effective. To determine the long-term water commitment from the USFWS, information is needed to understand how the site currently functions hydraulically and the amount of additional water that will be required for maintaining successful marsh habitat.

Upon completion of the final design, a restoration development plan will be prepared and posted on the Web site. The cost of construction and expected acreage of created habitat will be refined in FY08 and included in the FY09 Work Plan, prior to implementation. Prior to beginning construction, a land use agreement between USFWS and Reclamation securing land and water resources will be prepared.

**FY06 Accomplishments:** NEPA compliance, cultural surveys, topographic surveys, and marsh bird surveys were completed. Using the data from the surveys, a report detailing relative water balance estimates, hydrology, baseline hydraulic conditions, and requirements for restoration and habitat creation at Hart Mine Marsh was initiated. These baseline conditions will assist in setting limits for restoration design.

In anticipation of marsh habitat creation at Hart Mine Marsh, pre-development surveys for marsh birds and riparian obligate birds began in 2006. Eight marsh bird survey points were established adjacent to suitable habitat and surveys were conducted on March 21, April 19, and May 23, 2006. A total of two least bitterns and 4 Yuma clapper rail detections were recorded during the three survey efforts. Thirteen points were established on roads surrounding the site. Surveys were conducted on May 25, June 21, and July 18, 2006. Approximately 160 individuals were recorded, comprising 36 species. Red-winged blackbirds, song sparrows, white-winged doves, brown-headed cowbirds, and common yellowthroats were the most commonly encountered species. No LCR MSCP covered species were detected during the 2006 point counts.

**FY07 Activities:** The Comprehensive Conceptual Restoration Plan and workshop will occur in August-September. This will allow for additional data collection during high river stages and irrigation regimes and would provide a more realistic picture of the hydraulic conditions at Hart Mine Marsh. A coarse water balance and preliminary findings is expected in March.

In August 2007, a workshop will be conducted shortly after an initial review of the options in the Comprehensive Conceptual Restoration Plan, and will be used as a decision point for project continuation. Based on review of the Comprehensive Conceptual Restoration Plan and preliminary projected costs for design and construction, a decision will be made to continue the project into design or to cancel the project. FY08 and FY09 budgets and activities will be adjusted accordingly to reflect any changes.

The suitability of Hart Mine Marsh for habitat creation will be determined in 2007. Pre-development surveys will continue if the decision is made to go forward with this project.

**Proposed FY08 Activities:** If a decision is made in FY07 to proceed with this work task, Reclamation will finalize the restoration design for marsh habitat early in FY08. Using the final design, a Restoration Development Plan and appropriate section 404 permit application will be prepared, and posted on the LCR MSCP Web site. In addition, during FY08 and prior to beginning construction, agreements outlining party responsibilities and securing interest in land and water will developed. Completion of these activities would allow construction to begin early in FY09. Pre- and post-development monitoring will be contingent on decisions made during FY07.

**Pertinent Reports:** *Hart Mine Marsh, Existing Conditions Report*.

## Work Task E12: Butler Lake

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $140,000 | $32,151 | $109,717 | $120,000 | $0 | $0 | $0 |

**Contact:** Nathan Lenon, (702) 293-8015, nlenon@lc.usbr.gov

**Start Date:** FY04

**Expected Duration:** FY07

**Long-term Goal:** Restoration Research

**Conservation Measures:** BONY2, RASU2, LEBI1, CLRA1

**Location:** Reach 5, Imperial NWR, River Mile 61, AZ

**Purpose:** Evaluate potential lower-cost alternatives to dredging such as aeration, in situ bioremediation, or temporarily opening the backwater to the river, while meeting the needs of the LCR MSCP to provide habitat for covered native fish.

**Connections with Other Work Tasks (past and future):** This work task was previously included in the FY04 Work Tasks as Butler Lake, Imperial National Wildlife Refuge (D5). Species monitoring is being addressed under F2 and F4.

**Project Description:** Backwaters are an expensive land cover type to create. Studies are being conducted on this backwater to develop technology to effectively restore existing backwaters to levels of sustainable backwater habitat. Butler Lake, and other existing backwaters, contain many of the components required to sustain native fish, but suffer from poor water quality. This research project will evaluate the water quality of the lake by conducting seasonal sampling, identify options to improve water quality in the eutrophic backwater, and develop a range of alternatives for improving water quality.

Located on Imperial NWR, Butler Lake is a 43-acre disconnected floodplain lake with an approximate mean depth of 3 feet. This backwater is seepage-driven, with no known surface connection to the Colorado River, or any other body of water. The lack of freshwater flushing has caused the lake to become hypereutrophic (an advanced state of nutrient enrichment) to the extent that, in its present condition, Butler Lake provides little benefit to fish or wildlife.

During FY06, the U of A initiated their limnological assessment of Butler Lake. The purpose of this assessment is to address the uncertainty related to restoring an eutrophic backwater system and identify whether any of the alternatives to dredging would be feasible in this situation. This

agreement was executed at the end of FY05; therefore, all the work funded out of FY05 was completed during FY06.

**Previous Activities:** In FY05, Reclamation completed a preliminary assessment report, based on limited data collection during FY04, which evaluated conditions at Butler Lake, and proposed various restoration alternatives. Because of the uncertainty related to experimental treatments, Reclamation, in consultation with Imperial NWR, decided to collect additional data prior to selecting a restoration approach.

**FY06 Accomplishments:** A limnological assessment of Butler Lake was initiated. The purpose of this assessment is to address the uncertainty related to restoring a eutrophic backwater system and identify whether any of the alternatives to dredging would be feasible in this situation. This agreement was executed at the end of FY05; therefore, all the work funded out of FY05 was completed during FY06.

A monitoring protocol was developed to address the concerns regarding uncertainty and includes data collection on major and minor ions, nutrients, metals, sediment chemistries, algal toxins, zooplankton, and macro-invertebrates. This will provide Reclamation with an increased understanding of the ecological dynamics of the system, as well as a solid baseline from which to measure the effectiveness of any proposed restoration activities.

A larger, graded and graveled boat ramp was originally planned; however, the decision was made in consultation with Imperial NWR to scale back site access to provide minimal boat access only. In-house staff from Reclamation and Imperial NWR cooperatively cleared vegetation and made minor improvements to a restricted-access road to provide access for small boats to create site access for sampling purposes.

Three sampling trips in FY06 were conducted and a preliminary report of initial impressions after the first site visit was submitted.

Two marsh bird surveys were conducted at Butler Lake on April 18 and May 9, 2006. Two points were surveyed at either end of the lake, and two least bitterns were detected during the first survey period and one was detected during the second. No other marsh bird or LCR MSCP covered species were detected.

**FY07 Activities:** A full year of quarterly sampling trips have been completed. The year-end report will include recommendations for the best course of action to restore the backwater for native fish. Preliminary findings indicated that only through large-scale restoration could Butler Lake be made suitable for native fish.

After a review of the final report, Reclamation will decide, in consultation with the Imperial NWR, whether to pursue the project.

Because a large-scale restoration technique such as dredging or excavation of an inlet/outlet channel is likely to be required, Reclamation will evaluate this site relative to all other candidates included in the Backwater Site Selection (E15) for reaches 5 and 6. Under this scenario, no

further activity would occur under this work plan in FY07, which would reduce expenditures for FY07 below the current estimate.

**Proposed FY08 Activities:** At this time, no activities are planned at Butler Lake in FY08. This site will be evaluated relative to all other candidates included in the Backwater Site Selection (E15) for reaches 5 and 6.

**Pertinent Reports:** *Butler Lake Native Fish Refugium, Preliminary Assessment* is posted to the LCR MSCP Web site. *Limnological Survey and Assessment of Butler and McAllister Lakes* will be posted to the LCR MSCP Web site.

## Work Task E13: McAllister Lake

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $75,000 | $82,437 | $153,488 | $50,000 | $0 | $0 | $0 |

**Contact:** Nathan Lenon, (702) 293-8015, nlenon@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY07 decision point

**Long-term Goal:** Habitat creation

**Conservation Measures:** BONY2, RASU2, and LEBI1

**Location:** Reach 5, Imperial NWR, River Mile 61, AZ

**Purpose:** Evaluate a method of water quality improvement by dewatering the lake and inducing groundwater recharge to dilute the lake's existing high salt concentrations.

**Connections with Other Work Tasks (past and future):** Species monitoring is being addressed under F2 and F4.

**Project Description:** Located on Imperial NWR, McAllister Lake is a shallow 32-acre isolated floodplain lake with no known surface connection to the LCR. The lack of freshwater flushing had caused the lake to become highly saline, to the extent that it provides limited fish and wildlife value. Because backwaters are expected to be the most expensive land cover type to create under the LCR MSCP, Reclamation has been, through the restoration of existing backwaters, developing the technology to more effectively create sustainable backwater habitat. The purpose of this ongoing investigation is to determine whether this experimental method of pumping water out of the lake, followed by induced groundwater recharge from the river aquifer, may be a sustainable method of improving water quality in isolated backwaters with high salinity levels on the LCR. Potentially, this method provides a high degree of safety against intrusion by non-native fish species by eliminating the need for engineered fish barriers.

**Previous Activities:** Reclamation initiated a series of experimental pump-tests during FY03 and FY04, which dewatered the lake to about one-fourth of its normal volume. Before, during, and after these tests, a variety of environmental data were collected to measure the lake's response to the pumping and the consistency of the groundwater supply through the river aquifer. This monitoring includes groundwater and surface water levels, and water quality measurements of the river and lake. These pump tests were conducted from December 2002 through March 2004, during the fall and winter months only, to avoid potential impacts to Yuma clapper rails.

The lake was left unmanaged during FY05. Monitoring was continued to determine how quickly the lake's water quality would degrade if pumping is stopped, so that Reclamation may decide whether the lake can be maintained in a manner that is cost effective.

An agreement was executed to initiate limnological investigations at McAllister Lake. This effort will evaluate the sustainability of maintaining McAllister Lake as a backwater for native fish, and provide recommendations to Reclamation as to how to best manage the site.

**FY06 Accomplishments:** A report was drafted, documenting the methods and results of the experimental pump-tests performed during FY03 and FY04. A final draft report is expected in FY07. Three dewatering events were conducted. Each dewatering event removed approximately 75% of the lake's volume, which was subsequently replaced by groundwater recharge. Water quality parameters were monitored in conjunction with each event.

Marshbird surveys were conducted at McAllister Lake on April 18 and May 9, 2006. Two points were surveyed at either end of the lake. No marshbird or LCR MSCP listed species were detected.

Anabat acoustic surveys for bat species were conducted at McAllister Lake for one night on April 5, 2006. Six species were detected. None of the species detected was an LCR MSCP listed species.

**FY07 Activities:** A report detailing the methodology and results of all experimental dewatering conducted from FY03-FY05 was finalized and posted to the LCR MSCP Web site. The report documents all five pump tests between FY03 and FY04, as well as the degradation of water quality, which occurred during FY05 while the site was left unmanaged.

A full year of quarterly water quality sampling events have been completed. A final report documenting the quarterly sampling and recommendations on practices for long-term management of the lake for native fish is due in FY07.

Activities in FY07 are expected to be limited to the discussion of the alternatives listed in the report, a review of available water data, and the determination by the fisheries group as to the value and intended use of McAllister Lake. All decisions will be made in consultation with Imperial NWR. Therefore, expenditures in FY07 are likely to be less than approved.

**Proposed FY08 Activities:** At this time, no activities are planned for FY08 pending the decision on whether to continue the management of McAllister Lake under the LCR MSCP. If the decision is made to continue management of this site, Reclamation will prepare a land use agreement securing the necessary land and water interests for the duration of the LCR MSCP program. A restoration plan will be prepared and posted to the LCR MSCP Web site for review.

**Pertinent Reports:** *Experimental Design Plan for McAllister Lake Study; Hydrologic Characterization of McAllister Lake, Arizona;* and the study plan are available upon request from the LCR MSCP. *Induced Recharge in McAllister Lake, Arizona to Reduce Salinity for the PossibleIntroduction of Native Fish Species* is posted on the LCR MSCP Web site. *Limnological*

*Survey and Assessment of Butler and McAllister Lakes* will be posted to the LCR MSCP Web site.

## Work Task E14: Imperial Ponds Conservation Area

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $595,000 | $2,114,868 | $2,219,177 | $2,070,000 | $974,000 | $498,000 | $252,000 |

**Contact:** Nathan Lenon, (702) 293-8015, nlenon@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Habitat creation

**Conservation Measures:** CLRA1, BONY2, RASU2, LEBI1, and BLRA1

**Location:** Reach 5, Imperial NWR, River Mile 59, AZ.

**Purpose:** Expansion of the existing ponds to satisfy the backwater requirements of the 2001 SIA.

**Connections with Other Work Tasks (past and future):** Vegetation and species monitoring is being conducted under F1, F2, F3, F4, F5, and D9.

**Project Description:** Located on Imperial NWR, the Imperial Ponds, previously referred to as the DU2 Ponds, were originally constructed to provide a mixture of habitat types, including isolated backwater for native fish, marsh, and riparian land cover types. The site consists of four ponds, which are connected by a single channel that supplies fish free water from a dedicated well. The ponds were originally renovated in the fall of 2002, and stocked with RASU in the spring of 2003.

In FY05, an interdisciplinary group of 13 subject matter experts from four agencies collaboratively prepared a conceptual design for the re-construction and expansion of the ponds. Subject matter experts in the fields of fisheries, hydrology, wetland science/botany, and engineering participated. This report was finalized in July 2005. Reclamation initiated detailed planning and engineering for the site in FY05.

**Previous Activities:** In December 2004, the interdisciplinary group developed recommendations for how to best manage the site. Under the new design, the existing ponds will be deepened and enlarged by approximately 50 surface acres. The ponds will be deepened and divided into six ponds, each with their own independent water delivery and drainage system.

Soils excavated from the ponds during expansion will be incorporated into 104 acres of existing adjacent farm fields, raising them an average of 3-5 feet. This feature of the project was added

during the post-conceptual design phase to provide a location to place approximately 500,000 cubic yards of fill. The existing field irrigation system will then be retrofitted and the fields will be re-leveled. This will result in an additional 34 acres of flood-irrigated fields, which will be planted for cottonwood-willow habitat. In addition, a 12-acre field, adjacent to a currently functional BLRA marsh field, will be developed for BLRA.

**FY06 Accomplishments:** Construction was originally scheduled for FY07. However, the opportunity arose to start construction in June 2006, allowing excavation activities to be conducted and completed in the winter, during low-flow river conditions. As a result, significantly higher costs were incurred in FY06 than originally estimated.

During FY06, Reclamation and USFWS executed a Land Use Agreement that secured the land and water interests for the duration of the LCR MSCP program. Reclamation completed all necessary environmental compliance activities for this project, conducted a harvest of the remaining razorback suckers (in cooperation with USFWS), and dewatered the ponds. Imperial NWR then arranged and supervised a prescribed burn, which reduced the volume of vegetation around the ponds, which would have otherwise required clearing.

Engineering design drawings were completed and construction rental equipment was procured. Site clearing was initiated and completed in May, and construction of the ponds began in June. By the end of FY06, two of the six ponds were fully excavated, with the third 75% completed. In addition, a large portion of the pipe materials were procured and delivered to the site.

Increased construction costs due to price increase in services and suplies, and higher than expected water intrusion within the excavation areas resulted in several modifications to the original design. First, the piping system was reconfigured to reduce the amount of pipe required, thereby mitigating for increased pipe costs. Second, excavation of the western shores of the ponds (adjacent to the river) is being modified to leave a shallow bench, to avoid deep excavation in areas where water intrusion was causing productivity losses. Finally, improved excavation techniques have reduced handling requirements for the excavated materials and minimized issues with equipment sticking.

Construction work on the ponds began during the period when bird surveys would normally be conducted; therefore, no bird surveys were conducted.

Anabat acoustic bat surveys were conducted at ponds 1 and 5 for one night on April 5. At Pond 1, 56 bat passes were detected at a rate of 5.09 per hour, and at Pond 5, 18 bat passes were detected at a rate of 1.64 per hour. At Pond 1, four species were detected and at Pond 5, three species were detected. No LCR MSCP covered species were detected at either pond.

A point-count survey of the area to be planted with cottonwood and willow was attempted, but was hindered by construction work being conducted at the site. Only 6 points out of 10 were surveyed as construction work caused too much noise disturbance to continue the remaining point counts. No vegetation besides some grass and low, sparse, herbaceous vegetation was present and almost all bird detections came from areas adjacent to the fields. A total of 21 species were detected and 3 LCR MSCP covered species were detected. Sonoran yellow warbler and summer tanager were detected in the nursery site adjacent to the creation site. A Western

least bittern was detected in the marsh habitat located to the south of the cottonwood-willow creation site.

Anabat acoustic surveys were not conducted in the cottonwood/willow creation site itself, but were conducted at the adjacent nursery site. One night was surveyed on April 5, and six species were detected. One LCR MSCP evaluation species, the California leaf-nosed bat, was detected in the interior of the nursery site. On the nursery edge, 48 bat passes at a rate of 8 per hour were detected, and in the interior a total of 32 bat passes were detected ar a rate of 2.91 per hour.

**FY07 Activities:** Excavation of the ponds, placement of all associated rip-rap and gravel substrates, and construction of the new pump platform, wedge-wire screen system, water supply, and drainage ditch will be completed. All major purchases of materials to support these tasks have been completed. Due to the wet site conditions in FY06, excavation was extended into March of 2007.

Preliminary designs for the 104 acres of filled fields have been completed for the leveling and new concrete-irrigation canal, which will be finalized and executed early in FY08. Following these tasks, a salt-tolerant cover crop will be established to facilitate salt flushing and soil stabilization. The fill area and associated 34 acres of cottonwood-willow land cover were incorporated into the design after the original FY07 work plans, and were therefore not included in the previous cost estimates.

A conceptual design for the 12 acres of BLRA marsh (Field 18) has been completed. A contract will be prepared using FY07 funds to clear and level this field, but will be awarded during winter FY08.

A draft restoration development plan has been prepared detailing the design, construction, vegetation planting, species monitoring, and management of the site. Upon completion, this document will be posted to the LCR MSCP Web site.

**Proposed FY08 Activities:** Ground clearing, contouring, and leveling of the 12 acres of marsh habitat for BLRA (Field 18) will occur during the winter of FY08. Following this work, Field 18 will be planted with wetland species during the spring of FY08. In addition, wetland plants will be planted in selected areas within the ponds, and within the drainage ditch during the spring of FY08.

Ground preparation and planting of a cover crop on 34 acres eventually targeted for cottonwood-willow will occur in the fall of FY08. These fields will be managed to flush salts and condition the soils for approximately 1.5 years, prior to planting with cottonwood and willow in the spring of FY09. In addition, an automation system is being discussed to reduce the irrigation labor requirements for the cottonwood-willow fields.

Additional site maintenance tasks during FY08 will include herbicide control of nonnative plants, operation and maintenance of the pumps and screen system, and other tasks to be determined.

**Pertinent Reports:** *Imperial National Wildlife Refuge, Imperial Native Fish Habitat*

*Reconstruction; Design Workshop Final Report;* and *Clean Water Act, Section 404 Permit – Final Site Plan* have been posted to LCR MSCP Web site. *Imperial Ponds Development Plan* will be posted to the LCR MSCP Web site.

## Work Task E15: Backwater Site Selection

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $200,000 | $265,497 | $265,497 | $430,000 | $387,000 | $285,000 | $460,000 |

**Contact:** Nathan Lenon, (702) 293-8015, nlenon@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY10

**Long-term Goal:** Habitat Creation

**Conservation Measures:** BONY2, RASU2, and FLSU1

**Location:** Reaches 3-6, CA and NV; river miles 22-276, AZ, CA, and NV

**Purpose:** To establish and validate a consistent standardized technique for evaluating and selecting backwaters with the highest probability of success, based on biological and physical attributes, as well as other program considerations (e.g., cost, land ownership, and feasibility). The technique will then be used to inventory backwaters in reaches 3-6. This inventory is expected to identify potential backwater creation sites, develop conceptual restoration approaches, estimate the relative cost of habitat creation, and estimate the habitat credit potential of the backwater. This would generate a list of potential sites to be developed as habitat, which would be sequenced into the Work Plan process based on habitat creation goals and budget constraints.

**Connections with Other Work Tasks (past and future):** E16 is used with this work task to identify projects for habitat creation.

**Project Description:** Reclamation has developed a standardized technique for evaluating and selecting backwaters for habitat creation, considering biological attributes and other program considerations (e.g., cost, land ownership, and feasibility).

The backwater inventory process is being completed in two phases. The first phase, which started in FY06 and is scheduled to be completed in FY08, is the inventory and evaluation of backwaters in reaches 5 and 6. The second phase, which began in FY07 and has been rescheduled to be completed in FY11, is the inventory and evaluation of backwaters in reaches 3 and 4. Upon completion of the inventory and evaluation, backwaters selected for restoration will be addressed under site-specific work tasks. An additional effort may be undertaken in the future, specific to flannelmouth suckers in Reach 3, as additional information becomes available on life history and habitat creation requirements.

For planning purposes, each phase of the backwater inventory process is divided into three steps. The first step is the inventory of existing backwaters. Basic information that can be obtained without visiting the sites will be used to make these determinations. This information includes backwater size and connectedness to the river, and willingness of the landowner/manager to participate in the program.

During the second step, approximately 30 backwaters will be visited during the summer, with one site visit to each backwater. Physical and biological data will be collected to generate biological ranking scores and habitat opportunity rankings as described in the *Draft Final Guidelines for the Screening and Evaluation of Potential Conservation Areas*. Trip reports will be completed for review by the LCR MSCP Program Manager and a technical work group. The estimated cost for the initial site visit, sampling effort, and bathymetry is $10,000 per backwater.

In the third step, habitat assessments will be completed for the final highest priority four or five sites, which would include four quarterly monitoring trips. These sampling and assessment methodologies will be included in the updated *Final Guidelines for the Screening and Evaluation of Potential Conservation Areas*. At the conclusion of these assessments, final reports will be completed and reviewed by the technical work group. The estimated cost for 1 year of quarterly sampling is $40,000 per backwater.

**Previous Activities:** None. This was a new start in FY06.

**FY06 Accomplishments:** The *Draft Final Guidelines for the Screening and Evaluation of Potential Conservation Areas* was completed, and will include guidelines specific to selecting backwaters. To validate the backwater model for accuracy and applicability, these guidelines were used at seven sites with known histories of razorback sucker introductions. All sites were visited in the summer. An integrated GPS-sonar system was procured to facilitate the data collection for this and future backwater site-selection efforts.

The backwater inventory data review (Step 1) of Reach 5 and Reach 6 backwaters was completed and generated a list of approximately 25 candidate backwater sites (with 5 alternate sites) for site visits to be conducted during summer FY07.

**FY07 Activities:** The Model Evaluation report has been completed and is posted on the LCR MSCP Web site. The final report updated the parameters and values for generating the biological rating for backwaters.

Reclamation conducted a helicopter survey of reaches 5 and 6 to determine the degree of permanence of the candidate backwater sites. During this survey, Reclamation performed a visual inspection of the permanence of open water, potential site access issues, approximate percentage of vegetation cover, qualitative assessment of water quality/water clarity, recreational use, and limited water quality profiling of several selected backwaters.

Right-of-entry permits are under development with the appropriate landowners to allow for the initial site visits (Step 2). Site visits will be conducted in the summer of FY07. A report detailing the initial inventory (Step 1) will be posted to the LCR MCSP Web site upon completion.

During the summer of FY07, Reclamation will conduct site visits (Step 2) at each of the 25 candidate backwater sites. Trip reports for these site visits will be completed during FY08.

Using in-house staff and data resources, Reclamation has initiated the initial backwater inventory data review (Step 1) of Reach 3 and Reach 4 backwaters. During FY07, Reclamation will complete the data review of Reach 3 and Reach 4 backwaters and generate the list of backwaters for site visits in summer of FY08, using in-house staff and data resources.

**Proposed FY08 Activities:** Reclamation will apply the updated biological and evaluation ratings criteria (Step 3) for the candidate backwater sites in reaches 5 and 6 and select four or five sites to initiate backwater site assessments (Step 4), which will include conceptual habitat creation plans and preliminary cost assessments. These assessment reports will be completed in FY10. The inventory process for reaches 3 and 4 has been postponed at this time until FY10.

**Pertinent Reports:** *Draft Guidelines for the Screening and Evaluation of Potential Conservation Areas* is posted on the LCR MSCP Web site. *Colorado River Backwaters Restoration Final Model Evaluation Report*, February 2007 is also posted. *Backwater Inventory: Reaches 5 & 6, Step 1: Identification of Backwaters for Screening and Evaluation* will be posted to the LCR MSCP Web site.

## Work Task E16: Conservation Area Site Selection

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $200,000 | $158,330 | $293,144 | $50,000 | $200,000 | $200,000 | $200,000 |

**Contact:** Terry Murphy, (702) 293-8140, tmurphy@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY30

**Long-term Goal:** Identify and prioritize potential conservation areas to develop under the habitat creation requirements of the LCR MSCP.

**Conservation Measures:** None

**Location:** Reaches 1-7, AZ, CA, and NV

**Purpose:** Develop and utilize guidelines to provide Reclamation with a consistent and transparent method for screening and evaluating the suitability of lands that are made available to the program for use as Conservation Areas.

**Connections with Other Work Tasks (past and future):** The process developed under this work task will guide the selection of future Conservation Area sites to be developed under Section E work tasks.

**Project Description:** Guidelines have been developed to describe the process for working with interested parties to identify sites for screening and evaluation as potential Conservation Areas for creating and maintaining habitat over the term of the LCR MSCP. Screening of potential sites will be conducted under this work task.

Reclamation intends to work with land owners to secure an interest in land and water resources sufficient to create and maintain LCR MSCP habitats. It is anticipated that willing landowners will enter into some form of long-term commitment that secures resources for the 50-year term of the LCR MSCP.

**FY06 Accomplishments:** The *Draft Final Guidelines for the Screening and Evaluation of Potential Conservation Areas* were reviewed and accepted by the Steering Committee and have been posted on the LCR MSCP Web site. Expenditures in FY06 were less than projected and a modification scheduled for FY06 was not completed until FY07. Therefore, expenditures in FY07 are expected to be approximately $40,000 higher than projected due to the modification being delayed.

**FY07 Activities:** In November of 2006, the riparian screening criteria were applied to four locations along the LCR. The first area was identified in response to a recent fire on Cibola NWR and targeted honey mesquite land cover type. The second area was also on Cibola NWR and targeted cottonwood-willow land cover type as an expansion of activities already funded by the LCR MSCP. The third area was an existing backwater and adjacent lands near Laughlin, Nevada. The final area included active agricultural lands being assessed by the Metropolitan Water District in the Palo Verde Irrigation District, and if secured, would target cottonwood-willow, honey mesquite, and marsh land cover types. Site-specific information can be found in trip reports.

**Proposed FY08 Activities:** A request for potential conservation areas is anticipated to be issued in the summer of FY07. A maximum of 10 sites (current estimate) will be evaluated in FY08 using the *Draft Final Guidelines for the Screening and Evaluation of Potential Conservation Areas*.

**Pertinent Reports:** *Draft Guidelines for the Screening and Evaluation of Potential Conservation Areas* are posted on the LCR MSCP Web site.

## Work Task E17: Topock Marsh Pumping

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $70,000 | $1,127 | $1,127 | $70,000 | $5,000 | $70,000 | $70,000 |

**Contact:** Terry Murphy, (702) 293-8140, tmurphy@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY55

**Long-term Goal:** Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh.

**Conservation Measures:** AMM2

**Location:** Reach 3, Havasu NWR, river miles 235-244, AZ

**Purpose:** To avoid flow-related covered impacts on covered species habitats at Topock Marsh. One option identified includes the design, permitting, and construction of a reliable and manageable water delivery system for Topock Marsh.

**Connections with Other Work Tasks (past and future):** None.

**Project Description:** Topock Marsh has been identified as an important area for LCR MSCP covered species such as Yuma clapper rail and the SWFL. At times, flow-related activities could lower river elevations to levels that could disrupt existing gravity diversions of water from the river to the marsh. The option identified in the LCR MSCP HCP assumed two pumps would be purchased and installed at the existing inlet canal for Topock Marsh. The cost of the purchase, installation, and operation of the pumps throughout the life of the 50-year program would be funded by the LCR MSCP. It is anticipated that the gravity diversion of water, along with supplemental pumping to maintain the water surface elevation, would avoid negative effects on the groundwater elevation.

**FY06 Accomplishments:** The specific actions required to satisfy AMM2 have not been determined at this time. Therefore, expenditures were less than anticipated. However, in FY06 the *Draft Havasu National Wildlife Refuge Water Management Plan* was reviewed by Dr. Charles Burt of the California Polytechnic State University and by Reclamation's Denver Technical Service Center. Both reviews were funded outside the LCR MSCP and are focused on addressing any water accounting issues associated with water management of the refuge. The revised draft is scheduled to be submitted by the USFWS to Reclamation in FY07.

**FY07 Activities:** Discussion of the technical reviews, water accounting issues, and feasibility of implementation are scheduled to begin in April of 2007. After a decision is reached, the commitments or obligations of the LCR MSCP will be determined.

**Proposed FY08 Activities:** Funding has been reduced until a strategy for completing AMM2 is finalized.

**Pertinent Reports:** N/A

## Work Task E18: Law Enforcement and Fire Suppression

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $50,000 | $0 | $0 | $75,000 | $25,000 | $75,000 | $75,000 |

**Contact:** Terry Murphy, (702) 293-8140, tmurphy@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY55

**Long-term Goal:** Created habitat protection.

**Conservation Measures:** CMM1

**Location:** Reaches 1-7

**Purpose:** Provide law enforcement and fire suppression in support of habitat created under the LCR MSCP.

**Connections with Other Work Tasks (past and future):** Law enforcement and fire suppression are anticipated to be integral management components for all habitat created through Section E work tasks.

**Project Description:** Fund law enforcement and fire protection for created habitat. It is assumed that BLM, USFWS, AGFD, CDFG, NDOW, and other local agencies will conduct law enforcement and fire fighting activities on the river. The LCR MSCP will provide funding to agencies to cover additional LCR MSCP lands (lands that were not already in public ownership). There is a need to develop a comprehensive approach to address these issues along the Colorado River.

**FY06 Accomplishments:** As discussed in the FY05 annual accomplishment report, implementation of this work task was delayed until FY07 and therefore no funds were expended.

**FY07 Activities: O**ptions will be evaluated for system-wide, site specific law enforcement, and fire suppression. A strategy will be developed which that will form the basis for future law enforcement and fire suppression activities for the LCR MSCP.

**Proposed FY08 Activities:** Funding has been reduced to allow sufficient time to identify both the law enforcement and fire suppression strategies.

**Pertinent Reports:** N/A

## Work Task E24: Cibola NWR Unit #1

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $120,000 | $1,213,000 | $1,072,000 | $1,236,000 |

**Contact:** Gregg Garnett, (702) 293-8347, ggarnett@lc.usbr.gov

**Start Date:** FY07

**Expected Duration:** FY55

**Long-term Goal:** Habitat Creation

**Conservation Measures:** WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, and SUTA1

**Location:** Reach 4, Cibola National Wildlife Refuge, one-half mile east of River Mile 97, AZ

**Purpose:** Create and manage a mosaic of native land cover types for LCR MSCP covered species.

**Connections with Other Work Tasks (past and future):** This work task incorporates Cottonwood Genetics Study (E6), Mass Transplanting Demonstration (E7), and Seed Feasibility Study (E8) with additional adjacent acreage on Unit 1 of Cibola NWR. After completion of the research projects in FY09, operation and maintenance of these work tasks will be tracked under E24.

**Project Description:** Reclamation currently has a number of established projects at Unit 1, which include restoration research and demonstrations projects that began as a pre-cursor to the LCR MSCP. In 1999, USFWS and Reclamation planted the Cibola Nature Trail and established 34 acres of cottonwood-willow and mesquite land cover type within Unit 1. In 2002, USFWS and Reclamation planted another approximately 18 acres of cottonwood/willow in Unit 1 north of the Nature Trail. Four additional approximately 20-acre fields in Unit 1 are occupied by three projects that have been fully or partially funded by the LCR MSCP. These include E6 (Cottonwood Genetics Study), E7 (Mass Transplanting Demonstration), and E8 (Seed Feasibility Study). To the east of these projects are an additional two agricultural fields. The six fields combined are currently included in a 5-year land use agreement with USFWS to continue research activities on Unit 1 (expires in FY09).

Work task E24 incorporates the aforementioned existing projects and agricultural land as well as substantial additional adjacent acreage into a single conservation area. Research projects that are currently ongoing will retain their individual work task designation until the termination of research or in FY09. The land included in Unit 1 (E24) encompasses approximately 900 acres

and ranges in cover and use from agricultural fields, to partially improved land, to undeveloped land. The acreage in Unit 1 is targeted primarily for cottonwood/willow cover type development for SWFL, but will also likely include a mosaic of native habitats including riparian, wetland, and riparian-upland interface areas.

The acreage in Unit 1 (E24) has been categorized into five areas. Area #1 (180 acres) includes active agricultural fields, existing (converted agriculture) cottonwood/willow cover-type, and ongoing LCR MSCP research and demonstration projects. Area #2 (Hippy Fire) includes 313 acres that have been cleared as a result of the Hippy Fire. Cibola NWR has performed substantial capital improvements to this area over the past few years including clearing, laser-leveling, field construction, and irrigation and drainage infrastructure installation. The area is currently planted in a cover crop and is being conditioned to improve soil salinity. Areas #3 (Baseline 90) and #4 (North 160) are 100 and 146 acres of undeveloped land and fallowed agricultural land, respectively. The areas will require clearing, leveling, installation of irrigation infrastructure, and soil conditioning before development for native riparian species. Area #5 (Crane Roost, 147 acres) has been cleared and leveled and is currently irrigable. A portion of this area has been planted with cottonwood, willow, and mesquite species. The area will require upgrades to the irrigation system and needs further soil conditioning to continue development.

**Previous Activities:** N/A

**FY06 Accomplishments:** This is a new start in FY07.

**FY07 Activities:** In November 2006, in coordination with the Refuge Manager, five areas of cottonwood-willow land cover development were selected within Unit 1 using the site-selection review process. The potential for development of a large block of cottonwood-willow land cover type, available land and water, existing investments already made by the LCR MSCP, the large amount of land and infrastructure improvements already made, protection from unrestricted public use, and willingness of the refuge manager to work in partnership with the LCR MSCP made this project an ideal candidate for incorporation into the LCR MSCP.

A land use agreement securing land and water resources for the life of the program is currently being developed and a Conservation Area Development Plan is being drafted. This long-term agreement will supersede the original short-term research agreements. Compliance with NEPA is covered under the Lower Colorado River National Wildlife Refuges Comprehensive Management Plan and Associated Environmental Assessment. Any additional compliance documentation will be secured in FY07.

Several areas on Unit 1 require immediate stabilization measures to ensure proper water delivery and drainage. In addition, ongoing measures to prevent encroachment of invasive nonnative species (primarily saltcedar), such as herbicide application and establishment and maintenance of a cover crop will be continued in FY07. Specific activities in FY07 include: 1) the addition of irrigation supply turnouts to the Crane Roost (Area #5) and establishment of a soil-conditioning cover crop, 2) uninterrupted continuation of invasive weed control over the entire site, 3) continuing existing cover-crop maintenance and soil conditioning in Area #2 (Hippy Fire), 4) drafting the land use agreement, development plan, and compliance documentation, and 5) initial survey of the irrigation and drainage infrastructure to determine necessary system upgrades for

future development and expansion. The development plan will allow us to refine acreage cost estimates for site development.

**Proposed FY08 Activities:** The majority of work planned for FY08 involves infrastructure upgrades and repair. Approximately 5,000 feet of roads will be repaired to allow equipment access to the site (planting, hauling, and construction). A number of the existing drains will be cleaned, others will require further excavation for proper function, and additional drains will be constructed to improve drainage (particularly on acreage surrounding the Hippy Fire). In addition, trees will be ordered (FY08 dollars obligated) for mass transplanting of Crane Roost (150 acres). Regular irrigation cycles, cover crop and soil management practices, invasive weed control, and general maintenance activities will continue in FY08.

**Pertinent Reports:** *Cibola NWR Unit 1 Trip Report, November 2006* is available from the LCR MSCP.

# WORK TASKS
# SECTION F

# POST-DEVELOPMENT MONITORING

## Work Task F1: Habitat Monitoring

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $250,000 | $138,256 | $375,470 | $275,000 | $325,000 | $350,000 | $390,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Post-development monitoring

**Conservation Measures:** MRM2, CLRA1, WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2

**Location:** Beal Lake, Havasu NWR, Arizona; CRIT 9, Ahakhav Tribal Preserve, Arizona; PVER, California; CVCA, Arizona; Cibola Nature Trail, Cibola NWR, Cibola, Arizona; Imperial Ponds, Imperial NWR; Arizona

**Purpose:** Habitat creation projects will be monitored for initial survivorship and successional changes over time to determine if habitat acreage goals are met. To evaluate habitat, a monitoring plan will be written prior to project implementation, pre-development monitoring may occur (if necessary), and post-development monitoring will occur through the LCR MSCP time period. These data will be used to manage the habitat creation sites and to plan future projects through the adaptive management process. As each demonstration or habitat creation site is established, Reclamation will monitor initial survivorship for 2 years. Monitoring successional changes will occur on a periodic basis over time, with the interval dependent on the age of each stand.

**Connections with Other Work Tasks (past and future):** Post-development habitat monitoring is being conducted at habitat creation sites detailed in Section E.

**Project Description:** To implement the adaptive management program, habitat creation projects must be monitored to determine whether necessary habitat components have been provided to qualify as habitat as described in the LCR MSCP. Monitoring the biotic components (vegetation) and abiotic components (e.g., soil moisture) will provide data to incorporate into future restoration efforts. Prior to the development of each proposed restoration site, monitoring plans will be written in conjunction with restoration plan development, and pre-development monitoring will be conducted, when necessary, to document baseline conditions to evaluate change in site conditions.

Vegetation will be monitored using two protocols. Immediately after development, each habitat creation site will be monitored to determine survivorship at the newly restored sites and to determine if all necessary habitat components have been provided. After 2 years, successional changes within stands will be monitored as each habitat creation site matures. Changes in habitat quality over time, in conjunction with covered species monitoring, will guide the management of each habitat creation site.

**Previous Activities:** Habitat restoration demonstration sites were monitored using established protocols, including Beal Lake, Cibola Nature Trail, and Pratt Restoration. Survival and growth rates were recorded at each site. Survival and growth rates were dependent on a number of factors, including planting technique. Results were summarized and evaluated for each restoration site.

**FY06 Accomplishments:** Monitoring plans were written for habitat creation projects listed in Section E, including CVCA, PVER, Imperial Ponds, Beal Lake, and 'Ahakhav Tribal Preserve. Pre-development habitat monitoring at planned habitat creation sites was not necessary in 2006. Habitat restoration demonstration sites were monitored using established protocols, including 'Ahakhav Tribal Preserve, Beal Lake, and Cibola Nature Trail. Post-development monitoring of restoration sites was conducted at CVCA and PVER. Specific data for each habitat creation site are reported in Section E of this report.

Habitat monitoring occurs mainly after the onset of dormancy in September/October. In 2006, habitat monitoring was delayed until late October due to other project needs. These staff costs will be reflected in FY07.

**FY07 Activities:** Pre-development monitoring will be conducted at habitat creation sites identified in Section E, when necessary. Post-development monitoring will be conducted at existing restoration sites, including Beal Lake, Cibola Nature Trail, Imperial Ponds, CVCA, and PVER. Monitoring plans will be created for new habitat creation sites.

**Proposed FY08 Activities:** Pre-development monitoring will be conducted at habitat creation sites identified in Section E, when necessary. Post-development monitoring will be conducted at existing restoration sites. Monitoring plans will be created for new projects.

**Pertinent Reports:** The monitoring plans are included in the restoration development plans and will be available for CVCA, PVER, Beal Lake, and 'Ahakav Tribal Preserve. Annual reports for Beal Lake, CRIT 9, CVCA, PVER will be posted on the LCR MSCP Web site.

## Work Task F2: Avian Use of Habitat Creation Sites

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $125,000 | $28,524 | $106,095 | $150,000 | $150,000 | $150,000 | $150,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Conduct pre- and post-development monitoring for avian species.

**Conservation Measures:** AMM1, AMM3, MRM1, MRM2, CLRA1, WIFL1, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI, YWAR1, SUTA1, and CMM2

**Location:** Beal Lake, Havasu NWR, Arizona; CRIT 9, 'Ahakav Tribal Preserve, Arizona; PVER, California; CVCA, Cibola Nature Trail, Hart Mine Marsh, Cibola NWR, Cibola, Arizona; Imperial Ponds, and Imperial NWR, Yuma, Arizona.

**Purpose:** Monitor avifauna use of habitat creation sites to provide data for the adaptive management process and develop management guidelines for created habitat sites.

**Connections with Other Work Tasks (past and future):** Post-development avian monitoring will be conducted at habitat creation sites listed in section E. In addition, information obtained from this work task may be used to provide data to avian system monitoring by using the same protocols established in the system monitoring program (D1, D2, D5, D6, and D7).

**Project Description:** Riparian habitat creation will benefit nine LCR MSCP covered avian species, including SWFL and YBCU. Habitat creation and restoration demonstration sites will be monitored for bird activity, using a variety of techniques including point counts, area searches, and species-specific survey protocols. Data gathered will be used to guide the design of future riparian habitat creation projects to provide covered species habitat.

**Previous Activities:** During FY05, monitoring for avian covered species occurred at three restoration sites: Pratt, Beal Lake, and the Cibola Nature Trail. Mean relative abundance of individual birds was highest at the Cibola Nature Trail site. The Cibola Nature Trail site contained more habitat generalists than Pratt due to its small patch size, open habitat, and surrounding agricultural fields. Riparian associated species, such as song sparrow and common yellowthroat, benefit from adjacent water sources, as occurred at the Beal Lake Site. Avian use was summarized and evaluated for each site and compared between sites. Surveys for SWFL were conducted under D2 at the Cibola Nature Trail Site.

**FY06 Accomplishments:** Avian post-development monitoring was conducted at four restoration sites: Cibola Nature Trail, CRIT 9 'Ahakav Tribal Preserve, Beal Lake, and CVCA Phase 1. The LCR MSCP covered species detected at these restoration sites were the yellow warbler and vermilion flycatcher. The house finch, great-tailed grackle, and Abert's towhee were the most abundant species detected at the Beal Lake restoration site. Brown-headed cowbirds, western kingbirds, and mourning doves were the most abundant species detected at CRIT 9. Red-winged blackbirds were the most abundant species detected at CVCA Phase 1.

Avian pre-development monitoring was conducted at three restoration sites: CVCA Phase 2 and Control, PVER, and Hart Mine Marsh. No LCR MSCP species were detected at these sites. Red-winged blackbirds were the most abundant species detected at the PVER and CVCA Phase 2 and Control restoration sites.

When possible, pre- and post-development avian monitoring was conducted in conjunction with other monitoring activities, including system monitoring, small mammal monitoring, and bat monitoring. In this fiscal year, combining monitoring efforts resulted in cost savings for pre-development surveys. In the future, habitat suitability models may reduce pre-development monitoring in non-riparian areas, such as agricultural fields.

**FY07 Activities:** Pre-development monitoring is being conducted at habitat creation sites identified in Section E, including CVCA, PVER, and Hartmine Marsh. Post-development monitoring is being conducted at existing restoration sites, including Beal Lake, Cibola Nature Trail, Imperial Ponds, CVCA, PVER, and CRIT 9 'Ahakav Tribal Preserve. Surveys for SWFL will be conducted under D2 for CRIT 9 'Ahakav Tribal Preserve, Beal Lake, and Cibola Nature Trail. Surveys for YBCU will be conducted under D7 for CRIT 9 'Ahakav Tribal Preserve and Beal Lake. Marsh bird presence/absence surveys will be conducted for Imperial Ponds, Butler Lake, McAllister Lake, and Hart Mine Marsh.

**Proposed FY08 Activities:** Pre-development monitoring will be conducted at habitat creation sites identified in Section E, including CVCA, PVER, and Hart Mine Marsh. Post-development monitoring will be conducted at existing restoration sites, including Beal Lake, Cibola Nature Trail, Imperial Ponds, CVCA, PVER, and CRIT 9 'Ahakav Tribal Preserve. Surveys for SWFL will be conducted under D2 for CRIT 9 Ahakav Tribal Preserve, Beal Lake and Cibola Nature Trail. Surveys for YBCU will be conducted under D7 for CRIT 9 'Ahakav Tribal Preserve and Beal Lake. Marsh bird presence/absence surveys will be conducted for Imperial Ponds and Hart Mine Marsh.

**Pertinent Reports:** The following reports will be posted on the LCR MSCP Web site: *Beal Lake Riparian and Marsh 2006 Annual Report; Palo Verde Ecological Reserve 2006 Annual Report; Cibola Valley Conservation Area 2006 Annual Report; Hart Mine Marsh 2006 Annual Report; CRIT 9 Ahakav Preserve 2006 Annual Report; Monitoring Avian Productivity and Survivorship 2006 Annual Report; Imperial Ponds 2006 Annual Report; Butler and McCalllister Lake 2006 Annual Report; Avian use of restoration sites along the lower Colorado River, 2006; Marsh bird 2006 Annual Report; Southwestern Willow Flycatcher Surveys, Demography, and Ecology Along the Lower Colorado River and Tributaries 2006;* and *Yellow-Billed Cuckoo Distribution, Abundance, and Habitat Use Along The Lower Colorado and Gila Rivers 2006 Annual Report.*

The monitoring plans are included in the restoration development plans and have been drafted for each habitat creation project listed in Section E.

## Work Task F3: Small Mammal Colonization of Restoration Sites

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $45,000 | $10,384 | $37,761 | $50,000 | $55,000 | $55,000 | $55,000 |

**Contact:** Chris Dodge, (702) 293-8115, cdodge@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** Conduct pre- and post-development monitoring for small mammal species.

**Conservation Measures:** AMM1, AMM5, AMM6, MRM2, DPMO1, CRCR1, CRCR2, YHCR1, and YHCR2.

**Location:** Beal Lake, Havasu NWR; PVER, California; CVCA, Cibola Nature Trail, Hart Mine Marsh

**Purpose:** Monitor small mammal populations within habitat creation sites. Data will be used in the adaptive management process to guide the design of future habitat creation projects targeting covered small mammal species.

**Connections with Other Work Tasks (past and future):** Post-development small mammal monitoring will be conducted at habitat creation sites listed in Section E. In addition, information obtained from this work task, in conjunction with C27, will be used to define habitat requirements for future habitat creation projects.

**Project Description:** Reclamation will conduct presence/absence surveys in restoration demonstration and habitat creation sites to determine small mammal occurrence. These efforts will be focused on detecting the presence of Yuma hispid cotton rats and Colorado River cotton rats at these sites. The data will be used to guide the design of habitat restoration for covered small mammal species.

**Previous Activities:** Small mammal surveys have been conducted at the Cibola Nature Trail site and at the Pratt Agricultural site. Several animals from the genus *Sigmodon* have been captured at each site. At the Pratt Agricultural site *Sigmodon* spp. Was captured in dense habitat of *Baccharus* spp., and at the Cibola Nature Trail site they were captured in dense habitat dominated by Johnsongrass.

**FY06 Accomplishments:** Presence/absence live trapping surveys were conducted at several sites during FY06, but only one *Sigmodon* spp. Was captured at the Beal restoration site. The one *Sigmodon* individual was captured in dense arrowweed habitat. The following numbers of trap-

nights were conducted at each site: Beal Lake restoration site, 1,104; Pratt Agricultural site, 270; CVCA, 775; Imperial NWR nursery site, 75; and PVER, 180.

Pre- and post-development small mammal surveys were conducted in conjunction with other monitoring programs in an effort to keep costs to a minimum. As the habitat creation projects listed in Section E become established, additional surveying effort will be required.

**FY07 Activities:** Presence/absence live trapping surveys will continue as part of the post development monitoring efforts at LCR MSCP habitat creation sites. Any *Sigmodon* spp. Captured will have small tissue samples collected and these samples will be analyzed to determine species and subspecies.

**Proposed FY08 Activities:** Post-development monitoring activities for small mammals at habitat creation sites will continue.

**Pertinent Reports:** A summary of mammal trapping results at LCR MSCP restoration sites for 2006 will be posted on the LCR MSCP Web site.

## Work Task F4: Post-Development Monitoring of Covered Bat Species

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $60,000 | $70,000 | $70,000 | $70,000 |

**Contact:** Theresa Olson, (702) 293-8127, tolson@lc.usbr.gov

**Start Date:** FY07

**Expected Duration:** FY55

**Long-term Goal:** Pre- and post-development monitoring of covered bat species

**Conservation Measures:** AMM1, MRM1, MRM2, WRBA2, WYBA2, and WYBA3

**Location:** Beal Lake, Havasu NWR; PVER, California; CVCA, Cibola Nature Trail, Cibola NWR, Cibola, Arizona; Imperial Ponds, and Imperial NWR, Arizona.

**Purpose:** Monitor bat use of habitat creation sites to provide data for the adaptive management process and develop management guidelines for created habitat sites. Pre- and post-development monitoring for the presence/absence of covered bat species will be conducted following a protocol developed in 2006. Information obtained through this work task, in conjunction with D9, will help determine the distribution of these species.

**Connections with Other Work Tasks (past and future):** Post-development bat monitoring will be conducted at habitat creation sites listed in Section E. In addition, information obtained from this work task may be used to provide data to D9.

**Project Description:** Indigenous bat species were surveyed annually along the LCR from 2001 to 2006. Post-development monitoring will utilize a protocol developed in 2006. Acoustic monitoring will be conducted at habitat creation sites, including CVCA, PVER, Cibola NWR Nature Trail, and Beal Lake on Havasu NWR. These surveys will utilize either active or stationary Anabat™ systems to record bat sounds for presence/absence surveys. In some circumstances, capture techniques may be used for those species not readily recorded by the Anabat™ system. These surveys will provide data on foraging habitat and use by covered species. Reclamation staff will conduct bat surveys before and after habitat creation utilizing Anabat™, Sonabat™, infrared cameras, stationary detection equipment, and mist netting, where appropriate.

**Previous Activities:** This is a new start in FY07.

**FY06 Accomplishments:** This is a new start in FY07.

**FY07 Activities:** Conduct pre- and post-development bat surveys on habitat creation sites, including Beal Lake, Cibola Nature Trail, CVCA, Imperial Ponds, and PVER. Anabat™ files will be analyzed to determine species richness and abundance at restoration sites.

**Proposed FY08 Activities:** Pre- and post-development bat surveys will be conducted on habitat creation sites, including Beal Lake, Cibola Nature Trail, CVCA, Imperial Ponds, and PVER. Anabat™ files will be analyzed to determine species richness and abundance at restoration sites.

**Pertinent Reports:** The work protocol will be posted on the LCR MSCP Web site.

## Work Task F5: Post-Development Monitoring of Fish Restoration Sites

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $0 | $0 | $0 | $65,000 | $130,000 | $130,000 | $130,000 |

**Contact:** Tom Burke, (702) 293-8310, tburke@lc.usbr.gov

**Start Date:** FY07

**Expected Duration:** FY55

**Long-term Goal:** Post-develop monitoring

**Conservation Measures:** RASU6 and BONY5

**Location:** Reaches 3-6, backwater habitats developed and stocked with RASU and BONY, NV, AZ, and CA

**Purpose:** Monitor fish use of habitat creation sites to provide data for the adaptive management process and develop management guidelines for created backwater habitats.

**Connections with Other Work Tasks (past and future):** All backwaters created in Section E.

**Project Description:** This work will monitor the fish and fish habitat at restoration sites. It is anticipated that fish restoration sites will play various roles for conservation of target fish species throughout the term of the LCR MSCP. Some habitats will be able to develop self-sustaining populations, others may become overpopulated requiring harvest or thinning, and some will require continuous population augmentation. Most isolated fish habitats will require some stock rotation to maintain genetic diversity through time. Basic surveys of the fish population and the physical and chemical habitat developed or restored will be required. Fish monitoring will include trapping (hoop, fyke, and minnow traps), trammel netting, electro-fishing, larvae light trapping, and ocular surveys (including scuba and snorkeling where necessary and practical). Water quality assessment will require annual measurements of temperature, oxygen, pH, and conductivity (salinity), as well as periodic monitoring of chemical makeup, including electro-ions and selenium.

**Previous Activities:** N/A.

**FY06 Accomplishments:** New start in FY07.

**FY07 Activities:** An interagency meeting was held at Bill Williams River NWR to scope monitoring parameters for native fish backwater habitats. The USFWS developed a draft fishery management plan for Beal Lake. Physical and chemical habitat at Beal Lake is being monitored, and monitoring of fish will be conducted (electrofishing and netting). All nonnative fish

encountered will be removed to reduce the biological demand in the pond and allow for greater growth of the remaining RASU and BONY.

Reclamation is in the process of finalizing a monitoring plan for the Imperial Ponds (E14). Stocking and monitoring of these ponds is likely to commence during winter 2007/2008.

**Proposed FY08 Activities:** Post-development monitoring of Beal Lake similar to FY07 monitoring will be continued. Increased monitoring of the Imperial Ponds will be continued to include physical and chemical conditions in the ponds and surveys of the fish populations. Netting and electrofishing will be used when water temperatures are less stressful to fish. Larvae light trapping will be conducted monthly from February to May to assess reproduction and recruitment. If needed, funds will be utilized for Imperial Pond non-native fish removal.

**Pertinent Reports:** N/A

# WORK TASKS
# SECTION G

# ADAPTIVE MANAGEMENT PROGRAM

## Work Task G1: Data Management

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $225,000 | $97,959 | $332,959 | $650,000 | $450,000 | $450,000 | $450,000 |

**Contact:** Theresa Olson, (702)293-8127, tolson@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY55

**Long-term Goal:** Data management will be an ongoing task for the species research, system monitoring, habitat creation, post-development monitoring, and habitat maintenance programs.

**Conservation Measures:** All

**Location:** System-wide

**Purpose:** Develop and maintain an accessible, multi-disciplinary, spatially referenced, relational database to consolidate, organize, document, store, and distribute scientific information related to the LCR MSCP.

**Connections with Other Work Tasks (past and future):** Database management is integral in the successful completion of work tasks undertaken for Fish Augmentation (Section B), Species Research (Section C), System Monitoring (Section D), Habitat Creation (Section E), Post-Development Monitoring (Section F), Adaptive Management (Section G), and Habitat Maintenance (Section H).

**Project Description:** To fully implement the LCR MSCP, a robust database management system needs to be developed to manage data collected through the species research, system monitoring, habitat creation, post-development monitoring, adaptive management, and habitat maintenance programs. Conservation measure completion and financial data also need to be managed to effectively and efficiently implement the LCR MSCP. Database design, initial implementation, and maintenance are funded through this work task.

**Previous Activities:** All RASU and BONY tagging and stocking data have been included in the Lower Colorado River Native Fishes database maintained by ASU in Tempe, Arizona. Arizona State University received a federal grant in FY04 to continue this work for 4 years. Reclamation accounted for these funds in its request for financial credit. The grant provides funds to support this work through FY07.

**FY06 Accomplishments:** The LCR MSCP Database Management Framework Requirements Analysis was completed in FY06, which outlined several options for implementing an accessible, multi-disciplinary, spatially referenced, relational database to consolidate, organize, document,

store, and distribute scientific information related to the LCR MSCP. This analysis will be used to develop the implementation strategy for the LCR MSCP database management system.

In the interim, a document/calendar management system was identified and implemented to facilatate the efficient collaboration among staff. Modifications were made to this off-the-shelf software package tailoring it to the needs of the LCR MSCP.

All tagging and stocking data for RASU and BONY collected in FY06 were provided to ASU and included in the Lower Colorado Native Fishes database.

Initial FY06 cost estimates assumed implementation of the database management system will begin in FY06.

**FY07 Activities:** The database management system will be implemented by staffing a database manager position and developing high priority modules. All tagging and stocking data for RASU and BONY will continue to be provided to ASU for inclusion into the Lower Colorado River Native Fishes database.

**Proposed FY08 Activities:** Database design and implementation will continue. A pilot project will be conducted and a plan developed to begin work on high priority modules. The native fishes database will continue to be maintained by ASU through 2010 until the LCR MSCP database is fully functional. Annual cost for management of the fishery database is estimated to be $110,000 per year.

**Pertinent Reports:** *Draft LCR MSCP Database Management Framework Requirements Analysis* is available upon request from the LCR MSCP.

## Work Task G2: Annual Report Writing and Production

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $35,000 | $57,263 | $92,263 | $75,000 | $0 | $0 | $0 |

**Contact:** Jed Blake, (702) 293-8165, jblake@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY07

**Long-Term Goal:** Transparent program communications between internal and external stakeholders.

**Conservation Measures:** N/A

**Location:** Boulder City, NV

**Purpose:** The creation of annual program documents as stated in the FMA section 7.3.12(A)

**Connections with Other Work Tasks (past and future):** This is an ongoing activity that will continue through the term of the program.

**Project Description:** Funds are reserved for labor and materials associated with creating the yearly annual Implementation Report, Work Plan, Budget and Contribution Schedule, as required by the LCR MSCP FMA.

**FY06 Accomplishments:** The Draft and Final Implementation Report Fiscal Year 2007 work plans and the Budget and Fiscal Year 2005 Accomplishments Report were completed. Based on the feedback from the Work Group review, the report was restructured to show multi-year activities, connections between work tasks and pertinent reports.

**FY07 Activities:** Preparation of the Implementation Report Fiscal Year 2008 work plans and the Budget and Fiscal Year 2006 Accomplishments Report will be completed.

**Proposed FY08 Activities:** This work task will be folded into A-1 Program Administration commencing in FY2008.

**Pertinent Reports:** *Lower Colorado River Multi-Species Conservation Program Final Implementation Report, Fiscal Year 2007 Work Plan, and Budget and Fiscal Year FY2005 Accomplishment* was posted on LCR MSCP Web site; the *Draft and Final Implementation Report, Fiscal Year 2008 Work Plan, and Budget and Fiscal Year 2006 Accomplishment* will be posted to the LCR MSCP Web site.

## Work Task G3: Adaptive Management Research Projects

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $230,000 | $281,328 | $281,328 | $275,000 | $230,000 | $230,000 | $230,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY55

**Long-term Goal:** Species Research

**Conservation Measures:** MRM1, MRM2, MRM4, WIFL1, AMM1, MRM5, BONY5, RASU6, CRCR1, YHCR1, MRM3, FLSU3, LLFR1, and LLFR3

**Location:** System-wide

**Purpose:** Evaluate existing knowledge for each LCR MSCP covered species to determine research needs, develop a research program to complete appropriate conservation measures, and provide data for the habitat creation and maintenance program. As data gaps are identified for each covered species and their habitats, a research activity will be developed to provide information for the Adaptive Management Program. This work task enables Reclamation to implement priority research projects in a timely manner.

**Connections with Other Work Tasks (past and future):** Research projects initiated under this work task may be continued as Species Research (Section C). Information obtained may be used for Fish Augumentation (Section B), System Monitoring (Section D), Habitat Creation (Section E), Post-Development Monitoring (Section F), or Habitat Maintenance (Section H).

**Project Description:** To achieve successful habitat creation and an effective Fish Augmentation Program over a long period of time, an Adaptive Management Program must be implemented. Data gaps will be identified during C3 and species research priorities will be defined. These research opportunities will be developed into projects/studies and be implemented by Reclamation staff or via contracts, grants, and agreements. Miscellaneous research projects that relate to LCR MSCP covered species and habitats may also be executed in this work task. New knowledge accumulated during the adaptive management process will be used in planning habitat creation projects for covered species, fish augmentation strategies, and system monitoring programs.

**Previous Activities:** This is a new start in FY06.

**FY06 Accomplishments:** Research needs were identified in the Fish Augmentation Program (Section B) to evaluate monitoring techniques for assessing relative abundance of RASU,

especially in riverine reaches. The standard technique used successfully in lakes Mohave and Havasu is trammel netting; however, this technique is not as successful in the river and causes bycatch mortalities of waterfowl and mammals. Techniques evaluated included video and still photography from helicopters, visual counts by drift boats, and using night-time electrofishing. Aerial photography showed promise; however, fish detection was highly influenced by wind, which distorts visibility. Spawning RASU in the Needles, California area proved far more accessible to night electrofishing than to standard trammel netting. More fish were contacted for staff hour, resulting in better population size estimates. Population estimates derived by boat surface counts fell within the population confidence limits resulting from the electrofishing. All three techniques will be tested further.

Also during FY06, Reclamation personnel met with USGS personnel to observe and discuss remote-sensing applications used to detect PIT tags implanted in native sucker species in Upper Klamath Lake and its tributaries. Applications were of two basic types. Multi-channel arrays were deployed in the Sprague River with capabilities for PIT-tag detection across an entire stream channel (stream widths in excess of 15 meters), and smaller ($<1$ $m^2$), single-channel arrays were deployed on spawning grounds in Upper Klamath Lake. Conditions and substrate are very similar to RASU spawning areas on Lake Mohave and for pilot study purposes, the single channel detection system was selected. A flat plate antenna was acquired and tested at WBNFH for detection of PIT tags implanted in a cohort of 20 adult RASU. Contact data was successfully logged and downloaded. This technique was promising enough that a research work task was put together to be implemented in FY07 (C23).

**FY07 Activities:** An external science review of the strategy for implementing the conservation measures for avian species will be initiated. Current and proposed activities will be evaluated and recommendations for increasing overall program efficiency will be made.

Three weeks have been dedicated during the RASU spawning period to test, analyze, and refine remote sensing techniques. Reclamation's helicopter will be used to take aerial photography during the second and fourth week of February. During this same period the spawning community will be surveyed by boat surface counts and electrofishing. These data will be compared to data from standard mark/recapture protocols using electrofishing for accuracy, cost, and overall impact and the least favorable survey method will be discontinued. An annual report will be written during the summer of FY07.

**Proposed FY08 Activities:** The avian program review will be completed and results will be published in refereed outlets. Based on the outcome of the remote sensing work for RASU monitoring from FY07, a final monitoring protocol will be developed, further tested, and refined. A final report will be written in FY08 presenting the outcome of these tests in terms of estimating population trends, cost, and overall impact to the resource.

**Pertinent Reports:** A draft progress report, *Development of remote sensing techniques to monitor relative abundance of razorback sucker found between Hoover and Parker Dams,* is under review and will be posted to the LCR MSCP web site.

## Work Task G4: Science/Adaptive Management Strategy

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $173,000 | $82,870 | $82,870 | $100,000 | $20,000 | $20,000 | $20,000 |

**Contact:** John Swett, (702) 293-8574, jswett@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY55

**Long-term Goal:** Ensure successful and efficient implementation of the LCR MSCP conservation measures.

**Conservation Measures:** All conservation measures dealing with habitat creation, species research, system monitoring, and fish augmentation.

**Location:** LCR MSCP planning area

**Purpose:** Define the process for implementing the LCR MSCP using the best available science and adaptive management processes.

**Connections with Other Work Tasks (past and future):** All science-based work tasks.

**Project Description:** A draft science strategy was developed in FY06 that defines processes for ensuring LCR MSCP implementation using the best available science. This strategy includes processes for planning, adaptive management, status review, implementation elements, and monitoring and research plans. Annual meeting or workshops will be held to provide a forum for interested parties to discuss natural resource conservation along the LCR, especially LCR MSCP implementation.

During FY07, a 5-year monitoring and research priorities report will be completed, outlining priorities for FY08-FY12. It is anticipated that an interim workshop will be held in FY10, highlighting ongoing research and monitoring activities.

The LCR MSCP will rear and stock some 1.2 million native fishes. Roughly 10% of these fish are to be released over a 5-year period to allow for extensive research and monitoring. These releases are targeted to begin in 2011 and run through 2016. The associated research and monitoring program will also commence in 2011; however, the studies may continue through 2019 if necessary. During summer 2007, Reclamation will develop a science advisory panel consisting of fishery scientists familiar with RASU and DONY life history and ecology. The panel will convene quarterly during 2008 and 2009 to develop and prioritize a multi-year research and monitoring program to coincide with fish releases. During 2010, Reclamation will

organize, coordinate, and finalize study plans and scopes of work necessary to begin this research program in 2011 in concert with the accelerated native fish stockings.

**Previous Activities:** None

**FY06 Accomplishments:** A draft science strategy was developed. It is anticipated that this science strategy will be in draft form for approximately 1 year, after which it will be revised and finalized. In January 2006, the first annual Colorado River terrestrial and riparian ecosystem (CRITER) meeting was held to discuss research and monitoring of terrestrial, riparian, and marsh wildlife and their habitats along the LCR.

**FY07 Activities:** The draft science strategy will be revised and finalized. The 5-year monitoring and research priorities for FY08-12 will be developed. A fisheries science advisory panel will be organized to evaluate RASU and BONY life history and ecology.

The second annual CRITER meeting was held in January 2007. In conjunction with the meeting, discussions were held on SWFL and YBCU research and monitoring along the LCR.

**Proposed FY08 Activities:** The final science strategy will be implemented. Additional informational meetings, including CRITER, will be held. Quarterly meetings of the fisheries advisory panel will be convened to develop and prioritize monitoring and research programs in advance of expected large-scale RASU and BONY stocking efforts.

**Pertinent Reports:** The *Draft Final Science Strategy* is posted on the LCR MSCP Web site.

## Work Task G5: Public Outreach

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $35,000 | $8,789 | $8,789 | $35,000 | $35,000 | $35,000 | $35,000 |

**Contact:** Laura Vecerina, (702) 293-8540, lvecerina@lc.usbr.gov

**Start Date:** FY05

**Expected Duration:** FY55

**Long-term Goal:** To increase education and support for the LCR MSCP.

**Conservation Measures:** N/A

**Location:** N/A

**Purpose:** To define and establish outreach programs to increase public awareness.

**Connections with Other Work Tasks (past and future):** N/A

**Project Description:** To develop both short- and long-term outreach goals for LCR MSCP. To communicate, coordinate, and educate LCR MSCP Steering Committee members, internal and external stakeholders, and the general public about LCR MSCP implementation activities

**Previous Activities:** An LCR MSCP Web site was established, and a Farmers Advisory Board was developed.

**FY06 Accomplishments:** Reclamation formed a core outreach group, consisting of representatives from Reclamation and the Steering Committee. This group met frequently to develop and implement short- and long-term outreach goals. For short-term goals, the group updated the LCR MSCP logo and developed a standardized banner that will be used in various outreach materials. In the short term, the group developed a standard LCR MSCP report cover for publication that reflects the partnership aspect of the program.

For long-term goals, the core group helped develop a questionnaire to identify LCR MSCP outreach goals. This questionnaire was used to guide two focus group meetings: one that was held with Reclamation staff in March 2006, and another for the Steering Committee Work Group in April 2006. Information from those focus group meetings will be used to develop an outreach strategy for the program.

In addition, the core group helped to create a new display unit for the LCR MSCP, which was used at the 2006 Colorado River Water Users Conference. Along with the display, life size

cottonwood and willow trees, table runners, logo pens and notepads, and revised program fact sheets were added.

**FY07 Activities:** One of the recommendations from the focus group meetings held in FY06 was that the content of the Reclamation Web site needed to be expanded to offer information for interested stakeholders and the general public. Reclamation and the core group will redesign the Web site to include the new partnership look and add more lay-friendly information to the site. Reclamation will also continue to develop fact sheets and conference materials for specific aspects of the program. In addition, information and photos of the covered species will be obtained for various uses.

**Proposed FY08 Activities:** Based on input from the focus group meetings, Reclamation will draft a long-term outreach strategy for the program. This strategy will then be used as a guide for continuing efforts.

**Pertinent Reports:** N/A

# WORK TASKS
# SECTION H

# EXISTING HABITAT MAINTENANCE

## Work Task H1: Existing Habitat Maintenance

| FY06 Estimates | FY06 Actual | Cumulative Accomplishment Through FY06 | FY07 Approved Estimate | FY08 Proposed Estimate | FY09 Proposed Estimate | FY10 Proposed Estimate |
|---|---|---|---|---|---|---|
| $541,500 | $541,500 | $541,500 | $561,000 | $593,500 | $593,500 | $593,500 |

**Contact:** Jed Blake, (702) 293-8165, jblake@lc.usbr.gov

**Start Date:** FY06

**Expected Duration:** FY15

**Long-term Goal:** Maintenance of existing habitat.

**Conservation Measures:** N/A

**Location:** Lower Colorado River (reaches 1-7)

**Purpose:** Maintain existing habitat areas by implementing actions that will prevent the further degradation or loss of habitat.

**Connections with Other Work Tasks (past and future):** N/A

**Project Description:** The LCR MSCP will contribute to maintaining the condition of a portion of important existing habitat for southwestern willow flycatcher, yellow-billed cuckoo, Yuma clapper rail, and California black rail within the LCR MSCP planning area. Maintaining important existing habitat areas is necessary to help ensure the continued existence of these species, provide source populations, and mitigate adverse affects of ongoing and future covered actions.

**Previous Activities:** This is a new start in FY06.

**FY06 Accomplishments:** A total of $541,500 was deposited into interest bearing accounts among the Arizona, California, and Nevada partners.

**FY07 Activities:** A total of $561,000 was deposited into interest bearing accounts among Arizona, California, and Nevada partners.

**Proposed FY08 Activities:** A total of $593,500 is expected to be deposited into the three non-Federal interest bearing accounts.

**Pertinent Reports:** N/A

# Appendix A. Letter from Central Arizona Water Conservation District

CAP
CENTRAL ARIZONA PROJECT

P.O. Box 43020 • Phoenix, AZ 85080-3020
23636 North Seventh Street • Phoenix, AZ 85024
623-869-2333 • www.cap-az.com

May 15, 2007

Joseph A. Vanderhorst
Deputy General Counsel
Metropolitan Water District of Southern California
P.O. Box 54153
Los Angles, CA 90054-0153

Christopher S. Harris
Environmental Program Manager
Colorado River Board of California
770 Fairmont Avenue, Suite 100
Glendale, CA 91203-1035

Phillip S. Lehr
Environmental Program Manager
Colorado River Commission of Nevada
555 E. Washington Ave., Suite 3100
Las Vegas, NV 89101

Gentlemen:

For the Federal Fiscal Year 2008, the Non-Federal share, both annually and quarterly by state are detailed in this letter. The inflation index used is 1.187.

| | |
|---|---|
| FY 2008 Non-Federal Share (2003 $) | $5,607,000 |
| FY 2008 Inflation Index | 1.187 |
| FY 2008 Non-Federal Share (Escalated $) | $6,655,509 |

| FY 2008 Non-Federal Payments | Existing Habitat Maintenance | Balance | Total |
|---|---|---|---|
| Arizona (10% of Non-Federal Share) | $148,375.00 | $ 517,175.90 | $ 665,550.90 |
| Nevada (32.5% of Non-Federal Share) | 148,375.00 | 2,014,665.43 | 2,163,040.43 |
| California (57.5% of Non-Federal Share) | 296,750.00 | 3,530,167.67 | 3,826,917.67 |
| Total | $593,500.00 | $6,062,009.00 | $6,655,509.00 |

| FY 2008 Quarterly Payments | | Existing Habitat Maintenance | Balance | Total |
|---|---|---|---|---|
| Arizona | Q1 | $ 37,093.75 | $ 129,293.98 | $ 166,387.73 |
| | Q2 | 37,093.75 | 129,293.98 | 166,387.73 |
| | Q3 | 37,093.75 | 129,293.98 | 166,387.73 |
| | Q4 | 37,093.75 | 129,293.96 | 166,387.71 |
| Nevada | Q1 | $ 37,093.75 | $ 503,666.36 | $ 540,760.11 |
| | Q2 | 37,093.75 | 503,666.36 | 540,760.11 |
| | Q3 | 37,093.75 | 503,666.36 | 540,760.11 |
| | Q4 | 37,093.75 | 503,666.35 | 540,760.10 |
| California | Q1 | $ 74,187.50 | $ 882,541.92 | $ 956,729.42 |
| | Q2 | 74,187.50 | 882,541.92 | 956,729.42 |
| | Q3 | 74,187.50 | 882,541.92 | 956,729.42 |
| | Q4 | 74,187.50 | 882,541.91 | 956,729.41 |

Please note that some of the quarterly amounts are not exactly equal due to annual numbers that are not divisible by four.

If you have any questions, please call or e-mail either Dana Medlock, 623-869-2148 (dmedlock@cap-az.com) or myself, 623-869-2167 (tcooke@cap-az.com).

Sincerely,

T Cooke

Theodore Cooke
Central Arizona Project
Assistant General Manager
Finance and Information Technologies

Attachments

Cc Lorri Gray, MSCP Program Manager, Bureau of Reclamation
Jackie Brown, Financial Analysis and Planning Manager, CAP
Dana Medlock, Senior Financial Analyst, CAP

## Section 8.1.1 - Fiscal Year 2008 Inflation Calculation for Lower Colorado River Multi-Species Conservation Program

| Item | | Description / Formula | | Values | | Result |
|---|---|---|---|---|---|---|
| FY | = | Federal Fiscal Year Being Adjusted for Inflation | | 2008 | | 2008 |
| FY-2 | = | Federal Fiscal Year for 2 years prior to Federal Fiscal Year Being Adjusted for Inflation | | 2006 | | 2006 |
| PPI Inflation Index for FY | = | Producer Price Index for Materials and Components for Const Sept FY-4 / Producer Price Index for Materials and Components for Const Sept 2002 | = | 191/ 152.1 | = | 1.2560 |
| | | | | | | |
| | | | | | | |
| GDPIP Inflation Index for FY | = | Gross Domestic Product Implicit Price Deflator September 30, FY-4 / Gross Domestic Product Implicit Price Deflator September 30, 2002 | | 116.420 / 104.243 | = | 1.1170 |
| | | | | | | |
| Inflation Index for FY | = | (PPI Inflation Index for FY + GDPIP inflation Index for FY)/2 | | (1.256+1.117)/2 | = | 1.187 |
| | | | | | | |
| | | | | | | |
| Non-Federal Funding Obligation for FY | = | (5 - year Amount from Table 7-1 of HCP 2003 dollars adjusted to yearly amount)/2 | = | $56,070 / 5 = $11,214 $11,214 / 2 | = | $5,607 |
| Federal Funding Obligation for FY | = | (5 - year Amount from Table 7-1 of HCP 2003 dollars adjusted to yearly amount)/2 | = | $56,070 / 5 / 2 | = | $5,607 |
| Non-Federal Indexed Funding Obligation for FY | = | (Non-Federal Funding Obligation for FY) X (Inflation Index for FY) | | $5,607 X 1.1187 | = | $6,655.509 |
| Federal Indexed Funding Obligation for FY | = | (Federal Funding Obligation for FY) X (Inflation Index for FY) | | $5,607 X 1.1187 | = | $6,655.509 |

All $ are in thousands

| Individual State's share in $ | | | | |
|---|---|---|---|---|
| California Share | | 50.00% | | $3,327,754.50 |
| Arizona Share | | 25.00% | | $1,663,877.25 |
| Nevada Share | | 25.00% | | $1,663,877.25 |
| Total Non-Federal Share | | | | $6,655,509.00 |

| Adjusted Split in Individual State Shares | | |
|---|---|---|
| California - 57.5% | 57.5% | $3,826,917.68 |
| Arizona - 10% | 10% | $665,550.90 |
| Nevada - 32.5% | 32.5% | $2,163,040.43 |
| Total Non-Federal Share | 100% | $6,655,509.00 |

## Fiscal Year 2008 Lower Colorado River Multi-Species Program Funding, Indexing and Inflation Adjusted Changes in Funding (Actual Indices through September 2006)

| | | | | | | | | | Program in 9/2002 $ (Table 7-1 of HCP) | | | Program in Indexed $ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sept/FY | Estimated Annual Inflation GDP | Estimated Annual Inflation PPI | Gross Domestic Product Index | GDP Inflation Index | Producer Price Index | PPI Inflation Index | Composite Inflation Index | Total | Federal | Non-Federal | Indexed Total | Indexed Federal | Indexed Non-Federal |
| row | col (a) | col (b) | col (c) | col (d) | col (e) | col (f) | col (g) | col (h) | col (i) | col (j) | col (k) | col (l) | col (m) | col (n) |
| 1 | | | | | d3/d2 =e3 | | f3/f2 =g3 | (e3+g3)/2 =h3 | | | | | j6*h4 =m6 | k6*h4 =n6 |
| 2 | 2002 | Actual | Actual | 104.243 | 1.000 | 152.100 | 1.000 | 1.000 | | | | | | |
| 3 | 2003 | Actual | Actual | 106.148 | 1.018 | 155.000 | 1.019 | 1.019 | | | | | | |
| 4 | 2004 | Actual | Actual | 108.482 | 1.041 | 170.900 | 1.124 | 1.083 | | | | | | |
| 5 | 2005 | Actual | Actual | 112.527 | 1.079 | 177.000 | 1.164 | 1.122 | | | | | | |
| 6 | 2006 | Actual | Actual | 116.420 | 1.117 | 191.000 | 1.256 | 1.187 | 11,214 | 5,607 | 5,607 | 12,145 | 6,072 | 6,072 |
| 7 | 2007 | 3.0% | 3.5% | 119.913 | 1.150 | 197.685 | 1.300 | 1.225 | 11,214 | 5,607 | 5,607 | 12,582 | 6,291 | 6,291 |
| 8 | 2008 | 3.0% | 3.5% | 123.510 | 1.185 | 204.604 | 1.345 | 1.265 | 11,214 | 5,607 | 5,607 | 13,311 | 6,656 | 6,656 |
| 9 | 2009 | 3.0% | 3.5% | 127.215 | 1.220 | 211.765 | 1.392 | 1.306 | 11,214 | 5,607 | 5,607 | 13,737 | 6,869 | 6,869 |
| 10 | 2010 | 3.0% | 3.5% | 131.032 | 1.257 | 219.177 | 1.441 | 1.349 | 11,214 | 5,607 | 5,607 | 14,186 | 7,093 | 7,093 |
| 11 | 2011 | 3.0% | 3.5% | 134.963 | 1.295 | 226.848 | 1.491 | 1.393 | 27,540 | 13,770 | 13,770 | 35,967 | 17,984 | 17,984 |
| 12 | 2012 | 3.0% | 3.5% | 139.012 | 1.334 | 234.788 | 1.544 | 1.439 | 27,540 | 13,770 | 13,770 | 37,151 | 18,576 | 18,576 |
| 13 | 2013 | 3.0% | 3.5% | 143.182 | 1.374 | 243.005 | 1.598 | 1.486 | 27,540 | 13,770 | 13,770 | 38,363 | 19,182 | 19,182 |
| 14 | 2014 | 3.0% | 3.5% | 147.477 | 1.415 | 251.511 | 1.654 | 1.535 | 27,540 | 13,770 | 13,770 | 39,630 | 19,815 | 19,815 |
| 15 | 2015 | 3.0% | 3.5% | 151.902 | 1.457 | 260.313 | 1.711 | 1.584 | 27,540 | 13,770 | 13,770 | 40,924 | 20,462 | 20,462 |
| 16 | 2016 | 3.0% | 3.5% | 156.459 | 1.501 | 269.424 | 1.771 | 1.636 | 22,164 | 11,082 | 11,082 | 34,022 | 17,011 | 17,011 |
| 17 | 2017 | 3.0% | 3.5% | 161.153 | 1.546 | 278.854 | 1.833 | 1.690 | 22,164 | 11,082 | 11,082 | 35,108 | 17,554 | 17,554 |
| 18 | 2018 | 3.0% | 3.5% | 165.987 | 1.592 | 288.614 | 1.898 | 1.745 | 22,164 | 11,082 | 11,082 | 36,260 | 18,130 | 18,130 |
| 19 | 2019 | 3.0% | 3.5% | 170.967 | 1.640 | 298.716 | 1.964 | 1.802 | 22,164 | 11,082 | 11,082 | 37,457 | 18,729 | 18,729 |
| 20 | 2020 | 3.0% | 3.5% | 176.096 | 1.689 | 309.171 | 2.033 | 1.861 | 22,164 | 11,082 | 11,082 | 38,676 | 19,338 | 19,338 |
| 21 | 2021 | 3.0% | 3.5% | 181.379 | 1.740 | 319.992 | 2.104 | 1.922 | 19,982 | 9,991 | 9,991 | 36,008 | 18,004 | 18,004 |
| 22 | 2022 | 3.0% | 3.5% | 186.820 | 1.792 | 331.191 | 2.177 | 1.985 | 19,982 | 9,991 | 9,991 | 37,187 | 18,593 | 18,593 |
| 23 | 2023 | 3.0% | 3.5% | 192.425 | 1.846 | 342.783 | 2.254 | 2.050 | 19,982 | 9,991 | 9,991 | 38,405 | 19,203 | 19,203 |
| 24 | 2024 | 3.0% | 3.5% | 198.197 | 1.901 | 354.780 | 2.333 | 2.117 | 19,982 | 9,991 | 9,991 | 39,664 | 19,832 | 19,832 |
| 25 | 2025 | 3.0% | 3.5% | 204.143 | 1.958 | 367.198 | 2.414 | 2.186 | 19,982 | 9,991 | 9,991 | 40,963 | 20,482 | 20,482 |
| 26 | 2026 | 3.0% | 3.5% | 210.267 | 2.017 | 380.050 | 2.499 | 2.258 | 8,144 | 4,072 | 4,072 | 17,241 | 8,620 | 8,620 |
| 27 | 2027 | 3.0% | 3.5% | 216.575 | 2.078 | 393.351 | 2.586 | 2.332 | 8,144 | 4,072 | 4,072 | 17,803 | 8,901 | 8,901 |
| 28 | 2028 | 3.0% | 3.5% | 223.073 | 2.140 | 407.119 | 2.677 | 2.409 | 8,144 | 4,072 | 4,072 | 18,389 | 9,195 | 9,195 |
| 29 | 2029 | 3.0% | 3.5% | 229.765 | 2.204 | 421.368 | 2.770 | 2.487 | 8,144 | 4,072 | 4,072 | 18,992 | 9,496 | 9,496 |
| 30 | 2030 | 3.0% | 3.5% | 236.658 | 2.270 | 436.116 | 2.867 | 2.568 | 8,144 | 4,072 | 4,072 | 19,619 | 9,809 | 9,809 |
| 31 | 2031 | 3.0% | 3.5% | 243.758 | 2.338 | 451.380 | 2.968 | 2.653 | 7,500 | 3,750 | 3,750 | 18,653 | 9,326 | 9,326 |
| 32 | 2032 | 3.0% | 3.5% | 251.070 | 2.409 | 467.178 | 3.072 | 2.741 | 7,500 | 3,750 | 3,750 | 19,268 | 9,634 | 9,634 |
| 33 | 2033 | 3.0% | 3.5% | 258.602 | 2.481 | 483.529 | 3.179 | 2.830 | 7,500 | 3,750 | 3,750 | 19,898 | 9,949 | 9,949 |
| 34 | 2034 | 3.0% | 3.5% | 266.361 | 2.555 | 500.453 | 3.290 | 2.923 | 7,500 | 3,750 | 3,750 | 20,558 | 10,279 | 10,279 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 2035 | 3.0% | 3.5% | 274,351 | 2.632 | 517,969 | 3.405 | 3.019 | 7,500 | 3,750 | 3,750 | 21,225 | 10,613 | 10,613 |
| 36 | 2036 | 3.0% | 3.5% | 282,582 | 2.711 | 536,098 | 3.525 | 3.118 | 7,173 | 3,587 | 3,587 | 20,967 | 10,483 | 10,483 |
| 37 | 2037 | 3.0% | 3.5% | 291,059 | 2.792 | 554,861 | 3.648 | 3.220 | 7,173 | 3,587 | 3,587 | 21,655 | 10,828 | 10,828 |
| 38 | 2038 | 3.0% | 3.5% | 299,791 | 2.876 | 574,281 | 3.776 | 3.325 | 7,173 | 3,587 | 3,587 | 22,365 | 11,183 | 11,183 |
| 39 | 2039 | 3.0% | 3.5% | 308,785 | 2.962 | 594,381 | 3.908 | 3.435 | 7,173 | 3,587 | 3,587 | 23,097 | 11,549 | 11,549 |
| 40 | 2040 | 3.0% | 3.5% | 318,048 | 3.051 | 615,184 | 4.045 | 3.548 | 7,173 | 3,587 | 3,587 | 23,857 | 11,929 | 11,929 |
| 41 | 2041 | 3.0% | 3.5% | 327,590 | 3.143 | 636,716 | 4.186 | 3.665 | 7,173 | 3,587 | 3,587 | 24,639 | 12,320 | 12,320 |
| 42 | 2042 | 3.0% | 3.5% | 337,418 | 3.237 | 659,001 | 4.333 | 3.785 | 7,173 | 3,587 | 3,587 | 25,450 | 12,725 | 12,725 |
| 43 | 2043 | 3.0% | 3.5% | 347,540 | 3.334 | 682,066 | 4.484 | 3.909 | 7,173 | 3,587 | 3,587 | 26,289 | 13,145 | 13,145 |
| 44 | 2044 | 3.0% | 3.5% | 357,966 | 3.434 | 705,938 | 4.641 | 4.038 | 7,173 | 3,587 | 3,587 | 27,150 | 13,575 | 13,575 |
| 45 | 2045 | 3.0% | 3.5% | 368,705 | 3.537 | 730,646 | 4.804 | 4.171 | 7,173 | 3,587 | 3,587 | 28,039 | 14,020 | 14,020 |
| 46 | 2046 | 3.0% | 3.5% | 379,766 | 3.643 | 756,219 | 4.972 | 4.308 | 7,173 | 3,587 | 3,587 | 28,965 | 14,482 | 14,482 |
| 47 | 2047 | 3.0% | 3.5% | 391,159 | 3.752 | 782,686 | 5.146 | 4.449 | 7,173 | 3,587 | 3,587 | 29,919 | 14,959 | 14,959 |
| 48 | 2048 | 3.0% | 3.5% | 402,894 | 3.865 | 810,080 | 5.326 | 4.596 | 7,173 | 3,587 | 3,587 | 30,901 | 15,451 | 15,451 |
| 49 | 2049 | 3.0% | 3.5% | 414,981 | 3.981 | 838,433 | 5.512 | 4.747 | 7,173 | 3,587 | 3,587 | 31,913 | 15,956 | 15,956 |
| 50 | 2050 | 3.0% | 3.5% | 427,430 | 4.100 | 867,778 | 5.705 | 4.903 | 7,173 | 3,587 | 3,587 | 32,967 | 16,484 | 16,484 |
| 51 | 2051 | 3.0% | 3.5% | 440,253 | 4.223 | 898,150 | 5.905 | 5.064 | 7,173 | 3,587 | 3,587 | 34,050 | 17,025 | 17,025 |
| 52 | 2052 | 3.0% | 3.5% | 453,461 | 4.350 | 929,586 | 6.112 | 5.231 | 7,173 | 3,587 | 3,587 | 35,169 | 17,585 | 17,585 |
| 53 | 2053 | 3.0% | 3.5% | 467,065 | 4.481 | 962,121 | 6.326 | 5.404 | 7,173 | 3,587 | 3,587 | 36,324 | 18,162 | 18,162 |
| 54 | 2054 | 3.0% | 3.5% | 481,077 | 4.615 | 995,795 | 6.547 | 5.581 | 7,173 | 3,587 | 3,587 | 37,522 | 18,761 | 18,761 |
| 55 | 2055 | 3.0% | 3.5% | 495,509 | 4.753 | 1,030,648 | 6.776 | 5.765 | 7,173 | 3,587 | 3,587 | 38,763 | 19,381 | 19,381 |
| | Total | | | | | | | | **626,180** | **313,090** | **313,090** | **1,403,392** | **701,696** | **701,696** |

**MSCP**
**Habitat Maintenance Account**

| Per Table 7-1 of the HCP | |
|---|---|
| | Years 1-5 |
| Existing Habitat Maintenance Cost | 2,500,000 |
| Total Cost | 56,070,000 |
| Percent of Existing Habitat Cost to Total Cost | 4.458712323880860% |

| | FY 2006 | FY 2007 | FY 2008 |
|---|---|---|---|
| Total Annual Funding Commitment | $ 12,144,762.00 | $ 12,582,108.00 | $ 13,311,018.00 |
| X Existing Habitat Percentage Above | 4.458712323880860% | 4.458712323880860% | 4.458712323880860% |
| Existing Habitat Maintenace Cost | $ 541,500.00 | $ 561,000.00 | $ 593,500.00 |
| Arizona - 25% | $ 135,375.00 | $ 140,250.00 | $ 148,375.00 |
| Nevada - 25% | 135,375.00 | 140,250.00 | 148,375.00 |
| California - 50% | 270,750.00 | 280,500.00 | 296,750.00 |
| Total Existing Habitat Maintenance Cost | $ 541,500.00 | $ 561,000.00 | $ 593,500.00 |

# Appendix B. Description of Take

AZ PROVISIONAL DATA -- PROVISIONAL DATA -- PROVISIONAL DATA -- PROVISIONAL DATA -- PROVISIONAL DATA -- PROVISIONAL DATA -- PROVISIONAL DATA -- PROVISIONAL DATA

DIVERSIONS FROM MAINSTREAM-AVAILABLE RETURN FLOW
AND CONSUMPTIVE USE OF SUCH WATER
CALENDAR YEAR 2006
STATE OF ARIZONA

03/02/07 (ACRE-FEET)

| WATER USER | Flnts | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL 1/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAKE MEAD NAT'L RECREATION, AZ. | | | | | | | | | | | | | | | |
| DIVERSIONS FROM LAKE MEAD | | DIVERSION | 2 | 3 | 3 | 6 | 10 | 11 | 12 | 13 | 15 | 9 | 5 | 3 | 92 |
| (TEMPLE BAR) | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 2 | 3 | 3 | 6 | 10 | 11 | 12 | 13 | 15 | 9 | 5 | 3 | 92 |
| LAKE MEAD NAT'L RECREATION, AZ. | | | | | | | | | | | | | | | |
| DIVERSIONS FROM LAKE MOHAVE | | DIVERSION | 10 | 12 | 15 | 14 | 20 | 25 | 30 | 32 | 22 | 21 | 13 | 12 | 226 |
| (KATHERINE, WILLOW BEACH) | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 10 | 12 | 15 | 14 | 20 | 25 | 30 | 32 | 22 | 21 | 13 | 12 | 226 |
| LOWER COLORADO RIVER DAMS PROJECT | | | | | | | | | | | | | | | |
| DIVERSION AT DAVIS DAM | | DIVERSION | 1 | 2 | 2 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 6 | 4 | 44 |
| | | MEAS. RETURNS | 1 | 2 | 2 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 6 | 3 | 43 |
| | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| BULLHEAD CITY | | | | | | | | | | | | | | | |
| PUMPED FROM WELLS | | DIVERSION | 779 | 760 | 802 | 843 | 1,018 | 1,121 | 1,189 | 1,313 | 1,021 | 1,092 | 779 | 774 | 11,491 |
| DIV. AT DAVIS DAM, MOHAVE CO. PARKS | | DIVERSION | 8 | 6 | 7 | 9 | 11 | 12 | 9 | 11 | 9 | 6 | 6 | 7 | 101 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 260 | 253 | 267 | 281 | 340 | 374 | 395 | 437 | 340 | 362 | 259 | 258 | 3,826 |
| | | CONSUMPTIVE USE | 527 | 513 | 542 | 571 | 689 | 759 | 803 | 887 | 690 | 736 | 526 | 523 | 7,766 |
| MOHAVE WATER CONSERVATION DIST. | | | | | | | | | | | | | | | |
| PUMPED FROM WELLS | | DIVERSION | 73 | 71 | 76 | 72 | 96 | 101 | 93 | 101 | 101 | 75 | 80 | 57 | 996 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 24 | 23 | 25 | 24 | 32 | 33 | 31 | 33 | 33 | 25 | 26 | 19 | 328 |
| | | CONSUMPTIVE USE | 49 | 48 | 51 | 48 | 64 | 68 | 62 | 68 | 68 | 50 | 54 | 38 | 668 |
| BROOKE WATER LLC | | | | | | | | | | | | | | | |
| PUMPED FROM RIVER | | DIVERSION | 33 | 38 | 37 | 32 | 40 | 41 | 47 | 48 | 43 | 36 | 34 | 30 | 459 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 11 | 13 | 12 | 11 | 13 | 14 | 16 | 16 | 14 | 12 | 11 | 10 | 153 |
| | | CONSUMPTIVE USE | 22 | 25 | 25 | 21 | 27 | 27 | 31 | 32 | 29 | 24 | 23 | 20 | 306 |
| MOHAVE VALLEY I.D.D. | | | | | | | | | | | | | | | |
| PUMPED FROM WELLS | | DIVERSION | 1,057 | 1,992 | 2,428 | 3,274 | 3,239 | 6,580 | 4,139 | 3,514 | 4,042 | 2,336 | 1,966 | 1,574 | 36,141 |
| PUMPED FROM TOPOCK MARSH INLET | | DIVERSION | | | | | | | | | | | | | |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 486 | 916 | 1,117 | 1,506 | 1,490 | 3,027 | 1,904 | 1,616 | 1,859 | 1,075 | 904 | 724 | 16,624 |
| | | CONSUMPTIVE USE | 571 | 1,076 | 1,311 | 1,768 | 1,749 | 3,553 | 2,235 | 1,898 | 2,183 | 1,261 | 1,062 | 850 | 19,517 |
| FORT MOJAVE INDIAN RESERVATION | | | | | | | | | | | | | | | |
| | 2/ | DIVERSION | | | | | | | | | | | | | 0 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GOLDEN SHORES WATER CONSERVATION DIST | | | | | | | | | | | | | | | |
| PUMPED FROM WELLS | 3/ | DIVERSION | 23 | 27 | 37 | 40 | 50 | 60 | 66 | 63 | 50 | 42 | 28 | 29 | 515 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 8 | 9 | 12 | 13 | 17 | 20 | 22 | 21 | 17 | 14 | 9 | 10 | 172 |
| | | CONSUMPTIVE USE | 15 | 18 | 25 | 27 | 33 | 40 | 44 | 42 | 33 | 28 | 19 | 19 | 343 |
| HAVASU NATIONAL WILDLIFE REFUGE | | | | | | | | | | | | | | | |
| TOPOCK MARSH INLET | 4/ | DIVERSION | 656 | 1,180 | 2,972 | 5,558 | 5,544 | 4,879 | 3,115 | 2,165 | 1,405 | 917 | 92 | 88 | 28,571 |
| FARM DITCH | | DIVERSION | 161 | 220 | 694 | 1,166 | 1,103 | 1,121 | 781 | 563 | 585 | 444 | 65 | 92 | 6,995 |
| PUMPED FROM ONE WELL IN THE FLOODPLAIN | 3/ | DIVERSION | 10 | 11 | 15 | 17 | 20 | 25 | 27 | 26 | 20 | 17 | 12 | 12 | 212 |
| | | MEAS. RETURNS | 13 | 11 | 10 | 6 | 0 | 0 | 0 | 0 | 11 | 6 | 0 | 0 | 57 |
| | | UNMEAS. RETURNS | 716 | 1,232 | 3,230 | 5,927 | 5,867 | 5,302 | 3,452 | 2,424 | 1,759 | 1,207 | 149 | 159 | 31,434 |
| | | CONSUMPTIVE USE | 98 | 168 | 441 | 808 | 800 | 723 | 471 | 330 | 240 | 165 | 20 | 23 | 4,287 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ LAKE HAVASU I.D.D. (CITY) | | | | | | | | | | | | | | | |
| AZ DISTRICT PUMPED FROM WELLS | | DIVERSION | 954 | 889 | 963 | 1,230 | 1,458 | 1,473 | 1,399 | 1,213 | 1,284 | 1,204 | 1,236 | 1,230 | 14,533 |
| AZ | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | UNMEAS. RETURNS | 363 | 338 | 366 | 467 | 554 | 560 | 532 | 461 | 488 | 458 | 470 | 467 | 5,524 |
| AZ | | CONSUMPTIVE USE | 591 | 551 | 597 | 763 | 904 | 913 | 867 | 752 | 796 | 746 | 766 | 763 | 9,009 |
| AZ CENTRAL ARIZONA PROJECT | | | | | | | | | | | | | | | |
| AZ PUMPED FROM LAKE HAVASU | | DIVERSION | 153,116 | 127,155 | 98,360 | 165,989 | 175,473 | 181,764 | 77,139 | 47,001 | 137,033 | 180,894 | 119,181 | 154,049 | 1,617,154 |
| WATER DIVERTED TO STORAGE FOR SNWA | 14/ | DIVERSION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| AZ | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | CONSUMPTIVE USE | 153,116 | 127,155 | 98,360 | 165,989 | 175,473 | 181,764 | 77,139 | 47,001 | 137,033 | 180,894 | 119,181 | 154,049 | 1,617,154 |
| AZ TOWN OF PARKER | | | | | | | | | | | | | | | |
| AZ PUMPED FROM 1 MUNICIPAL WELL | 5/ | DIVERSION | 50 | 51 | 54 | 66 | 91 | 97 | 107 | 103 | 84 | 74 | 63 | 53 | 893 |
| AZ | | MEAS. RETURNS | 23 | 20 | 23 | 23 | 22 | 20 | 25 | 22 | 19 | 20 | 20 | 20 | 257 |
| AZ | | UNMEAS. RETURNS | 14 | 15 | 15 | 19 | 26 | 28 | 30 | 29 | 24 | 21 | 18 | 15 | 254 |
| AZ | | CONSUMPTIVE USE | 13 | 16 | 16 | 24 | 43 | 49 | 52 | 52 | 41 | 33 | 25 | 18 | 382 |
| AZ COLORADO RIVER INDIAN RESERVATION | | | | | | | | | | | | | | | |
| AZ DIVERSION AT HEADGATE ROCK DAM | | DIVERSION | 26,330 | 31,510 | 45,700 | 56,700 | 74,160 | 72,640 | 76,640 | 69,220 | 51,520 | 36,920 | 26,510 | 32,280 | 600,130 |
| AZ 2 PUMPS AND MUNICIPAL | 6/ | DIVERSION | 6 | 6 | 6 | 12 | 11 | 9 | 8 | 9 | 7 | 6 | 6 | 7 | 93 |
| AZ | | MEAS. RETURNS | 19,041 | 17,692 | 22,740 | 23,077 | 25,688 | 26,534 | 29,934 | 20,110 | 24,497 | 22,825 | 19,007 | 19,919 | 271,064 |
| AZ | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | CONSUMPTIVE USE | 7,295 | 13,824 | 22,966 | 33,635 | 48,483 | 46,115 | 46,714 | 49,119 | 27,030 | 14,101 | 7,509 | 12,368 | 329,159 |
| AZ EHRENBURG IMPROVEMENT ASSN. | | | | | | | | | | | | | | | |
| AZ | | DIVERSION | 32 | 26 | 29 | 34 | 45 | 50 | 52 | 45 | 46 | 47 | 39 | 30 | 475 |
| AZ | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | UNMEAS. RETURNS | 9 | 7 | 8 | 10 | 13 | 14 | 15 | 13 | 13 | 13 | 11 | 9 | 135 |
| AZ | | CONSUMPTIVE USE | 23 | 19 | 21 | 24 | 32 | 36 | 37 | 32 | 33 | 34 | 28 | 21 | 340 |
| AZ CIBOLA VALLEY IRRIGATION DISTRICT | | | | | | | | | | | | | | | |
| AZ CIBOLA VALLEY IRRIGATION DISTRICT | | DIVERSION | 753 | 807 | 829 | 1,180 | 1,555 | 2,116 | 1,914 | 2,196 | 1,404 | 386 | 187 | 298 | 13,625 |
| AZ MOHAVE COUNTY WATER AUTHORITY | | DIVERSION | 190 | 363 | 385 | 365 | 847 | 1,170 | 1,043 | 1,134 | 921 | 163 | 96 | 0 | 6,677 |
| AZ HOPI TRIBE | | DIVERSION | 192 | 696 | 263 | 266 | 664 | 1,177 | 1,169 | 1,092 | 920 | 110 | 89 | 168 | 6,686 |
| AZ | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | UNMEAS. RETURNS | 323 | 503 | 421 | 513 | 874 | 1,272 | 1,173 | 1,260 | 925 | 188 | 106 | 133 | 7,691 |
| AZ | | CONSUMPTIVE USE | 812 | 1,263 | 1,056 | 1,287 | 2,192 | 3,191 | 2,943 | 3,162 | 2,320 | 471 | 266 | 333 | 19,296 |
| AZ CIBOLA NATIONAL WILDLIFE REFUGE | | | | | | | | | | | | | | | |
| AZ PUMPED FROM 3 PUMPS | | DIVERSION | 632 | 549 | 1,003 | 842 | 1,263 | 1,226 | 1,503 | 950 | 1,559 | 1,137 | 1,602 | 1,039 | 13,305 |
| AZ | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | UNMEAS. RETURNS | 240 | 209 | 381 | 320 | 480 | 466 | 571 | 361 | 592 | 432 | 609 | 395 | 5,056 |
| AZ | | CONSUMPTIVE USE | 392 | 340 | 622 | 522 | 783 | 760 | 932 | 589 | 967 | 705 | 993 | 644 | 8,249 |
| AZ IMPERIAL NATIONAL WILDLIFE REFUGE | | | | | | | | | | | | | | | |
| AZ PUMPED FROM 4 PUMPS | 3/ | DIVERSION | 218 | 169 | 122 | 118 | 196 | 154 | 115 | 125 | 131 | 121 | 123 | 79 | 1,671 |
| AZ | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | UNMEAS. RETURNS | 83 | 64 | 46 | 45 | 74 | 59 | 44 | 48 | 50 | 46 | 47 | 30 | 636 |
| AZ | | CONSUMPTIVE USE | 135 | 105 | 76 | 73 | 122 | 95 | 71 | 77 | 81 | 75 | 76 | 49 | 1,035 |
| AZ YUMA PROVING GROUND | | | | | | | | | | | | | | | |
| AZ DIVERSION AT IMPERIAL DAM | | DIVERSION | 0 | 1 | 3 | 0 | 4 | 1 | 1 | 3 | 2 | 0 | 0 | 0 | 15 |
| AZ WELLS W, X, Y, Z | | DIVERSION | 19 | 22 | 19 | 60 | 89 | 128 | 95 | 94 | 89 | 42 | 27 | 29 | 713 |
| AZ | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | CONSUMPTIVE USE | 19 | 23 | 22 | 60 | 93 | 129 | 96 | 97 | 91 | 42 | 27 | 29 | 728 |
| AZ GILA MONSTER FARMS | | | | | | | | | | | | | | | |
| AZ DIVERSION AT IMPERIAL DAM | | DIVERSION | 406 | 440 | 664 | 752 | 1,225 | 1,532 | 1,485 | 891 | 617 | 713 | 552 | 335 | 9,612 |
| AZ *Use from ASLD lease has been deducted. | | MEAS. RETURNS | 40 | 7 | 77 | 33 | 34 | 38 | 85 | 19 | -8 | 21 | 45 | 11 | 402 |
| AZ | | UNMEAS. RETURNS | 154 | 167 | 252 | 286 | 466 | 582 | 564 | 339 | 234 | 271 | 210 | 127 | 3,652 |
| AZ | | CONSUMPTIVE USE | 212 | 266 | 335 | 433 | 725 | 912 | 836 | 533 | 391 | 421 | 297 | 197 | 5,558 |
| AZ WELLTON MOHAWK I. & D. D. | | | | | | | | | | | | | | | |
| AZ DIVERSION AT IMPERIAL DAM | | DIVERSION | 18,953 | 24,980 | 31,912 | 43,778 | 48,627 | 46,567 | 39,897 | 36,580 | 33,485 | 30,448 | 22,831 | 23,991 | 402,049 |
| AZ | | GGMC RETURN | 2,092 | 461 | 4,079 | 2,166 | 1,531 | 1,279 | 0 | 857 | 0 | 991 | 2,063 | 851 | 16,370 |
| AZ | | DOME RETURN | 1,000 | 1,228 | 1,046 | 984 | 596 | 317 | 378 | 0 | 621 | 497 | 360 | 528 | 7,555 |
| AZ | 7/ | MOD RETURN | 8,420 | 7,430 | 7,990 | 6,770 | 7,070 | 8,600 | 9,110 | 9,470 | 9,360 | 9,980 | 9,930 | 9,680 | 103,810 |
| AZ | | RETURNS, TOTAL | 11,512 | 9,119 | 13,115 | 9,920 | 9,197 | 10,196 | 9,488 | 10,327 | 9,981 | 11,468 | 12,353 | 11,059 | 127,735 |
| AZ | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | CONSUMPTIVE USE | 7,441 | 15,861 | 18,797 | 33,858 | 39,430 | 36,371 | 30,409 | 26,253 | 23,504 | 18,980 | 10,478 | 12,932 | 274,314 |
| AZ CITY OF YUMA | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ | DIVERSION AT IMPERIAL DAM (AAC) | | DIVERSION | 1,961 | 1,857 | 1,901 | 1,879 | 2,316 | 2,634 | 2,830 | 2,794 | 2,519 | 2,218 | 5,544 | 1,987 | 30,440 |
| AZ | DIVERSION AT IMPERIAL DAM (GILA) | | DIVERSION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | PUMP DIVERSION FOR YUMA EAST WETLANDS | | DIVERSION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | MWD DESALTING STUDY | | DIVERSION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | MEAS. RETURNS | 835 | 819 | 817 | 768 | 787 | 690 | 646 | 782 | 719 | 701 | 766 | 806 | 9,136 |
| AZ | | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | CONSUMPTIVE USE | 1,126 | 1,038 | 1,084 | 1,111 | 1,529 | 1,944 | 2,184 | 2,012 | 1,800 | 1,517 | 4,778 | 1,181 | 21,304 |
| AZ | MARINE CORPS AIR STATION (YUMA) | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | | DIVERSION | 137 | 251 | 111 | 370 | 162 | 189 | 186 | 176 | 172 | 135 | 117 | 98 | 2,104 |
| AZ | | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | CONSUMPTIVE USE | 137 | 251 | 111 | 370 | 162 | 189 | 186 | 176 | 172 | 135 | 117 | 98 | 2,104 |
| AZ | SOUTHERN PACIFIC COMPANY | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | | DIVERSION | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 48 |
| AZ | | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | UNMEAS. RETURNS | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 24 |
| AZ | | | CONSUMPTIVE USE | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 24 |
| AZ | YUMA MESA FRUIT GROWERS ASSN. | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | | DIVERSION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | UNIVERSITY OF ARIZONA | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | | DIVERSION | 58 | 32 | 28 | 56 | 66 | 83 | 0 | 0 | 0 | 0 | 0 | 0 | 323 |
| AZ | (WARREN ACT) | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | CONSUMPTIVE USE | 58 | 32 | 28 | 56 | 66 | 83 | 0 | 0 | 0 | 0 | 0 | 0 | 323 |
| AZ | YUMA UNION HIGH SCHOOL | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | | DIVERSION | 8 | 7 | 14 | 13 | 15 | 33 | 22 | 15 | 14 | 17 | 1 | 2 | 161 |
| AZ | | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | UNMEAS. RETURNS | 2 | 2 | 1 | 3 | 1 | 8 | 6 | 1 | 1 | 1 | 0 | 1 | 42 |
| AZ | | | CONSUMPTIVE USE | 6 | 5 | 10 | 10 | 11 | 25 | 16 | 11 | 10 | 13 | 1 | 1 | 119 |
| AZ | CAMILLE, ALEC. JR. | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | | DIVERSION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | (WARREN ACT) | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | DESERT LAWN MEMORIAL | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | | DIVERSION | 1 | 9 | 12 | 12 | 12 | 21 | 19 | 22 | 40 | 0 | 0 | 0 | 148 |
| AZ | | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | UNMEAS. RETURNS | 0 | 3 | 4 | 4 | 4 | 6 | 6 | 7 | 12 | 0 | 0 | 0 | 46 |
| AZ | | | CONSUMPTIVE USE | 1 | 6 | 8 | 8 | 8 | 15 | 13 | 15 | 28 | 0 | 0 | 0 | 102 |
| AZ | NORTH GILA VALLEY IRRIGATION DISTRICT | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | 8/ | DIVERSION | 2,662 | 3,284 | 3,965 | 4,044 | 5,326 | 5,023 | 4,597 | 2,638 | 3,550 | 4,764 | 3,450 | 2,878 | 46,181 |
| AZ | | | MEAS. RETURNS | 1,807 | 1,926 | 2,335 | 2,259 | 2,795 | 2,791 | 2,540 | 1,877 | 2,040 | 2,721 | 2,146 | 1,728 | 26,965 |
| AZ | | | UNMEAS. RETURNS | 365 | 450 | 543 | 554 | 730 | 688 | 630 | 361 | 486 | 653 | 473 | 394 | 6,327 |
| AZ | | | CONSUMPTIVE USE | 490 | 908 | 1,087 | 1,231 | 1,801 | 1,544 | 1,427 | 400 | 1,024 | 1,390 | 831 | 756 | 12,889 |
| AZ | YUMA IRRIGATION DISTRICT | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | 8/ | DIVERSION | 4,128 | 4,472 | 6,157 | 7,009 | 7,392 | 6,919 | 5,614 | 4,355 | 5,535 | 5,696 | 4,843 | 3,922 | 66,042 |
| AZ | PUMPED FROM PRIVATE WELLS | 9/ | DIVERSION | 47 | 58 | 81 | 172 | 352 | 239 | 161 | 155 | 251 | 139 | 210 | 67 | 1,932 |
| | | 10/ | DELIVERED BY YID | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | SURFACE RETURNS | | MEAS. RETURNS | 1,437 | 913 | 2,092 | 1,662 | 1,548 | 1,494 | 1,010 | 1,009 | 1,048 | 1,181 | 1,372 | 891 | 15,657 |
| | PUMPED FROM WELLS | 9/ | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | UNMEAS. RETURNS | 889 | 965 | 1,329 | 1,530 | 1,649 | 1,525 | 1,230 | 961 | 1,232 | 1,243 | 1,076 | 850 | 14,479 |
| AZ | | | CONSUMPTIVE USE | 1,849 | 2,652 | 2,817 | 3,989 | 4,547 | 4,139 | 3,535 | 2,540 | 3,506 | 3,411 | 2,605 | 2,248 | 37,838 |
| AZ | YUMA MESA I. D. D. | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | 8/ | DIVERSION | 10,000 | 8,675 | 13,529 | 14,843 | 23,024 | 24,350 | 21,860 | 24,623 | 16,415 | 13,405 | 10,994 | 8,762 | 190,480 |
| AZ | | | MEAS. RETURNS | 5,756 | 5,672 | 6,968 | 6,865 | 5,506 | 4,288 | 5,106 | 6,879 | 4,290 | 3,052 | 3,461 | 2,699 | 60,542 |
| AZ | | | UNMEAS. RETURNS | 1,600 | 1,388 | 2,165 | 2,375 | 3,684 | 3,896 | 3,498 | 3,940 | 2,626 | 2,145 | 1,759 | 1,402 | 30,478 |
| AZ | | | CONSUMPTIVE USE | 2,644 | 1,615 | 4,396 | 5,603 | 13,834 | 16,166 | 13,256 | 13,804 | 9,499 | 8,208 | 5,774 | 4,661 | 99,460 |
| AZ | UNIT "B" I. D. D. | | | | | | | | | | | | | | | |
| AZ | DIVERSION AT IMPERIAL DAM | 8/ | DIVERSION | 1,412 | 1,130 | 1,751 | 2,114 | 3,344 | 3,324 | 3,278 | 3,740 | 2,251 | 2,244 | 1,795 | 1,149 | 27,532 |
| AZ | | 8/ | MEAS. RETURNS | 964 | 991 | 1,123 | 1,178 | 941 | 720 | 901 | 1,195 | 757 | 533 | 593 | 457 | 10,353 |
| AZ | | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ | | CONSUMPTIVE USE | 448 | 139 | 628 | 936 | 2,403 | 2,604 | 2,377 | 2,545 | 1,494 | 1,711 | 1,202 | 692 | 17,179 |
| AZ YUMA COUNTY WATER USERS ASSOCIATION | | | | | | | | | | | | | | | |
| AZ DIVERSION AT IMPERIAL DAM | | DIVERSION | 21,970 | 23,462 | 33,054 | 42,485 | 40,714 | 26,261 | 27,625 | 21,287 | 25,899 | 39,797 | -1 | 20,520 | 323,073 |
| AZ PUMPED FROM WELLS | | DIVERSION | 45 | 70 | 567 | 84 | 41 | 56 | 29 | 65 | 73 | 0 | 0 | 17 | 1,047 |
| AZ | | MEAS. RETURNS | 8,333 | 7,636 | 7,187 | 7,105 | 8,770 | 6,943 | 7,099 | 6,669 | 8,951 | 12,138 | 11,815 | 9,922 | 102,568 |
| AZ | | UNMEAS. RETURNS | 462 | 494 | 706 | 894 | 856 | 553 | 581 | 448 | 545 | 836 | 0 | 431 | 6,806 |
| AZ | | CONSUMPTIVE USE | 13,220 | 15,402 | 25,728 | 34,570 | 31,129 | 18,821 | 19,974 | 14,235 | 16,476 | 26,823 | -11,816 | 10,184 | 214,746 |
| AZ COCOPAH INDIAN RESERVATION | | | | | | | | | | | | | | | |
| AZ DIVERSION AT IMPERIAL DAM | | DIVERSION | 384 | 397 | 469 | 329 | 422 | 664 | 1,144 | 691 | 295 | 482 | 287 | 27 | 5,591 |
| AZ PUMPED FROM WELLS | 11/ | DIVERSION | 1 | 1 | 8 | 1 | 0 | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 16 |
| AZ | | MEAS. RETURNS | 8 | 6 | 1 | 3 | 14 | 19 | 12 | 20 | 8 | 2 | 1 | 1 | 95 |
| AZ | | UNMEAS. RETURNS | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 4 |
| AZ | | CONSUMPTIVE USE | 377 | 392 | 473 | 327 | 408 | 646 | 1,133 | 672 | 288 | 480 | 286 | 26 | 5,508 |
| AZ YUMA AREA OFFICE, USBR | | | | | | | | | | | | | | | |
| AZ | | DIVERSION | | | | | | | | | | | | | 0 |
| AZ | | MEAS. RETURNS | | | | | | | | | | | | | 0 |
| AZ | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | | | | | | | | | | | | | |
| AZ PUMPED FROM SOUTH GILA WELLS (DPOC'S) | 12/ | MEAS. RETURNS | 6,647 | 4,866 | 4,540 | 5,058 | 6,108 | 6,654 | 6,583 | 6,397 | 5,388 | 6,507 | 6,768 | 7,044 | 72,560 |
| AZ | | UNMEAS. ABOVE | -6,647 | -4,866 | -4,540 | -5,058 | -6,108 | -6,654 | -6,583 | -6,397 | -5,388 | -6,507 | -6,768 | -7,044 | -72,560 |
| AZ | | RETURNS CREDIT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | | | | | | | | | | | | | | |
| AZ OTHER USERS PUMPING FROM COLORADO | | | | | | | | | | | | | | | |
| AZ RIVER AND WELLS IN FLOOD PLAIN DAVIS | 13/ | DIVERSION | 74 | 78 | 109 | 102 | 107 | 150 | 146 | 137 | 135 | 131 | 96 | 106 | 0 |
| AZ DAM TO INTERNATIONAL BOUNDARY | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AZ | | UNMEAS. RETURNS | 26 | 27 | 38 | 36 | 37 | 53 | 51 | 48 | 47 | 46 | 34 | 37 | 0 |
| AZ | | CONSUMPTIVE USE | 48 | 51 | 71 | 66 | 70 | 97 | 95 | 89 | 88 | 85 | 62 | 69 | 0 |
| AZ ARIZONA TOTALS | | | | | | | | | | | | | | | |
| AZ | | DIVERSION | 247,556 | 235,673 | 249,160 | 355,932 | 400,159 | 394,035 | 279,586 | 229,214 | 293,574 | 326,297 | 202,968 | 255,809 | 3,469,962 |
| AZ | | MEAS. RETURNS | 66,117 | 19,680 | 61,030 | 67,969 | 61,113 | 60,391 | 63,131 | 65,311 | 67,706 | 61,180 | 68,363 | 64,660 | 697,131 |
| AZ | | UNMEAS. RETURNS | -610 | 2,214 | 6,406 | 9,762 | 11,104 | 11,828 | 8,170 | 6,433 | 5,914 | 2,546 | -595 | -1,561 | 61,611 |
| AZ | | CONSUMPTIVE USE | 191,749 | 183,779 | 181,724 | 288,211 | 327,642 | 321,816 | 207,982 | 167,470 | 229,954 | 262,571 | 145,210 | 202,810 | 2,710,917 |

AZ

AZ Note: The term 'CONSUMPTIVE USE' in this tabulation means diversions including groundwater pumping, less measured return flow and less current estimated unmeasured return flow to the river.

AZ

AZ Footnotes:

AZ 1/ Totals may differ from the sum of the monthly values due to rounding to the nearest acre-foot.

AZ 2/ Monthly diversion amounts are provided by the user. Diversion amount includes deliveries from the City of Needles (25af) and diversions from Topock Marsh Inlet canal (225af).

AZ 3/ Reported annual total only, distributed monthly according to the monthly use patterns of nearby users.

AZ 4/ Havasu NWR diversion amounts have been adjusted downward for diversions out of the inlet channel by Mohave Valley Irrigation and Drainage District (Chesney) and Fort Mojave Indian Reservation.

AZ 5/ Town of Parker diversion amounts have been adjusted downward for potable water delivered to the Colorado River Indian Tribes by the Town of Parker.

AZ 6/ Sum of diversions by two river pumps, water delivered by the Town of Parker and an estimate of municipal diversion. Municipal diversions estimated by multiplying CRIT's portion of measured
AZ effluent by using the Town of Parker's diversion:effluent ratio. CRIT portion of wastewater returns from Joint Venture Treatment Plant are combined with agricultural drainage measured at Scott Road gage.

AZ 7/ Main Outlet Drain return flow credit is measured flow at Station 0+00. During periods of sustained flow in the Gila River this measurement includes both Colorado River and Gila River water.
AZ At such times Reclamation will determine how best to differentiate return flows from the two sources.

AZ 8/ This is the summation for the Yuma Mesa Division of the Gila Project, consisting of the North Gila Valley Irrigation District, the Yuma Irrigation District and the Yuma Mesa
AZ Irrigation & Drainage District:

| AZ Item | | Annual Totals (Acre-Feet) |
|---|---|---|
| AZ ---- | | ---------- |
| AZ Diversion at Imperial Dam | A/ | 302,703 |
| AZ Pumped from wells | | 1,932 |
| AZ Surface returns from South Gila Valley (S.Gila Canal Wasteway) | | 0 |
| AZ Return flow North Gila Valley (6 drains & wasteways) | | 0 |
| AZ Return flow South Gila Valley wells (DPOC's) less Unmeasured Return | | 51,284 |
| AZ Return flow Yuma Mesa Outlet Drain | B/ | 0 |
| AZ Return flow protective and regulatory pumping unit | C/ | 0 |
| AZ Estimated unmeasured groundwater return flow | D/ | 26,795 |
| AZ Return flow share of Gila Main Canal loss | E/ | 0 |
| AZ Subtotal return flow | F/ | 78,079 |
| AZ Consumptive Use (see note above) | | 226,556 |

AZ

AZ A/ Total for the North Gila Valley, the Yuma Irrigation and the Yuma Mesa Irrigation and Drainage Districts.

AZ B/ 85 percent of the Yuma Mesa Outlet Drain credited to Yuma Mesa Irrigation and Drainage District with balance credited to 'Unit B'.

AZ C/ Estimated at 85 percent of Protective and Regulatory Pumping Unit with balance credited to 'Unit B'.
AZ D/ Estimated at 38 percent of the North Gila Valley Diversion at Imperial Dam plus 14 percent of Yuma Irrigation District diversion at
AZ Imperial Dam. (Based on analysis of the USGS Report 83-4220 entitled 'A Method for Estimating Ground-Water Return Flow to the
AZ Lower Colorado River in the Yuma Area')
AZ E/ Diversion multiplied by the mileage weighted share of Gila Main Canal loss, less canal surface evaporation (1,397 af/yr) and phreatophyte use (2,154 af/yr).
AZ
AZ 9/ Diversion and return amounts include pumpage from AEW-6,7,8,10,11,41. These wells were previously reported in the Arizona Supplemental Section.
AZ 10/ This is water diverted by YID and delivered to users, with own entitlements, outside of the YID service area. YID's consumptive use has been reduced by an equal amount.
AZ 11/ Diversion amounts include pumpage from AEW-15,16 and the Cocopah Bend R.V. Park. These wells were previously reported in the Arizona Supplemental Section.
AZ 12/ Reclamation is engaged in a modeling study to determine the amount of water returning to the Colorado River upstream of NIB, and how this return is affected by pumping of the DPOC wellfield.
AZ Until comprehensive modeling of the Yuma area is complete, this pumpage is added to Arizona's measured returns and subtracted from Arizona's unmeasured returns.
AZ 13/ Details on Arizona Supplemental Sheets.
14/ Water recovered by CAP for use by SNWA is accounted as a diversion for the year in which it was recovered

DIVERSIONS FROM MAINSTREAM-AVAILABLE RETURN FLOW
AND CONSUMPTIVE USE OF SUCH WATER
CALENDAR YEAR 2006
STATE OF CALIFORNIA

03/02/07 (ACRE-FEET)

| WATER USER | Ftnts | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL 1/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FORT MOJAVE INDIAN RESERVATION | | | | | | | | | | | | | | | |
| DELIVERED BY CITY OF NEEDLES | 2/ | DIVERSION | | | | | | | | | | | | | 0 |
| PUMPED FROM RIVER AND WELLS | | DIVERSION | 679 | 1,260 | 1,578 | 2,322 | 2,329 | 3,157 | 2,244 | 2,919 | 2,221 | 935 | 470 | 65 | 20,179 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 314 | 582 | 729 | 1,073 | 1,076 | 1,459 | 1,037 | 1,349 | 1,026 | 432 | 217 | 30 | 9,324 |
| | | CONSUMPTIVE USE | 365 | 678 | 849 | 1,249 | 1,253 | 1,698 | 1,207 | 1,570 | 1,195 | 503 | 253 | 35 | 10,855 |
| CITY OF NEEDLES | | | | | | | | | | | | | | | |
| PUMPED FROM FOUR WELLS IN FLOODPLAIN | | DIVERSION | 160 | 143 | 164 | 216 | 281 | 293 | 297 | 303 | 219 | 198 | 192 | 160 | 2,626 |
| | | MEAS. RETURNS 9/ | 26 | 23 | 26 | 35 | 46 | 47 | 48 | 49 | 35 | 32 | 31 | 26 | 423 |
| | | UNMEAS. RETURNS | 20 | 17 | 20 | 26 | 34 | 36 | 37 | 37 | 27 | 24 | 24 | 20 | 322 |
| | 3/ | CONSUMPTIVE USE | 114 | 103 | 118 | 155 | 202 | 210 | 212 | 217 | 157 | 142 | 137 | 114 | 1,881 |
| CHEMEHUEVI INDIAN RESERVATION | | | | | | | | | | | | | | | |
| PUMPED FROM RIVER AND WELLS | | DIVERSION | | | | | | | | | | | | | 0 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| METROPOLITAN WATER DISTRICT | | | | | | | | | | | | | | | |
| DIVERSION FROM LAKE HAVASU | 4/5/ | DIVERSION | 45,790 | 38,842 | 41,992 | 62,563 | 76,770 | 77,243 | 81,320 | 87,805 | 59,524 | 24,238 | 13,991 | 25,496 | 635,574 |
| WATER DIVERTED TO STORAGE FOR SNWA | 4/ | DIVERSION | | | | | | | | | | | | | 0 |
| WATER EXCHANGED WITH SDCWA | 6/ | DIVERSION | | | | | | | | | | | | | 0 |
| | | MEAS. RETURNS | 265 | 239 | 265 | 256 | 257 | 246 | 345 | 245 | 242 | 255 | 253 | 0 | 2,868 |
| | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 45,525 | 38,603 | 41,727 | 62,307 | 76,513 | 76,997 | 80,975 | 87,560 | 59,282 | 23,983 | 13,738 | 25,496 | 632,706 |
| PARKER DAM AND GOVERNMENT CAMP | | | | | | | | | | | | | | | |
| DIVERSION AT PARKER DAM | | DIVERSION | | | | | | | | | | | | | 0 |
| | | MEAS. RETURNS | | | | | | | | | | | | | 0 |
| | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| COLORADO RIVER INDIAN RESERVATION | | | | | | | | | | | | | | | |
| 4 RIVER PUMPS | | DIVERSION | | | | | | | | | | | | | 0 |
| BIG RIVER WATER DEPT. - 8 WELLS | | DIVERSION | | | | | | | | | | | | | 0 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 7/ | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CITY OF WINTERHAVEN | | | | | | | | | | | | | | | |
| PUMPED FROM 1 WELL IN FLOODPLAIN | 8/ | DIVERSION | | | | | | | | | | | | | 0 |
| | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PALO VERDE IRRIGATION DISTRICT | | | | | | | | | | | | | | | |
| DIVERSION FROM PALO VERDE DAM | | DIVERSION | 36,540 | 51,620 | 61,870 | 72,490 | 91,720 | 98,680 | 102,400 | 103,700 | 78,640 | 63,980 | 45,530 | 44,480 | 851,650 |
| | | MEAS. RETURNS | 28,607 | 29,828 | 34,962 | 34,973 | 40,147 | 40,369 | 41,203 | 43,244 | 39,508 | 42,391 | 36,125 | 37,392 | 448,749 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA | | UNMEAS. RETURNS | 2,046 | 2,891 | 3,465 | 4,059 | 5,136 | 5,526 | 5,734 | 5,807 | 4,404 | 3,583 | 2,550 | 2,491 | 47,692 |
| CA | | CONSUMPTIVE USE | 5,887 | 18,901 | 23,443 | 33,458 | 46,437 | 52,785 | 55,463 | 54,649 | 34,728 | 18,006 | 6,855 | 4,597 | 355,209 |
| CA | YUMA PROJECT, RES. DIV. INDIAN UNIT | | | | | | | | | | | | | | |
| CA | DIVERSION AT IMPERIAL DAM | DIVERSION | 2,806 | 2,498 | 3,815 | 5,084 | 4,425 | 1,061 | 1,633 | 1,970 | 2,209 | 5,134 | 5,172 | 3,242 | 39,049 |
| CA | | MEAS. RETURNS | 49 | 30 | 8 | 35 | 122 | 27 | 13 | 49 | 41 | 88 | 105 | 70 | 637 |
| CA | | UNMEAS. RETURNS | 469 | 417 | 637 | 849 | 739 | 177 | 273 | 329 | 369 | 857 | 864 | 541 | 6,521 |
| CA | YUMA PROJECT, RES. DIV. BARD UNIT | | | | | | | | | | | | | | |
| CA | DIVERSION AT IMPERIAL DAM | DIVERSION | 2,246 | 1,905 | 3,908 | 5,058 | 6,319 | 3,963 | 4,189 | 2,017 | 2,547 | 3,275 | 3,559 | 1,994 | 40,980 |
| CA | | MEAS. RETURNS | 24 | 14 | 5 | 20 | 99 | 56 | 22 | 31 | 34 | 36 | 47 | 25 | 413 |
| CA | | UNMEAS. RETURNS | 375 | 318 | 653 | 845 | 1,055 | 662 | 700 | 337 | 425 | 547 | 594 | 333 | 6,844 |
| CA | RETURNS FROM YUMA PROJECT | | | | | | | | | | | | | | |
| CA | RESERVATION DIVISION RETURNS | 9/ MEAS. RETURNS | 1,282 | 1,649 | 1,645 | 1,953 | 2,126 | 1,718 | 1,730 | 1,776 | 1,899 | 2,204 | 2,633 | 2,658 | 23,273 |
| CA | SUM YUMA PROJECTS, RES. DIV. USE | CONSUMPTIVE USE | 2,853 | 1,975 | 4,775 | 6,440 | 6,603 | 2,384 | 3,084 | 1,465 | 1,988 | 4,677 | 4,488 | 1,609 | 42,341 |
| CA | | | | | | | | | | | | | | | |
| CA | IMPERIAL IRRIGATION DISTRICT | | | | | | | | | | | | | | |
| CA | DIVERSION AT IMPERIAL DAM | 5/ DIVERSION | 155,181 | 177,064 | 236,054 | 299,375 | 342,111 | 316,698 | 326,189 | 302,081 | 265,329 | 244,800 | 176,117 | 153,322 | 2,994,321 |
| CA | | MEAS. RETURNS | 4,616 | 3,545 | 850 | 3,273 | 15,260 | 12,245 | 4,735 | 12,177 | 9,368 | 7,192 | 5,946 | 5,424 | 84,631 |
| CA | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CA | | CONSUMPTIVE USE | 150,565 | 173,519 | 235,204 | 296,102 | 326,851 | 304,453 | 321,454 | 289,904 | 255,961 | 237,608 | 170,171 | 147,898 | 2,909,690 |
| | WATER TRANSFERRED TO SDCWA | 10/ DIVERSION | | | | | | | | | | | | | |
| | | MEAS. RETURNS | | | | | | | | | | | | | |
| | | CA CONSUMPTIVE USE | | | | | | | | | | | | | |
| CA | COACHELLA VALLEY WATER DISTRICT | | | | | | | | | | | | | | |
| CA | DIVERSION AT IMPERIAL DAM | DIVERSION | 17,969 | 19,259 | 21,506 | 32,958 | 35,077 | 36,342 | 37,171 | 35,171 | 29,932 | 26,961 | 28,372 | 18,347 | 339,065 |
| CA | | MEAS. RETURNS | 534 | 386 | 77 | 360 | 1,565 | 1,405 | 540 | 1,418 | 1,057 | 792 | 958 | 649 | 9,741 |
| CA | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CA | | CONSUMPTIVE USE | 17,435 | 18,873 | 21,429 | 32,598 | 33,512 | 34,937 | 36,631 | 33,753 | 28,875 | 26,169 | 27,414 | 17,698 | 329,324 |
| CA | OTHER USERS PUMPING FROM COLORADO | | | | | | | | | | | | | | |
| CA | RIVER AND WELLS IN FLOOD PLAIN | 11/ DIVERSION | | | | | | | | | | | | | 0 |
| CA | DAVIS DAM TO INTERNATIONAL BOUNDARY | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CA | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CA | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CA | CALIFORNIA TOTALS | | | | | | | | | | | | | | |
| CA | | DIVERSION | 261,371 | 292,591 | 370,887 | 480,066 | 559,032 | 537,437 | 555,443 | 535,966 | 440,621 | 369,521 | 273,403 | 247,106 | 4,923,444 |
| CA | | MEAS. RETURNS | 35,403 | 35,714 | 37,838 | 40,905 | 59,621 | 56,113 | 48,636 | 58,989 | 52,184 | 52,990 | 46,098 | 46,244 | 570,735 |
| CA | | UNMEAS. RETURNS | 3,224 | 4,225 | 5,504 | 6,852 | 8,040 | 7,860 | 7,781 | 7,859 | 6,251 | 5,443 | 4,249 | 3,415 | 70,703 |
| CA | | CONSUMPTIVE USE | 222,744 | 252,652 | 327,545 | 432,309 | 491,371 | 473,464 | 499,026 | 469,118 | 382,186 | 311,088 | 223,056 | 197,447 | 4,282,006 |
| CA | | | | | | | | | | | | | | | |
| CA | | | | | | | | | | | | | | | |

CA Note: The term 'CONSUMPTIVE USE' as used in this tabulation means diversions including ground water pumping, less measured return flow and less current estimated unmeasured return flow to the river.

CA

CA Footnotes:

CA 1/ Totals may differ from the sum of the monthly values due to rounding to the nearest acre-foot.

CA 2/ Monthly diversion amounts are provided by the user. Water delivered by Needles is provided by the City of Needles.

CA Diversion listed as Pumped From River and Wells is provided by the Fort Mojave Indian Tribe.

CA 3/ A portion of this Colorado River use is offset by pumping from the LCWSP. Details shown in the LCWSP Section of this report.

CA 4/ MWD diversion and consumptive use figures include 10 kaf diverted to storage for SNWA as shown. MWD diversion figures do not include 176 af diverted in October for delivery to Tijuana, Mexico.

CA 5/ Water captured and stored by MWD and IID at Reclamation's request is tabulated in this report under Water Subject to Temporary Re-Regulation.

CA During the year of capture, this water is not included in the MWD, IID, or State of California diversion and consumptive use totals.

CA 6/ Water conserved by IID and transferred to SDCWA, in accordance with the CRWDA, Exhibit B, Column 5, and the IID/SDCWA Water Transfer Agreement. At SDCWA's election, the water was

CA delivered by the Secretary to Lake Havasu under Article 4(c) of the CRWDA and there made available by SDCWA to MWD under the terms of the SDCWA/MWD Exchange Agreement.

CA Reclamation's future Water Accounting reports will reflect variations in the water delivery arrangements as they occur.

CA 7/ Unmeasured returns calculated as 40% of Big River pumpage.

CA 8/ Reported annual total only, distributed monthly according to the monthly use patterns of nearby users.

CA 9/ Unassigned Measured Returns include drainage from the Indian Unit and the Bard Unit in the Reservation Division but excludes seepage from the All-American Canal.

CA 10/ This entry represents water to be conserved by IID and transferred to SDCWA, in accordance with CRWDA, Exhibit B, Column 7, and the IID/SDCWA Water Transfer Agreement, as amended.

CA Water subject to temporary re-regulation was captured and temporarily stored by IID at Reclamation's request in 2004. A portion of the temporarily re-regulated water was restored to the system when Exhibit B,

CA column 7 obligation for 2005 was met from the re-regulatory water stored in IID's system. The use of this water does not constitute California agricultural usage for the purposes of meeting the ISG benchmark.

CA 11/ Details can be found on the California Supplemental Sheets.

CA

NV DIVERSIONS FROM MAINSTREAM-AVAILABLE RETURN FLOW

NV AND CONSUMPTIVE USE OF SUCH WATER

NV CALENDAR YEAR 2006

NV STATE OF NEVADA

NV 03/02/07 (ACRE-FEET)

| NV WATER USER | Flnts | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL 1/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NV BOULDER CANYON PROJECT | | | | | | | | | | | | | | | |
| NV DIVERSION AT HOOVER DAM | | DIVERSION | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 7 | 6 | 5 | 3 | 3 | 59 |
| NV | | MEAS. RETURNS | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 27 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 1 | 2 | 2 | 3 | 3 | 4 | 5 | 4 | 3 | 3 | 1 | 1 | 32 |
| NV ROBERT B. GRIFFITH WATER PROJECT | | | | | | | | | | | | | | | |
| NV DIVERSION AT SADDLE ISLAND, LAKE MEAD | | DIVERSION | 30,905 | 28,974 | 31,962 | 36,459 | 48,312 | 46,730 | 48,361 | 49,764 | 45,783 | 42,282 | 37,435 | 35,221 | 482,188 |
| NV BY USER: BOULDER CITY | 2/ | DIVERSION | 500 | 503 | 663 | 897 | 1,286 | 1,492 | 1,450 | 1,533 | 1,279 | 835 | 644 | 487 | 11,569 |
| NV LAS VEGAS VALLEY W.D. | 2/ | DIVERSION | 23,698 | 21,901 | 23,518 | 26,606 | 34,228 | 30,745 | 32,195 | 33,228 | 32,157 | 31,236 | 28,434 | 27,537 | 345,483 |
| NV HENDERSON | 2/ | DIVERSION | 3,468 | 3,536 | 4,295 | 5,005 | 7,356 | 8,669 | 8,441 | 8,556 | 6,948 | 5,446 | 4,322 | 3,571 | 69,613 |
| NV NORTH LAS VEGAS | 2/ | DIVERSION | 3,197 | 3,031 | 3,481 | 3,850 | 5,182 | 5,515 | 5,928 | 6,067 | 5,142 | 4,574 | 3,876 | 3,532 | 53,375 |
| NV NELLIS AIR FORCE BASE | 2/ | DIVERSION | 42 | 3 | 5 | 101 | 260 | 309 | 347 | 380 | 257 | 191 | 159 | 94 | 2,148 |
| NV | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 30,905 | 28,974 | 31,962 | 36,459 | 48,312 | 46,730 | 48,361 | 49,764 | 45,783 | 42,282 | 37,435 | 35,221 | 482,188 |
| NV LAKE MEAD NATIONAL RECREATION AREA | | | | | | | | | | | | | | | |
| NV DIVERSIONS FROM LAKE MEAD | | DIVERSION | 41 | 42 | 49 | 35 | 73 | 65 | 64 | 71 | 58 | 44 | 32 | 34 | 608 |
| NV | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 41 | 42 | 49 | 35 | 73 | 65 | 64 | 71 | 58 | 44 | 32 | 34 | 608 |
| NV LAKE MEAD NATIONAL RECREATION AREA | | | | | | | | | | | | | | | |
| NV DIVERSION FROM LAKE MOHAVE | | DIVERSION | 15 | 15 | 19 | 22 | 23 | 24 | 0 | 30 | 28 | 25 | 18 | 18 | 237 |
| NV (COTTONWOOD) | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 15 | 15 | 19 | 22 | 23 | 24 | 0 | 30 | 28 | 25 | 18 | 18 | 237 |
| NV BASIC MANAGEMENT INC. | | | | | | | | | | | | | | | |
| NV DIVERSION AT SADDLE ISLAND, LAKE MEAD | | DIVERSION | 485 | 336 | 349 | 577 | 616 | 537 | 692 | 641 | 578 | 536 | 436 | 403 | 6,186 |
| NV | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 485 | 336 | 349 | 577 | 616 | 537 | 692 | 641 | 578 | 536 | 436 | 403 | 6,186 |
| NV CITY OF HENDERSON | | | | | | | | | | | | | | | |
| NV DIVERSION AT SADDLE ISLAND, LAKE MEAD | | DIVERSION | 707 | 491 | 886 | 1,401 | 1,680 | 1,471 | 1,973 | 1,753 | 1,579 | 1,220 | 947 | 773 | 14,881 |
| NV | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 707 | 491 | 886 | 1,401 | 1,680 | 1,471 | 1,973 | 1,753 | 1,579 | 1,220 | 947 | 773 | 14,881 |
| NV NEVADA DEPARTMENT OF FISH & GAME | | | | | | | | | | | | | | | |
| NV DIVERSION AT SADDLE ISLAND, LAKE MEAD | | DIVERSION | 475 | 417 | 432 | 465 | 504 | 507 | 464 | 511 | 478 | 449 | 454 | 468 | 5,624 |
| NV | | MEAS. RETURNS | 474 | 416 | 431 | 464 | 503 | 506 | 463 | 510 | 477 | 448 | 453 | 467 | 5,612 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 |
| NV CITY OF BOULDER CITY | | | | | | | | | | | | | | | |
| NV DIVERSION AT HOOVER DAM | 2/ | DIVERSION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV PACIFIC COAST BUILDING PRODUCTS INC. | | | | | | | | | | | | | | | |
| NV DIVERSION AT GYPSUM WASH, LAKE MEAD | | DIVERSION | 90 | 83 | 84 | 84 | 82 | 74 | 78 | 77 | 70 | 65 | 61 | 66 | 914 |
| NV | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 90 | 83 | 84 | 84 | 82 | 74 | 78 | 77 | 70 | 65 | 61 | 66 | 914 |
| NV MOHAVE GENERATING STATION (SO. CAL. EDISON) | | | | est | est | est | est | | | | | | | | |
| NV PUMPED FROM 1 WELL | | DIVERSION | 181 | 100 | 150 | 150 | 225 | 140 | 74 | 68 | 40 | 42 | 39 | 39 | 1,248 |
| NV | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | CONSUMPTIVE USE | 181 | 100 | 150 | 150 | 225 | 140 | 74 | 68 | 40 | 42 | 39 | 39 | 1,248 |
| NV BIG BEND WATER DISTRICT | | | | | | | | | | | | | | | |
| NV | | DIVERSION | 379 | 363 | 387 | 402 | 452 | 491 | 543 | 525 | 471 | 426 | 365 | | 4,804 |
| NV | | MEAS. RETURNS | 208 | 201 | 228 | 228 | 230 | 231 | 263 | 252 | 224 | 230 | 197 | | 2,492 |
| NV | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NV | | | CONSUMPTIVE USE | 171 | 162 | 159 | 174 | 222 | 260 | 280 | 273 | 247 | 196 | 168 | 0 | 2,312 |
| NV | FORT MOJAVE INDIAN RESERVATION | 3/ | | | | | | | | | | | | | | |
| NV | PUMPED FROM 2 WELLS IN FLOODPLAIN | | DIVERSION | 99 | 331 | 283 | 528 | 590 | 842 | 655 | 807 | 314 | 377 | 99 | 99 | 5,024 |
| NV | | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | | | UNMEAS. RETURNS | 33 | 109 | 93 | 174 | 195 | 278 | 216 | 266 | 104 | 124 | 33 | 33 | 1,658 |
| NV | | | CONSUMPTIVE USE | 66 | 222 | 190 | 354 | 395 | 564 | 439 | 541 | 210 | 253 | 66 | 66 | 3,366 |
| NV | | | | | | | | | | | | | | | | |
| NV | LAS VEGAS WASH RETURN FLOWS | 4/ | RETURNS 2/ | 18,025 | 16,397 | 18,837 | 17,644 | 17,240 | 17,368 | 17,491 | 17,353 | 16,990 | 18,290 | 17,965 | 20,059 | 213,659 |
| NV | | | | | | | | | | | | | | | | |
| | OTHER USERS PUMPING FROM COLORADO | | | | | | | | | | | | | | | |
| | RIVER AND WELLS IN FLOOD PLAIN | 5/ | DIVERSION | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | DAVIS DAM TO CALIFORNIA BOUNDARY | | MEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | UNMEAS. RETURNS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | CONSUMPTIVE USE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NV | NEVADA TOTALS | | | | | | | | | | | | | | | |
| NV | | | DIVERSION | 33,379 | 31,155 | 34,605 | 40,128 | 52,563 | 50,888 | 52,912 | 54,254 | 49,405 | 45,471 | 39,889 | 37,124 | 521,773 |
| NV | | | MEAS. RETURNS | 18,708 | 17,015 | 19,498 | 18,338 | 17,976 | 18,108 | 18,220 | 18,118 | 17,694 | 18,970 | 18,617 | 20,528 | 221,790 |
| NV | | | UNMEAS. RETURNS | 33 | 109 | 93 | 174 | 195 | 278 | 216 | 266 | 104 | 124 | 33 | 33 | 1,658 |
| NV | | | CONSUMPTIVE USE | 14,638 | 14,031 | 15,014 | 21,616 | 34,392 | 32,502 | 34,476 | 35,870 | 31,607 | 26,377 | 21,239 | 16,563 | 298,325 |
| NV | | | | | | | | | | | | | | | | |
| NV | | | | | | | | | | | | | | | | |
| NV | GROUNDWATER INJECTED STORAGE | 6/ | | | | | | | | | | | | | | |
| NV | LAS VEGAS VALLEY WATER DIST. | | INJECTED | 3,079 | 1,905 | 8 | 0 | 102 | 0 | 0 | 0 | 0 | 2,188 | 5,819 | | 13,101 |
| NV | | | WITHDRAWN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 66 | 345 | 206 | 141 | | 758 |
| NV | CITY OF NORTH LAS VEGAS | | INJECTED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 |
| NV | | | WITHDRAWN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 |
| NV | | | | | | | | | | | | | | | | |

NV NOTE: The term 'CONSUMPTIVE USE' in this tabulation means diversions including underground pumping, less measured return flow and less current estimated unmeasured return flow to the river.

**Footnotes:**

1/ Totals may differ from the sum of the monthly values due to rounding to the nearest acre-foot.

2/ As of mid 2003 Boulder City had discontinued diverting water directly from Lake Mead but purchases its water from SNWA.

3/ Diversions provided by the user. Calculated by adding M&I use to the product of the acreage of each crop type times the crop specific evapotranspiration, times irrigation efficiency.

4/ Estimated return based on historic use method adopted by the task force on unmeasured return flows on August 28, 1984 and revised as noted in USBR letter to SNWA and CRCN dated July 29, 2003.

5/ Details on Nevada Supplemental Sheets.

| | | | | |
|---|---|---|---|---|
| NV | 6/ Nevada Injected Storage Balance: | A/ | Beginning of Year Cumulative Injected Storage | 311,029 |
| NV | | | Plus Current Year Additions | 13,101 |
| NV | | | Minus Current Year Withdrawals | 758 |
| NV | | | End of Year Cumulative Injected Storage | 323,372 |

A/ Colorado River water injected into ground water storage is accounted as a consumptive use in the year in which it is diverted from the Colorado River. It will not be accounted as a consumptive use in the year in which it is withdrawn from storage, but because it originated as Colorado River water it will be accounted for as a return flow credit in the year in which it returns to the Colorado River.

M)
M)
M)
M)

## DELIVERIES TO MEXICO IN SATISFACTION OF PART III OF 1944 TREATY AND WATER PASSING TO MEXICO IN EXCESS OF TREATY REQUIREMENTS CALENDAR YEAR 2006

MX 03/02/07 (ACRE-FEET)

| MX | WATER USER | Flnts | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MX | DELIVERY TO NIB | 1/ | 115,827 | 138,865 | 198,718 | 183,309 | 99,289 | 119,700 | 113,585 | 87,858 | 82,486 | 67,740 | 87,620 | 112,024 | 1,407,021 |
| MX | | | | | | | | | | | | | | | |
| MX | DELIVERY AT THE LIMITROPHE | 2/ | 799 | 859 | 658 | 445 | 615 | 312 | 316 | 271 | 657 | 874 | 1,075 | 896 | |
| MX | | | | | | | | | | | | | | | |
| MX | DELIVERY AT TIJUANA | 3/ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 23 | 0 | |
| MX | | | | | | | | | | | | | | | |
| MX | DELIVERY TO SIB | | 9,658 | 10,604 | 9,660 | 10,455 | 9,654 | 7,957 | 10,591 | 10,755 | 10,686 | 11,033 | 11,245 | 9,090 | 121,388 |
| MX | | | | | | | | | | | | | | | |
| MX | TOTAL DELIVERY IN SATISFACTION OF TREATY | 4/ | 126,284 | 150,328 | 209,036 | 194,209 | 109,558 | 127,969 | 124,492 | 98,884 | 93,829 | 79,663 | 99,963 | 122,010 | 1,536,225 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MX TO MEXICO AS SCHEDULED | | 123,771 | 149,057 | 206,284 | 193,325 | 108,570 | 127,252 | 121,879 | 92,704 | 89,307 | 70,098 | 98,763 | 118,994 | 1,500,004 |
| MX TO MEXICO IN EXCESS OF SCHEDULE | 5/ | 2,513 | 1,271 | 2,752 | 884 | 988 | 717 | 2,613 | 6,180 | 4,522 | 9,565 | 1,200 | 3,016 | 36,221 |
| MX WATER BYPASSED PURSUANT TO MINUTE 242 OF THE IBWC | | 8,679 | 7,677 | 8,437 | 7,557 | 7,407 | 8,829 | 9,071 | 9,749 | 9,970 | 10,362 | 10,071 | 9,505 | 107,314 |

**Footnotes:**

MX 1/ Flow in the river at the Northerly International Boundary.
MX 2/ Wasteway deliveries to the river limitrophe via the Cooper, 11 mile, and 21 mile lateral wasteways in satisfaction of the 1944 Treaty requirements.
MX 3/ Temporary emergency delivery of Colorado River water for Tijuana is diverted at Lake Havasu by MWD and delivered via the Colorado River Aqueduct, MWD, SDCWA, and Otay Water District's distribution systems pursuant to Minute No. 310 of the IBWC.
4/ Water delivered to Mexico and charged against treaty requirements. It does not include Water Bypassed Pursuant to Minute No. 242 of the IBWC.
5/ Water that is lost to the United States through flows and/or releases into the Colorado River above Morelos Dam in excess of Lower Division States deliveries and Mexican Treaty requirements.

## RELEASES OF WATER THROUGH REGULATORY STRUCTURES
## CONTROLLED BY THE UNITED STATES
## CALENDAR YEAR 2006

03/02/07 (THOUSAND ACRE-FEET)

| STRUCTURE | Ftnts | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL 1/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GLEN CANYON DAM | | 825 | 822 | 614 | 617 | 616 | 826 | 865 | 877 | 573 | 627 | 629 | 834 | 8723 |
| HOOVER DAM | | 595 | 611 | 830 | 990 | 1071 | 1036 | 967 | 818 | 633 | 564 | 525 | 621 | 9259 |
| DAVIS DAM | | 662 | 670 | 803 | 972 | 1046 | 1085 | 975 | 818 | 771 | 716 | 509 | 564 | 9590 |
| PARKER DAM | | 359 | 433 | 600 | 713 | 738 | 737 | 719 | 624 | 539 | 451 | 354 | 326 | 6592 |
| HEADGATE ROCK DAM | 2/ | 333 | 402 | 554 | 657 | 664 | 664 | 642 | 554 | 487 | 414 | 327 | 294 | 5992 |
| PALO VERDE DAM | | 309 | 376 | 509 | 603 | 605 | 563 | 552 | 460 | 399 | 348 | 268 | 236 | 5228 |
| IMPERIAL DAM | 3/ | 31 | 26 | 43 | 34 | 23 | 25 | 29 | 36 | 33 | 33 | 25 | 30 | 369 |
| DIVERSION TO MITTRY LAKE FROM GILA MAIN CAL | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |
| SUM IMPERIAL DAM + DIVERSION TO MITTRY LAKE | | 32 | 27 | 44 | 34 | 24 | 26 | 30 | 37 | 34 | 34 | 26 | 30 | 378 |
| LAGUNA DAM | | 31 | 29 | 37 | 31 | 25 | 33 | 27 | 26 | 27 | 31 | 22 | 28 | 347 |

**Footnotes:**

1/ Totals may differ from the sum of the monthly values due to rounding to the nearest thousand acre-feet.
2/ Computed as Parker Dam release less diversion at Headgate Rock Dam.
3/ Flow below Imperial Dam, does not include diversions through the All American Canal (AAC) and the Gila Gravity Main Canal (GGMC).

## SUMMARY
## USE BY STATE, UNMEASURED RETURNS ESTIMATE, AND RESERVOIR CONTENTS
## CALENDAR YEAR 2006

03/02/07 (THOUSAND ACRE-FEET)

| | Ftnts | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WATER USE SUMMARY | | | | | | | | | | | | | | |
| ARIZONA | | 191.7489 | 183.7788 | 181.7235 | 288.2105 | 327.6418 | 321.816 | 207.9822 | 167.4701 | 229.9545 | 262.5709 | 145.2098 | 202.8098 | 2711 |
| CALIFORNIA | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NEVADA | | 14.638 | 14.031 | 15.014 | 21.616 | 34.392 | 32.502 | 34.476 | 35.87 | 31.607 | 26.377 | 21.239 | 16.563 | 298 |
| TOTAL USE, LOWER BASIN STATES | | 206.3869 | 197.8098 | 196.7375 | 309.8265 | 362.0338 | 354.318 | 242.4582 | 203.3401 | 261.5615 | 288.9479 | 166.4488 | 219.3728 | 3009 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SU | | | | | | | | | | | | | | |
| SU | MEXICO IN SATISFACTION OF TREATY | | 126.284 | 150.328 | 209.036 | 194.209 | 109.558 | 127.969 | 124.492 | 98.884 | 93.829 | 79.663 | 99.963 | 122.01 | 1536 |
| SU | | | | | | | | | | | | | | | |
| SU | WATER BYPASSED PURSUANT TO MINUTE 242 | | 8.679 | 7.677 | 8.437 | 7.557 | 7.407 | 8.829 | 9.071 | 9.749 | 9.97 | 10.362 | 10.071 | 9.505 | 107 |
| SU | | | | | | | | | | | | | | | |
| SU | | | | | | | | | | | | | | | |
| SU | TOTAL USE, LOWER BASIN STATES & MEXICO | 2/ | 341.3499 | 355.8148 | 414.2105 | 511.5925 | 478.9988 | 491.116 | 376.0212 | 311.9731 | 365.3605 | 378.9729 | 276.4828 | 350.8878 | 4653 |
| SU | | | | | | | | | | | | | | | |
| SU | | | | | | | | | | | | | | | |
| SU | END OF MONTH ACTIVE CONTENTS: | | | | | | | | | | | | | | |
| SU | LAKE POWELL | | 11206 | 10793 | 10704 | 11093 | 12258 | 12766 | 12416 | 12017 | 11917 | 12526 | 12416 | 12076 | 142188 |
| SU | | | | | | | | | | | | | | | |
| SU | LAKE MEAD | | 15335 | 15520 | 15337 | 14966 | 14470 | 14178 | 13993 | 14005 | 13887 | 13964 | 14014 | 14164 | 173833 |
| SU | LAKE MOHAVE | | 1631.488 | 1626.108 | 1664.65 | 1665.46 | 1690.237 | 1670.05 | 1694.605 | 1705.85 | 1584.416 | 1467.453 | 1507.8 | 1579.096 | 19487 |
| SU | LAKE HAVASU | | 561.856 | 546.748 | 563.935 | 557.972 | 562.234 | 575.842 | 584.268 | 579.622 | 555.028 | 577.165 | 565.636 | 584.462 | 6815 |
| SU | LOWER BASIN TOTAL STORAGE | | 17528.34 | 17692.86 | 17565.59 | 17189.43 | 16722.47 | 16423.89 | 16271.87 | 16290.47 | 16026.44 | 16008.62 | 16087.44 | 16327.56 | 200135 |
| SU | | | | | | | | | | | | | | | |
| SU | USE ABOVE HOOVER DAM: | | | | | | | | | | | | | | |
| SU | ARIZONA | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SU | NEVADA | | 14 | 14 | 15 | 21 | 34 | 32 | 34 | 36 | 31 | 26 | 21 | 17 | 295 |
| SU | TOTAL USE | | 14 | 14 | 15 | 21 | 34 | 32 | 34 | 36 | 31 | 26 | 21 | 17 | 295 |
| SU | | | | | | | | | | | | | | | |
| SU | USE BELOW PARKER DAM: | | | | | | | | | | | | | | |
| SU | ARIZONA | | 30.358 | 49.146 | 75.994 | 113.368 | 141.641 | 126.699 | 119.239 | 109.415 | 83.164 | 72.497 | 17.328 | 39.846 | 979 |
| SU | CALIFORNIA | | 176.74 | 213.268 | 284.851 | 368.598 | 413.403 | 394.559 | 416.632 | 379.771 | 321.552 | 286.46 | 208.928 | 171.802 | 3637 |
| SU | MEXICO | 3/ | 134.963 | 158.005 | 217.473 | 201.766 | 116.965 | 136.798 | 133.563 | 108.633 | 103.799 | 90.025 | 110.034 | 131.515 | 1644 |
| SU | TOTAL USE | | 342.061 | 420.419 | 578.318 | 683.732 | 672.009 | 658.056 | 669.434 | 597.819 | 508.515 | 448.982 | 336.29 | 343.163 | 6259 |
| SU | | | | | | | | | | | | | | | |
| SU | | | | | | | | | | | | | | | |

SU **Footnotes:**

SU 1/ Totals may differ from the sum of the monthly values due to rounding to the nearest thousand acre feet.

SU 2/ Sum of Total States, deliveries to Mexico in Satisfaction of Treaty and Bypass Pursuant to Min. 242.

SU 3/ Includes water delivered in satisfaction of the the treaty with Mexico and water bypassed pursuant to Minute 242.

**APPENDIX B TABLE B-1**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Flow-Related Covered Actions and Accomplishments**
**Calendar Year 2006**

| Federal Covered Actions<br>*Biological Assessment*<br>Chapter 2 | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions[1] | 2006 Accomplishments[2, 3] |
|---|---|---|---|---|
| 2.2 BUREAU OF RECLAMATION | | | | |
| **2.2.1 Ongoing Flow-Related Actions** | | | | |
| **2.2.1.1 Flood Control**<br>(page 2-3; Table 2-1, page 2-5) | • Prescribed flood control releases per Field Working Agreement and *Water Control Manual for Lake Mead/Hoover Dam* | • Timing of required releases may be varied within the month<br><br>• Anticipatory flood control releases<br><br>• Available flood control space in Lake Mead can be reduced to 1.5 maf August 1 to January 1 if prescribed space is available in upstream reservoirs<br><br>• Management of target elevations for Lake Mohave (Davis Dam) and Lake Havasu (Parker Dam) | • None | No flood control releases were made from Lake Mead.<br><br>The elevation of Lake Mead provided for flood control space that was well above that required. The elevation was between 1125.19 and 1141.31 feet mean sea level.<br><br>Elevations at Lake Mohave and Lake Havasu were managed to target elevations. |
| **2.2.1.2 State Apportionment and Water Contracts**<br>(page 2-5; Table 2-2, page 2-8) | • Delivery of water to water users in the United States pursuant to applicable Federal law, including the Boulder Canyon Project Act (BCPA); the Supreme Court Decree of March 9, 1964, 376 U.S. 340, as amended (Decree)<br><br>• Delivery of a State's unused entitlement to a junior entitlement holder within that State on an annual basis | • Determinations and delivery of post-2016 unused apportionment water from one State to another within the Lower Basin on an annual basis | • Delivery of water to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree | Water deliveries were made to water users in Arizona, California, and Nevada to satisfy the basic entitlements for delivery of Colorado River water. Unused entitlement water within a state's apportionment was delivered to junior priority holders in that state. |
| **2.2.1.3 Annual Operations Normal, Surplus, Shortage, and Unused Apportionment**<br>(page 2-6; Table 2-3, page 2-9) | • Issuance of an annual operating plan<br><br>• Delivery of water to water users in the United States pursuant to applicable Federal law, including the Boulder Canyon Project Act (BCPA); the Supreme Court Decree of March 9, 1964, 376 U.S. 340, as amended (Decree)<br><br>• Delivery of water to Mexico pursuant to the 1944 Water Treaty | • Determination of shortage conditions absent specific guidelines<br><br>• Determination of surplus conditions absent specific guidelines<br><br>• Revision of annual operations through the *Annual Operating Plan* (AOP), pursuant to the long-range operating criteria within the year to reflect current hydrologic conditions<br><br>• Determinations and delivery of post-2016 unused apportionment water from one Sstate to another within the Lower Basin on an annual basis<br><br>• Execution of agreements and the delivery of surplus waer pursuant to the Reclamation Reform Act and the Reclamation States Emergency Drought Relief Act<br><br>• Periodic review of the Long Range Operation of the Colorado (LROC) | • Delivery of water to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree | The *Annual Operating Plan* for 2006, which governed releases, was issued.<br><br>Annual operations were revised through the *Annual Operating Plan*, pursuant to the long-range operating criteria, to reflect current hydrologic conditions.<br><br>A Partial Domestic Surplus condition was declared for 2006. However, no surplus water was taken.<br><br>Water was delivered to water users in the United States pursuant to applicatle Federal law, including the BCPA and the Decree.<br><br>Water was delivered to Mexico pursuant to the 1944 Water Treaty. Delivery to Mexico in excess of schedule was 36,221 acre-feet.<br><br>There was a review of the Long-Range Operating Criteria of Colorado River reservoirs. |

**APPENDIX B TABLE B-1**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Flow-Related Covered Actions and Accomplishments**
**Calendar Year 2006**

| Federal Covered Actions<br>*Biological Assessment*<br>Chapter 2 | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions[1] | 2006 Accomplishments[2, 3] |
|---|---|---|---|---|
| **2.2.1.4 Daily Hoover Dam Operations**<br>(Table 2-4, page 2-10) | • Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver 1944 Water Treaty water, and generate hydropower with these water releases | • Monthly energy targets are set prior to each month, based on the best information available with respect to downstream water demands and lake elevation targets at Lakes Mohave and Havasu, energy targets may be revised during the month to meet changing water demands and other constraints (e.g., to benefit native fish in Lake Mohave) | • Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States and to generate hydropower with these water releases | Water releases from Hoover Dam were made to satisfy beneficial use requirements of entitlement holders in the United States, to deliver 1944 Water Treaty water, and to generate hydropower with these water releases.<br><br>Energy targets were set monthly based on the best information available with respect to downstream water demands and lake elevation targets at Lakes Mohave and Havasu. Energy targets were revised during the month to meet changing water demands and other constraints. |
| **2.2.1.4 Daily Davis Dam Operations**<br>(Table 2-5, page 2-11) | • Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver 1944 Water Treaty water, and generate hydropower with these water releases | • Timing of releases, to a limited degree, may be varied by a few days, based on available downstream storage, Lake Mohave and Lake Havasu operational constraints, downstream water requirements, and hydropower needs | • Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States and generate hydropower with these water releases | Water releases from Davis Dam were made to satisfy beneficial use requirements of entitlement holders in the United States, to deliver 1944 Water Treaty water, and to generate hydropower with these water releases.<br><br>The timing of releases was varied based on available downstream storage, operational constraints for lakes Mohave and Havasu, downstream water requirements, and hydropower needs. |
| **2.2.1.4 Daily Parker Dam Operations**<br>(Table 2-6, page 2-11) | • Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver 1944 Water Treaty water, and generate hydropower with these water releases | • Timing of releases, to a limited degree, may be varied by the hour based on hydropower needs, water requirements, or other operations constraints immediately downstream of the dam | • Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States and generate hydropower with these water releases | Water releases from Parker Dam were made to satisfy beneficial use requirements of entitlement holders in the United States, to deliver 1944 Water Treaty water, and to generate hydropower with these water releases.<br><br>The timing of releases was varied based on available downstream water requirements, hydropower needs, and other operational constraints immediately downsteam of Parker Dam. |
| **2.2.1.4 Daily Senator Wash, Imperial Dam, and Laguna Dam Reservoir Operations**<br>(Table 2-7, page 2-11) | • Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver 1944 Water Treaty water, and generate hydropower with water releases for Senator Wash | • Senator Wash, Imperial Dam, and Laguna Dam operations to prevent overdeliveries, to release water to entitlement holders, for sluicing operations, to deliver a portion of the 1944 Water Treaty deliveries to Mexico, and for flood control purposes | • Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States | Water releases from Senator Wash, Imperial, and Laguna dams were made to satisfy beneficial use requirements of entitlement holders in the United States, to deliver 1944 Water Treaty water, and to generate hydropower with water releases from Senator Wash.<br><br>Water releases from Senator Wash, Imperial, and Laguna dams were made to prevent overdeliveries, to release water to entitlement holders, for sluicing operations, to deliver a portion of the 1944 Water Treaty deliveries to Mexico, and for flood control purposes. |
| **2.2.1.5 Electric Power Generation**<br>(page 2-11)<br><br>**43 CFR PART 431**<br>(page 2-14) | • Operational requirements to satisfy 43 C.F.R. Part 431 requirements | — | — | Hydroelectric power generated:<br>• Hoover Dam: 3,786,617,085 kWh<br>• Davis Dam: 1,121,915,200 kWh<br>• Parker Dam: 448,860,850 kWh<br><br>Operations met the requirements to satisfy 43 C.F.R. Part 431. |
| **2.2.1.6 Lower Colorado Water Supply Project - California**<br>(page 2-15; Table 2-8, page 2-16) | • Delivery of water under executed Water Supply Project contracts | • Reclamation's execution and administration of individual Water Supply Project contracts | • Participate in the development of and consult in the execution of individual contracts under the Water Supply Project | Ten new subcontracts were issued by the City of Needles. One acre-foot of water is for immediate use through a change in point of diversion, consistent with the subcontracts. 15 acre-feet of water is reserved for future use. |

**APPENDIX B TABLE B-1**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Flow-Related Covered Actions and Accomplishments**
**Calendar Year 2006**

| Federal Covered Actions<br>*Biological Assessment*<br>Chapter 2 | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions[1] | 2006 Accomplishments[2, 3] |
|---|---|---|---|---|
| **2.2.1.7 1944 Water Treaty Deliveries**<br>(page 2-17, Table 2-9, page 2-20) | • Delivery of Mexico allotment (1.5 million acre-feet [maf]) pursuant to the 1944 Water Treaty and related Minutes<br><br>• Delivery of Mexico allotment (up to 1.7 maf) when surplus water is determined by the United States Section of the International Boundary Water Commission to be available beyond the needs of U.S. users<br><br>• Deliver of Mexico allotment pursuant to the 1944 Water Treaty and related Minutes under extraordinary drought conditions<br><br>• Compliance with the salinity requirements of Minute No. 242 of the 1944 Water Treaty<br><br>• Delivery of emergency waer to Tijuana pursuant ot Minute No. 310 of the 1944 Water Treaty and contract | • Routing of water through the Yuma Division for delivery to Northerly International Boundary (NIB)<br><br>• Determination of quantity of water delivered at Southerly International Boundary (SIB) up to 140,000 afy<br><br>• Drainage pumping and delivery of drainage return flows at NIB and SIB<br><br>• Operation of variable-speed pumps and diversion canal at SIB to reduce salinity<br><br>• Execution of contracts to deliver a portion of Mexico's allotment to Tijuana pursuant to Minute No. 310 of the 1944 Water Treaty<br><br>• Routing of water through the Yuma Division during flood control conditions | • Delivery of emergency water to Tijuana pursuant to Minute No. 310 of the 1944 Water Treaty and contract<br><br>• Retention of a portion of Metropolitan's entitlement in Lake Mead to accommodate delivery of water pursuant to Minute No. 310 of the 1944 Water Treaty | Water delivery met the Mexico allotment (1.5 maf) pursuant to the 1944 Water Treaty and related Minutes.<br><br>A total of 1,536,232 acre-feet of water was delivered to Mexico.<br><br>Compliance was met with the salinity requirements of Minute No. 242 of the 1944 Water Treaty.<br><br>Delivery of emergency water to Tijuana pursuant to Minute No. 310 of the 1944 Water Treaty totaled 39 acre-feet<br><br>Water was routed through the Yuma Division for delivery to NIB. Water arriving at NIB is water that stays in the river below Imperial Dam, inflow from the Gila River, and water that enters the river from many returns, including Pilot Knob Wasteway.<br><br>Delivery of water at SIB totaled 129,226 acre-feet.<br><br>Drainage pumping and delivery of drainage return flows were made at NIB and SIB.<br><br>Variable-speed pumps and the diversion canal at SIB were used to reduce salinity. A total of 44 acre-feet was diverted through the diversion canal. |
| **2.2.1.8 Decree Accounting**<br>(page 2-21, Table 2-10, page 2-22) | • Annual preparation of official records of the diversion, return flow, and consumptive use of Colorado River water pursuant to Article V of the Supreme Court Decree in *Arizona v. California* | • None | • Report data for Decree Accounting records | The *Colorado River Accounting and Water Use Report: Arizona, California, Nevada* for calendar year 2006 is currently being prepared. Publication will take place during Fiscal Year 2007. Provisional data is available (see Appendix B, Attachment 1).<br><br>Provisional Data - Diversions from Mainstream Summary[4]<br>• Arizona:<br>Diversions = 3,579,085 acre-feet<br>Measured Returns = 707,008 acre-feet<br>Unmeasured Returns = 96,871 acre-feet<br>Consumptive Use = 2,775,186 acre-feet<br>• California:<br>Diversions = 4,978,484 acre-feet<br>Measured Returns = 571,916 acre-feet<br>Unmeasured Returns = 83,442 acre-feet<br>Consumptive Use = 4323,126 acre-feet<br>• Nevada:<br>Diversions = 522,105 acre-feet<br>Measured Returns = 237,603 acre-feet<br>Unmeasured Returns = 1658 acre-feet<br>Consumptive Use = 282,844 acre-feet |

**APPENDIX B TABLE B-1**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Flow-Related Covered Actions and Accomplishments**
**Calendar Year 2006**

| Federal Covered Actions<br>*Biological Assessment*<br>Chapter 2 | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions<br>Related to Non-Federal Actions[1] | 2006 Accomplishments[2, 3] |
|---|---|---|---|---|
| **2.2.2 Future Flow-Related Covered Actions** | | | | |
| **2.2.2.1 Specific Surplus and Shortage Guidelines**<br>(page 2-22; Table 2-11, page 2-24) | • Delivery of surplus water pursuant to the Article II(B)(2) of the Supreme Court Decree of March 9, 1964, 376 U.S. 340, as amended (Decree)<br><br>• Delivery of water pursuant to the Article II(B)(3) of the Decree (shortage) | • Adoption of specific post-2016 surplus guidelines<br><br>• Adoption of specific shortage guidelines | • Consult with States on development of specific post-2016 surplus guidelines or development of specific shortage guidelines<br><br>• Delivery of water to water users in the United States pursuant to applicable Federal law, including the Boulder Canyon Project Act and the Decree | No surplus water was delivered pursuant to Article II(B)(2) of the Decree.<br><br>No water was delivered pursuant to Article II(B)(3) of the Decree.<br><br>No adoption of specific post-2017 surplus guidelines was made. There was no adoption of specific shortage guidelines. |
| **2.2.2.2 Flood Release Contracts**<br>(page 2-24; Table 2-12, page 2-25) | • Delivery of water under executed flood release contracts | • Execution of contracts for water released during flood control operations | • Participate in the development of and consult in the execution of flood release contracts | No water deliveries were made under flood release contracts |
| **2.2.2.3 Changes in the Storage and Delivery of State Entitlement Waters through Various Administrative Actions**<br>(page 2-25; Table 2-13, page 2-26) | — | — | — | No administrative actions were taken to reduce the water deliveries as listed in Table 2-13 of the *Biological Assessment*. |
| **Flow Changes Below Hoover Dam to Davis Dam**<br>(Table 2-14, after page 2-26) | — | — | — | Releases were not reduced as listed in Table 2-14. Banking of 189,127 acre-feet of water on behalf of Nevada by Arizona increased the release of water below Hoover Dam to Davis Dam. Banking is not accounted as a transfer (see Changes in Delivery Related to Off-Stream Storage below.) No banking was done by California for Nevada in 2006. |
| **Flow Changes Below Davis Dam to Parker Dam**<br>(Table 2-15, after page 2-26) | — | — | — | Releases were not reduced as listed in Table 2-14. Banking of 189,127 acre-feet of water on behalf of Nevada by Arizona increased the release of water below Davis Dam to Parker Dam. Banking is not accounted as a transfer (see Changes in Delivery Related to Off-Stream Storage below.) No banking was done by California for Nevada in 2006. |
| **Flow Changes Below Parker Dam to Imperial Dam**<br>(Table 2-16, after page 2-26 | — | — | — | Releases were not reduced as listed in Table 2-14. Banking of 189,127 acre-feet of water on behalf of Nevada by Arizona did not affect the amount of water released below Parker Dam. Banking is not accounted as a transfer (see Changes in Delivery Related to Off-Stream Storage below.) No banking was done by California for Nevada in 2006. |
| **Water Conservation Field Services Program**<br>(page 2-27; Table 2-17, page 2-28) | • Develop water conservation program pursuant to Reclamation Reform Act section 210(a) | • Implementation of the Field Services Program | • Consult in the development of conservation plans pursuant to RRA section 210(a) | Three water conservation plans were updated (CAP subcontractors' Active Management Plans were included in 2006). All water conservation plans for the Lower Colorado Region are complete. |
| **Unauthorized Use**<br>(page 2-28; Table 2-18, page 2-30) | • Enforcement of provisions of the Boulder Canyon Project Act in *Arizona v. California* to limit the release and delivery of Colorado River water to authorized users | • Implementation of appropriate policy or rule to address four types of unauthorized use<br><br>• Execution of water delivery contracts with entities identified as non-contract users | • Consult with states in the development of policies or rules to address four types of unauthorized use<br><br>• Consult with the states on the execution of water delivery contracts with entities identified as noncontract users | The Advanced Notice of Proposed Rulemaking was published in the *Federal Register* on August 18, 2006. The 60-day public comment period ended under the notice on October 17, 2006. A government to government consultation was held with Colorado River Indian Tribes on November 1, 2006. |
| **Unallocated or Noncontract Water in Arizona, Exclusive of CAP**<br>(page 2-30; Table 2-19, page 2-31) | • Delivery of water pursuant to executed contracts for unallocated water in Arizona (non-CAP) | • Execution of water delivery contracts for unallocated water in Arizona (non-CAP) | • Review of water delivery contracts and consultation with Arizona on contract recommendations | Unallocated (non-CAP) Arizona water was delivered to Central Arizona Water Conservation District as allowed under that agency's contract with the United States. This water remains unallocated and not yet placed under permanent contract. Arizona Department of Water Resources is waiting for the well inventory to be completed before it recommends to the Secretary the entities to enter into contracts for the unallocated Arizona water. The well inventory is scheduled to be completed in 2008. |

**APPENDIX B TABLE B-1**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Flow-Related Covered Actions and Accomplishments**
**Calendar Year 2006**

| Federal Covered Actions<br>*Biological Assessment*<br>Chapter 2 | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions[1] | 2006 Accomplishments[2, 3] |
|---|---|---|---|---|
| **Central Arizona Project Contract Actions**<br>(page 2-31; Table 2-20, page 2-31) | • Delivery of water pursuant to executed contracts | • Completion of allocation and execution of contracts for delivery of CAP subject to Congressional direction | • Review of contracts and consultation on proposed allocation | Water was delivered to the CAP for use by CAP subcontractors and Indian tribes in satisfaction of water delivery contracts. A *Federal Register* notice was developed and signed on August 22, 2006, to announce the allocation that was implemented by the Arizona Water Settlements Act. The contracts to implement the act have been developed for execution. |
| **Changes in Delivery Related to Water Transfers**<br>(page 2-32; Table 2-21, page 2-32 | • Delivery of water pursuant to contracts that recognize temporary or permanent transfers of water entitlements | • Approval of new contracts or contract changes to recognize temporary or permanent transfers of water entitlements | • Review of contracts and consultation on new or amended contracts that recognize transfers of water entitlements | One assignment and transfer was executed. Cibola Resources assigned and transferred to B&F Investments its entitlement to 60 acre-feet per year of Arizona 4th priority water. The documents for this assignment and transfer were executed on October 27, 2006.<br><br>Delivery of 135,700 acre-feet of water was made under the Colorado River Water Delivery Agreement that reflects changes in points of diversion and is used to implement the Quantification Settlement Agreement water transfers. |
| **Changes in Delivery Related to Off-Stream Storage**<br>(page 2-32; Table 2-22, page 2-33) | • Delivery of water under executed off-stream storage agreements, pursuant to 43 C.F.R. Part 414 | • Execution of Storage and Interstate Release Agreements, pursuant to 43 C.F.R. Part 414 | • Delivery of water under executed off-stream storage agreements, pursuant to 43 C.F.R. Part 414 | No water was banked for Nevada in California by The Metropolitan Water District of Southern California.<br><br>In Arizona, 189,127 acre-feet of water were diverted to storage for Nevada. This water was part of Arizona's apportionment; Nevada was not required to reduce its diversions. When Arizona pumps water from storage in the future, Arizona will reduce its consumptive use on the Colorado River in an amount equal to Nevada's requested release. Nevada will receive the water through the intentially created unused apportionment made available by Arizona. The change in point of diversion for delivery to Nevada will be accounted for at that time. |
| **Changes in Amount of Delivery**<br>(page 2-33; Table 2-23, page 2-34) | • Delivery of water pursuant to executed contracts or amendments to recognize changes in amounts of delivery or changes in points of diversion | • Execution of contract amendments or amendments to recognize changes in amounts of delivery or changes in points of diversion | • Review of contracts and consultation on new or amended contracts | There was one change in point of diversion. Cibola Resources assigned and transferred to B&F Investments its entitlement to 60 acre-feet per year of Arizona 4th priority water. The point of diversion changed from the Cibola Valley Irrigation and Drainage District area to the Ehrenburg area. The documents for this assignment and transfer were executed on October 27, 2006. |
| **Changes in Type of Water Use**<br>(page 2-34; Table 2-24, page 2-34) | • Delivery of water pursuant to executed contracts or contract amendments that recognize changed water use types | • Execution of contracts or contract amendments that recognize changed water use types | • Review of contracts and consultation with Reclamation on new or amended contracts | No contracts were executed for change in type of use. |
| **Inclusions and Exclusions to Service Areas**<br>(page 2-34; Table 2-25, page 2-35) | • Delivery of water pursuant to executed contract amendments or new contracts that includes or excludes lands in service areas | • Execution of contract amendments or new contracts that includes or excludes lands in service areas | • Review of contracts and consultation on new or amended contracts | The Hillcrest Water Company requested an amendment to its contract to include lands within the Hillcrest Water Company service area that are owned by Springs Del Sol. This action was completed on January 5, 2006. The Golden Shores Water Conservation District requested an amendment to its service area to include some private lands owned by Topock Village Estates, second phase. This action was completed on April 11, 2006. |
| **Contract Terminations**<br>(page 2-35; Table 2-26, page 2-36) | • None | • Termination of water contract due to abandonment<br><br>• Execution of contract amendments when entitlement holder has relinquished water | • Consultation on the disposition of any water allocated for use but not consumptively used within a state | No contracts were terminated. |

**APPENDIX B TABLE B-1**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Flow-Related Covered Actions and Accomplishments**
**Calendar Year 2006**

| Federal Covered Actions<br>*Biological Assessment*<br>Chapter 2 | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions[1] | 2006 Accomplishments[2, 3] |
|---|---|---|---|---|
| **2.3 WESTERN AREA POWER ADMINISTRATION[5]** | --- | --- | --- | See section 2.2.1.5 accomplishments in this table. |
| **2.4 NATIONAL PARK SERVICE** | --- | --- | • Water entitlement holder | See section 2.2.1.8 accomplishments in this table. |
| **2.5 BUREAU OF INDIAN AFFAIRS** | | | | |
| **2.5.2.2 Ongoing Water Conservation Practices**<br>(page 2-77) | --- | • Conduct conservation measures for efficient water use | --- | Existing practices were continued. |
| **2.5.2.6 Flow-Related Actions**<br>(page 2-82) | --- | --- | • Water entitlement holder | See section 2.2.1.8 accomplishments in this table. |
| **2.5.3.2 Future Water Conservation Practices**<br>(page 2-77) | --- | • Institute new conservation measures for efficient water use | --- | No implementation in 2006. |
| **2.5.3.5 Headgate Rock Dam Operation and Maintenance**<br>(page 2-88) | --- | • Water releases and generate hydropower with these water releases | --- | Existing practices were continued. |
| **2.6 FISH AND WILDLIFE SERVICE** | --- | --- | • Water entitlement holder | See section 2.2.1.8 accomplishments in this table. |
| **2.7 BUREAU OF LAND MANAGEMENT** | --- | --- | • Water entitlement holder | See section 2.2.1.8 accomplishments in this table. |

NOTES:
1. See *LCR MSCP Habitat Conservation Plan*, section 2.1.1, Relationship of Non-Federal Covered Activities to Federal Nondiscretionary Actions. This can be accessed at http://www.lcrmscp.gov/publications/VolumeII.pdf.
2. Reporting for the Non-Federal Flow-Related Covered Activities (Appendix B, Table B-3) is included in the Federal Flow-Related Covered Actions and Accomplishments.
3. Flow-Related Federal Covered Actions and Flow-Related Non-Federal Covered Activities are reported for Calendar Year 2006.
4. Bureau of Reclamation. Provisional data from Draft *Colorado River Accounting and Water Use Report; Arizona, California, Nevada; Calendar Year 2006* (see Appendix B, Attachment 1). This can be accessed at http://www.usbr.gov/lc/region/g4000/hourly/use06.pdf.
5. Actions associated with water releases, and associated power generation, are described in the *LCR MSCP Biological Assessment*, section 2.2, Bureau of Reclamation Covered Actions. This can be accessed at http://www.lcrmscp.gov/publications/VolumeIII.pdf.

**APPENDIX B TABLE B-2**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Non-Flow-Related Covered Actions and Incidental Take Summary**
**Fiscal Year 2006**

| Federal Covered Actions *Biological Assessment* Chapter 2 | Covered Actions Summary | | | Covered Actions Implemented | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions | Reach | Location | River Miles | Habitat Type Impacted | Number of Acres Impacted | Complied with Avoidance and Minimization Measures | |
| **2.2 BUREAU OF RECLAMATION** | | | | | | | | | | |
| **2.2.3 Ongoing Non-Flow-Related (Facilities and Channel Activities)** (page 2-36; Table 2-27, page 2-37) | • Operate, maintain, and control river in Arizona, California, and Nevada<br>• Construct, maintain, and improve drainage works for water projects<br>• Maintain floodway to accommodate flood flows for 100-year event or 40,000 cubic feet per second, whichever is greater<br>• Measure diversions and return flows to and from the mainstem of the Colorado River | --- | • Administration of contracts for water district operation and maintenance of Federally owned facilities | | | | | | | See line items in this table. |
| **2.2.3.1 Channel Maintenance** (page 2-38) | --- | --- | --- | 4 | Mule Wash | A107.4 | None | 0 | 1, 3, and 6 | |
| | | | | 4 | Gould Wash | A105.9 | None | 0 | 1, 3, and 6 | |
| | | | | 4 | Piute Wash | C253.8 | None | 0 | 1, 3, and 6 | |
| | | | | 4 | Vidal Wash | C164.0 | None | 0 | 1, 3, and 6 | |
| **Wash Fans** (page 2-40; Table 2-30, page 2-42) | --- | • Wash fan removal | --- | | | | | | | No implementation in FY06. |
| **Protected Bankline Maintenance and Care of Unprotected Banklines** (page 2-43) | --- | • Protected bankline location and maintenance | --- | 4 | --- | C88.4 | None | < 1.0 acre | 1, 3, and 6 | Walter's Camp area. |
| | | | | 4 | --- | A179.2 | None | < 1.0 acre | 1, 3, and 6 | Parker Strip above Blue Water Casino. |
| | | | | 4 | --- | C133.7 | None | < 1.0 acre | 1, 3, and 6 | Below Palo Verde Dam. |
| **Levee Maintenance** (page 2-44) | --- | • Levee location and maintenance | --- | | | | | | | No implementation in FY06. |
| **Desilting Basins** (page 2-46; Table 2-32, page 2-48) | --- | • Sediment dredging upstream of principal canal diversions and disposal sites<br>• Maintenance of settling basins to remove sediment and maintain flows; four principal basins | --- | 6 | --- | 49.2 | None | 0 | 1, 3, and 6 | 1,250,000 cubic yards dredged above Imperial Dam. |
| **Jetties and Training Structures** (page 2-47; Tables 2-33 – 2-34, page 2-48) | --- | • Jetty and training structure location and *maintenance* | --- | | | | | | | No implementation in FY06. |
| **Stockpiles** (page 2-49; Table 2-37, page 2-49) | --- | • Location of three future stock piles | --- | | | | | | | No implementation in FY06. |

**APPENDIX B TABLE B-2**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Non-Flow-Related Covered Actions and Incidental Take Summary**
**Fiscal Year 2006**

| Federal Covered Actions *Biological Assessment* Chapter 2 | Covered Actions Summary | | | Covered Actions Implemented | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions | Reach | Location | River Miles | Habitat Type Impacted | Number of Acres Impacted | Complied with Avoidance and Minimization Measures | |
| **Riprap Placement and Haul Roads** (page 2-50) | --- | • Haul roads and riprap storage location and maintenance | --- | 3 | --- | 235.0-271.0 | None | 0 | 1, 3, and 8 | Mohave Division: 72.8 miles road maintenance. |
| | | | | 4 | --- | 87.5-175.0 | None | 0 | 1, 3, and 8 | Cibola, Palo Verde, and Parker divisions: 168.6 miles road maintenance. |
| | | | | 6 | --- | 23.1-49.0 | None | 0 | 1, 3, and 8 | Yuma and Laguna divisions; Gila confluence: 107.8 miles road maintenance. |
| | | | | 7 | --- | 0.0-23.1 | None | 0 | 1, 3, and 8 | Limitrophe Division: 84.2 miles road maintenance. |
| **2.2.3.2 Major Federal Facilities and Miscellaneous Operation, Maintenance, and Replacement** (page 2-50; Table 2-36, after page 2-50) | --- | • Maintenance of Yuma area drainage wells and conveyance facilities including maintenance and access roads<br>• Maintenance of open channel drains and outfall channels<br>• Maintenance and replacement of gauging stations, survey line markers, and boat ramps | --- | 6 and 7 | U.S. Bypass Drain | C0.0-24.0 | None | 0 | 1, 3, and 8 | Concrete lining repairs. |
| | | | | 6 | Yuma Mesa Conduit | A27.0 | None | 0 | 1, 3, and 8 | Repair of associated components, Yuma Valley. |
| | | | | 6 | Yuma Mesa, Yuma Valley, & South Gila wells | A31.0-34.0 | None | 0 | 1, 3, and 8 | Pump and motors, Yuma Mesa. |
| | | | | 7 | DPOC 1, DPOC 2, & DPOC 3 | A31.0-36.0 | None | 0 | 1, 3, and 8 | Concrete lining repairs. |
| **Maintenance Activities at the SIB** (page 2-52) | --- | • Maintenance of facilities to provide flood flow capacity | --- | 7 | 242 Well Field | --- | None | 0 | 1, 3, and 8 | Pump and motor work. |
| **2.2.3.3 Backwater Maintenance** (page 2-53; Table 2-37, page 2-54) | --- | • Backwater maintenance | --- | | | | | | | No implementation in FY06. |
| **Mohave Division** (page 2-55; Table 2-38, page 2-56) | --- | • Backwater maintenance | --- | | | | | | | No implementation in FY06. |
| **Parker Division** (page 2-57; Table 2-39, page 2-57) | --- | • Backwater maintenance | --- | | | | | | | No implementation in FY06. |
| **Palo Verde Division** (page 2-58; Table 2-40, page 2-58) | --- | • Backwater maintenance | --- | | | | | | | No implementation in FY06. |
| **Cibola Division** (page 2-59; Table 2-41, page 2-59) | --- | • Backwater maintenance | --- | | | | | | | No implementation in FY06. |
| **Imperial Division** (page 2-59; Table 2-42, page 2-59) | --- | • Backwater maintenance | --- | | | | | | | No implementation in FY06. |
| **Laguna Division** (page 2-60; Table 2-43, page 2-60) | --- | • Backwater maintenance | --- | | | | | | | No implementation in FY06. |
| **Yuma Division** (page 2-60; Table 2-44, page 2-61) | --- | • Backwater maintenance | --- | 6 | RM 31 Backwater | A31.0 | None | 0 | 1, 3, and 8 | Backwater dredging. |
| | | | | 6 | RM 33 Backwater | A33.0 | None | 0 | 1, 3, and 8 | Backwater dredging. |
| **Limitrophe Division Mitigation Obligations** (page 2-61; Table 2-45, page 2-62) | --- | --- | --- | | | | | | | No implementation in FY06. |
| **2.2.3.4 Limitrophe Division Maintenance** (page 2-62) | --- | --- | --- | | | | | | | No implementation in FY06. |

**APPENDIX B TABLE B-2**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Non-Flow-Related Covered Actions and Incidental Take Summary**
**Fiscal Year 2006**

| Federal Covered Actions *Biological Assessment* Chapter 2 | Covered Actions Summary | | | Covered Actions Implemented | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions | Reach | Location | River Miles | Habitat Type Impacted | Number of Acres Impacted | Complied with Avoidance and Minimization Measures | |
| **2.2.4 Future Non-Flow-Related Actions** (page 2-63) | --- | --- | --- | | | | | | | |
| **2.2.4.1 Topock Marsh** (page 2-63) | --- | --- | --- | | | | | | | No implementation in FY06. |
| **2.2.4.2 Laguna Reservoir** (page 2-63) | --- | --- | --- | | | | | | | No implementation in FY06. |
| **2.2.4.3 Bankline Maintenance - Unprotected Banklines** (page 2-65, Table 2-46, page 2-66) | --- | --- | --- | | | | | | | No implementation in FY06. |
| **2.2.4.4 Proposed Jetties** (page 2-67, Table 2-46, page 2-67) | --- | --- | --- | | | | | | | No implementation in FY06. |

**APPENDIX B TABLE B-2**
**Lower Colorado River Multi-Species Conservation Program**
**Federal Non-Flow-Related Covered Actions and Incidental Take Summary**
**Fiscal Year 2006**

| Federal Covered Actions *Biological Assessment* Chapter 2 | Covered Actions Summary | | | Covered Actions Implemented | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| | Nondiscretionary Actions | Discretionary Actions | Nondiscretionary Actions Related to Non-Federal Actions | Reach | Location | River Miles | Habitat Type Impacted | Number of Acres Impacted | Complied with Avoidance and Minimization Measures | |
| **2.3 WESTERN AREA POWER ADMINISTRATION** | | | • Operation and maintenance of switchyards, substations, and transmission lines | 4 | 18 sites | n/a | saltcedar, developed | < 0.5 acres | 3 and 5 | Replaced 18 transmission poles. |
| **2.4 NATIONAL PARK SERVICE** | | | | | | | | | | |
| **2.4.2 Riparian Habitat Restoration** (page 2-70) | | • Riparian habitat restoration on Lake Mead and Lake Mohave | | | | | | | | No implementation in FY06. |
| **2.4.3 Fishery Management** (page 2-71) | | • Habitat modifications on Lake Mead and Lake Mohave, including development and enhancement of grow-out ponds, construction of docks, and creation of angler enhancement structures | | | | | | | | No implementation in FY06. |
| **2.4.4 Boating Access** (page 2-72) | | • Maintenance and enhancement of boating access on Lake Mead and Lake Mohave | | 1 | Boulder Harbor | --- | None | 1.5 | 1 and 3 | Launch ramp and connector road were rehabilitated. |
| **2.5 BUREAU OF INDIAN AFFAIRS** | | | | | | | | | | |
| **2.5.2.1 Ongoing Irrigation System Operation and Maintenance** (page 2-74) | | • Irrigation system operation and maintenance for existing Irrigation Projects | | 3 | Fort Mohave | --- | None | 0 | 1 and 3 | Continued existing practices |
| | | | | 3 | Chemehuevi | --- | None | 0 | 1 and 3 | Continued existing practices |
| | | | | 4 | CRIT | --- | None | 0 | 1 and 3 | Continued existing practices |
| | | | | 6 | Fort Yuma | --- | None | 0 | 1 and 3 | Continued existing practices |
| | | | | 7 | Cocopah | --- | None | 0 | 1 and 3 | Continued existing practices |
| **2.5.2.2 Ongoing Water Conservation Practices** (page 2-77) | | • Operation and maintenance of existing equipment | | | | | | | | Continued existing practices. |
| **2.5.2.4 Ongoing Wildland Fire Management** (page 2-88) | | • Implementation of fuels management projects | | | | | | | | No implementation in FY06. |
| **2.5.2.5 Ongoing Woodland and Shoreline Maintenance** (page 2-82) | | • Maintenance on Chemehuevi Woodlands Project | | | | | | | | Continued existing practices. |
| **2.5.3.1 Future Canal Lining** (page 2-84) | | • Repair, reline, and line irrigation canals | | | | | | | | No implementation in FY06. |
| **2.5.3.2 Future Water Conservation Practices** (page 2-85) | | • Installation, operation, and maintenance of new equipment | | | | | | | | No implementation in FY06. |
| **2.5.3.3 Future Farmland Development** (page 2-85) | | • Develop additional agricultural acreage, including construction of irrigation systems | | | | | | | | No implementation in FY06. |
| **2.5.3.6 Future Wildland Fire Management** (page 2-88) | | • Implementation of new fuels management projects | | | | | | | | No implementation in FY06. |
| **2.6 FISH AND WILDLIFE SERVICE** | | | | | | | | | | No Non-Flow-Related Actions are covered by the LCR MSCP. |
| **2.7 BUREAU OF LAND MANAGEMENT** | | | | | | | | | | No Non-Flow-Related Actions are covered by the LCR MSCP. |

**APPENDIX B TABLE B-3**
**Lower Colorado River Multi-Species Conservation Program**
**Non-Federal Covered Activities and Incidental Take Summary**
**Fiscal Year 2006**

| Non-Federal Covered Activities *Habitat Conservation Plan* Chapter 2 | Covered Activities Summary | Covered Activities Implemented | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|
| | | Reach | Location | River Miles | Habitat Type Impacted | Number of Acres Impacted | Complied with Avoidance and Minimization Measures | |
| **2.2 ARIZONA** | | | | | | | | |
| **2.2.1 Ongoing Flow-Related Covered Activities**[1] (page 2-4) | • Diversion of up to 2.8 maf of Arizona's full annual entitlement, plus surplus, plus Arizona's share of any unused apportionment, plus the volume of return flow, as applicable<br><br>• Generation and transmission of hydroelectric power<br><br>• Power contracting | | | | | | | Non-Federal Flow-Related Covered Activities are included in the Federal Flow-Related Covered Actions and Accomplishments (see Appendix B, Table B-1). |
| **2.2.2 Future Flow-Related Covered Activities**[1] (page 2-6) | Future Arizona water contract holder activities may include:<br>• Diversions, discharges, and return flows through existing facilities<br>• Changes to points of diversion<br>• New points of diversion<br>• Interstate water banking<br>• Water marketing<br>• Water transfers<br>• Any other actions as made possible from any future agreements and/or measures taken by the Arizona Department of Water Resources or contract holder(s)<br><br>Future Arizona hydroelectric power contract holder activities may include:<br>• Execution, administration, and operation of extended, renewed, new, or additional contracts for hydroelectric power from hydroelectric facilities at Hoover Dam, Davis Dam, Parker Dam, Headgate Rock Dam, Siphon Drop Power Plant, and Pilot Knob Power Plant | | | | | | | No implementation in FY06. |
| **2.2.3 Ongoing Non-Flow-Related Covered Activities** (page 2-7) | Operation, maintenance, and replacement of:<br>• The facilities and equipment through which water is diverted and conveyed<br><br>• The facilities through which return flows are returned to the river<br><br>• Drainage wells in the Yuma area<br><br>• The facilities and equipment through which electric power is generated and transmitted<br><br>• The appurtenant works that support these facilities, including access and service roads, electric power and communication transmission lines and substations, docks, boat ramps, and bankline protection | 6 | Yuma Valley | --- | --- | --- | 1 and 3 | 42 miles of drain maintenance. |
| **2.2.3.1 Arizona Game and Fish Department Programs and Activities** | | | | | | | | |
| **Vegetation and Habitat Management Programs** (page 2-8) | • Aquatic, wetland, and riparian habitat maintenance and restoration activities | | | | | | | No implementation in FY06. |
| **Fish Surveys** (page 2-8) | • Surveys for Federally listed and nonnative fish species | | | | | | | 21.5 nights of electro-fishing surveys. |
| **Fish Stocking** (page 2-9) | • Stocking of trout | | | | | | | No implementation in FY06. |
| **Maintenance of Aids to Navigation and Boating Access** (page 2-9) | • Place and maintain aids to navigation | | | | | | | 188 buoys inspected and maintained. |
| **Law Enforcement Patrol Activities** (page 2-9) | • Administer law enforcement and boating safety program using watercraft patrols | | | | | | | 283 person-days of watercraft patrol. |

**APPENDIX B TABLE B-3**
**Lower Colorado River Multi-Species Conservation Program**
**Non-Federal Covered Activities and Incidental Take Summary**
**Fiscal Year 2006**

| Non-Federal Covered Activities *Habitat Conservation Plan* Chapter 2 | Covered Activities Summary | Covered Activities Implemented | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|
| | | Reach | Location | River Miles | Habitat Type Impacted | Number of Acres Impacted | Complied with Avoidance and Minimization Measures | |
| **2.3 CALIFORNIA** | | | | | | | | |
| **2.3.1 Ongoing Flow-Related Covered Activities**[1] (page 2-11) | • Diversion of up to 4.4 maf of California's full annual entitlement (consistent with the Quantification Settlement Agreement), plus California's share of any unused apportionment and designated surpluses, plus volume of return flows, as applicable<br><br>• Generation and transmission of hydroelectric power<br><br>• Power contracting | | | | | | | Non-Federal Flow-Related Covered Activities are included in the Federal Flow-Related Covered Actions and Accomplishments (see Appendix B, Table B-1). |
| **2.3.2 Future Flow-Related Covered Activities**[1] (page 2-13) | Future California water contract holder activities may include:<br>• Diversions, discharges, and return flows through existing facilities<br>• Changes to points of diversion<br>• New points of diversion<br>• Interstate water banking<br>• Water marketing<br>• Water transfers<br>• Any other actions as made possible from any future agreements and/or measures taken by the Colorado River Board of California or contract holder(s)<br><br>Future California hydroelectric power contract holder activities may include:<br>• Execution, administration, and operation of extended, renewed, new, or additional contracts for hydroelectric power from hydroelectric facilities at Hoover Dam, Davis Dam, Parker Dam, Headgate Rock Dam, Siphon Drop Power Plant, and Pilot Knob Power Plant | | | | | | | Non-Federal Flow-Related Covered Activities are included in the Federal Flow-Related Covered Actions and Accomplishments (see Appendix B, Table B-1). |
| **2.3.3 Ongoing Non-Flow-Related Activities** | Operation, maintenance, and replacement of:<br>• The facilities and equipment through which water is diverted and conveyed<br><br>• The facilities through which return flows are returned to the river<br><br>• The facilities and equipment through which electric power is generated and transmitted<br><br>• The appurtenant works that support these facilities, including access and service roads, electric power and communication transmission lines and substations, docks, boat ramps, and bankline protection | 4<br><br>6 | Palo Verde Irrigation District<br><br>Bard Water District | --- | --- | --- | 1 and 3<br><br>1 and 3 | 19.45 miles of drain maintenance.<br><br>8.61 miles of drain maintenance. |

**APPENDIX B TABLE B-3**
**Lower Colorado River Multi-Species Conservation Program**
**Non-Federal Covered Activities and Incidental Take Summary**
**Fiscal Year 2006**

| Non-Federal Covered Activities *Habitat Conservation Plan* Chapter 2 | Covered Activities Summary | Covered Activities Implemented | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|
| | | Reach | Location | River Miles | Habitat Type Impacted | Number of Acres Impacted | Complied with Avoidance and Minimization Measures | |
| **2.4 NEVADA** | | | | | | | | |
| **2.4.1 Ongoing Flow-Related Covered Activities**[1] (page 2-15) | • Diversion of up to 0.3 maf of Nevada's full annual entitlement, plus surplus flows, plus Nevada's share of any unused apportionment, plus volume of return flows, as applicable<br>• Generation and transmission of hydroelectric power<br>• Power contracting | | | | | | | Non-Federal Flow-Related Covered Activities are included in the Federal Flow-Related Covered Actions and Accomplishments (see Appendix B, Table B-1). |
| **2.4.2 Future Flow-Related Covered Activities**[1] (page 2-17) | Future Nevada water contract holder activities may include:<br>• Diversions, discharges, and return flows through existing facilities<br>• Changes to points of diversion<br>• New points of diversion<br>• Interstate water banking<br>• Water marketing<br>• Water transfers<br>• Any other actions as made possible from any future agreements and/or measures taken by the Colorado River Commission of Nevada or contract holder(s)<br><br>Future Nevada hydroelectric power contract holder activities may include:<br>• Execution, administration, and operation of extended, renewed, new, or additional contracts for hydroelectric power from hydroelectric facilities at Hoover Dam, Davis Dam, Parker Dam, and Headgate Rock Dam | | | | | | | Non-Federal Flow-Related Covered Activities are included in the Federal Flow-Related Covered Actions and Accomplishments (see Appendix B, Table B-1). |
| **2.4.3 Ongoing Non-Flow-Related Activities** (page 2-18) | Operation, maintenance, and replacement of:<br>• The facilities and equipment through which water is diverted and conveyed<br>• The facilities through which return flows are returned to the river<br>• The facilities and equipment through which electric power is generated and transmitted<br>• The appurtenant works that support these facilities, including access and service roads, electric power and communication transmission lines and substations, docks, boat ramps, and bankline protection | | | | | | | No implementation in FY06. |
| **2.4.3.1 Nevada Game and Fish Department Programs and Activities** (page 2-18) | Implementation of select Federally funded:<br>• Aquatic, wetland, and riparian habitat maintenance and restoration activities | --- | --- | --- | --- | --- | --- | No implementation in FY06. |
| | • Aquatic, wetland, and riparian revegetation enhancement activities | --- | --- | --- | --- | --- | --- | No implementation in FY06. |
| | • Place and maintain aids to navigation and boating access | 3 | Clark County, downstream of Davis Dam | 257.5-275.0 | None | 0 | 1 and 3 | Performed routine maintenance and inspection of aids to navigation. |
| | • Administer law enforcement and boating safety program using watercraft patrols | 1 and 2 | --- | Lake Mead-275.0 | None | 0 | 1 and 3 | Conducted routine law enforcement patrols on Lake Mead, Lake Mohave, mainstem of LCR, and Laughlin Lagoon. |

**NOTE:**
1. See *LCR MSCP Habitat Conservation Plan* , section 2.1.1, Relationship of Non-Federal Covered Activities to Federal Nondiscretionary Actions. This can be accessed at http://www.lcrmscp.gov/publications/VolumeII.pdf.

# Appendix C. Recommendations from Resource Agencies

State of California – The Resources Agency ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
Eastern Sierra Inland Deserts Region – R6
4665 Lampson Avenue, Suite J
Los Alamitos, CA 90720

March 30, 2006

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CONTROL NO. 06005474
FOLDER I.D. 41079
KEYWORD Fish Project

Mr. Tom Burke
Bureau of Reclamation
Lower Colorado Region
Boulder City, NV 89006-1470

Re: Preliminary Comments on the Lower Colorado River Multi-species Conservation Program Draft Fish Augmentation Plan

Dear Mr. Burke:

The California Department of Fish and Game (Department) has reviewed the U.S. Bureau of Reclamation's (Reclamation) Draft Fish Augmentation Plan (Plan) and provides comment on biological resources that may be affected by the implementation of those activities. The Department finds the Plan to be consistent with requirements pursuant to section 3(e)(vi) of permit # 2081-2005-008-06. No changes or additions are warranted by the Department at this time. The Department, as an LCR-MSCP partner, shall continue to review Reclamation's annual stocking plan as defined on page 6, under stocking considerations of the Fish Augmentation Plan.

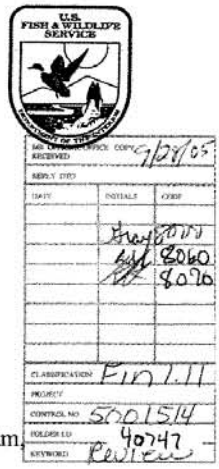
The Department appreciates the opportunity to comment on the Plan. If you have any questions regarding this letter please contact me at (760) 921-2974.

Sincerely,

Canh Nguyen
Environmental Scientist

*Conserving California's Wildlife Since 1870*

**United States Department of the Interior**
**U.S. Fish and Wildlife Service**
**Arizona Ecological Services Field Office**
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 Fax: (602) 242-2513



In Reply Refer to:

AESO/SE
02-21-04-F-0161

September 26, 2005

Memorandum

To: Program Manager, Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada (LC-8000)

From: Field Supervisor

Subject: Request for Consistency Review for Implementation Report, Fiscal Year 2006 Work Plan, and Budget for the Lower Colorado River Multi-Species Conservation Program, Arizona, California, and Nevada

This responds to your August 29, 2005, request for review by the Fish and Wildlife Service (FWS) of the subject document describing conservation actions undertaken or that will be undertaken by the Bureau of Reclamation (Reclamation) as part of the implementation of the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). The subject document contains information on conservation actions funded in Fiscal Year (FY) 2004, conservation measures proposed for FY 2006 (with some projections for 2007-2008), and the proposed budget for FY 2006. The FY 2006 report also contains sections to describe completed conservation measures, the amount of incidental take reported, monitoring and research results, and minor modifications made to the LCR MSCP. These sections are for future use, as there has been no activity for these sections in the six months since the LCR MSCP section 10(a)(1)(B) permit and biological opinion were issued.

The focus of our review is the FY 2006 Work Plan, containing a total of 63 work tasks in eight categories. Total funding for the work plan is $12,144,762.00.

We have reviewed the work tasks for FY 2006 and have the following observations. The conservation actions described therein are directed to the implementation needs of the LCR MSCP in several areas, including research on riparian and backwater restoration techniques, management of restoration areas, background information for system- and species-monitoring needs, information management, equipment for monitoring programs, and hatchery production of native fish for augmentation. All of these funded activities have direct application to the implementation needs of the LCR MSCP and allow for the appropriate initiation of the 50-year program. The work plan tasks are consistent with the requirements of the LCR MSCP section 10(a)(1)(B) permit and the biological opinion.

Thank you for the opportunity to review this FY 2006 work plan. We also appreciate the efforts to maintain connectivity between conservation efforts initiated in previous years and the FY 2006 program and advance information for the next two future program years. We look forward to working with you and the permittees on the implementation of this important conservation program. If there are any questions regarding this response, please contact me (602) 242-0210 (x244) or Lesley Fitzpatrick (x236).

FOR

Steven L. Spangle

cc: Lower Colorado River Coordinator, Fish and Wildlife Service, Phoenix, AZ

W:\Lesley Fitzpatrick\FY06 Work Plan approval.doc:cgg

**United States Department of the Interior**
**U.S. Fish and Wildlife Service**
**Arizona Ecological Services Field Office**
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 Fax: (602) 242-2513

In Reply Refer to:
AESO/SE
02-21-04-F-0161

May 15, 2006

Memorandum

To: Program Manager, Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada (LC-8000)

From: Field Supervisor

Subject: Consistency Review for New FY 2006 Work Plan Tasks, LCR MSCP

This responds to your memorandum of May 5, 2006, requesting comment from the Fish and Wildlife Service (FWS) on changes to the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) FY 2006 Work Plan expenditures. The two new projects are B9 (Overton Wildlife Management Area) which replaces the Boulder City Wetland Ponds work task and B10 (Uvalde National Fish Hatchery) which transfers funds from the Bubbling Ponds State Fish Hatchery work task. We reviewed these existing projects as part of the FY 2006 Work Plan and provided our concurrence on the consistency of these tasks with the terms of the Conservation Plan and the section 10(a)(1)(B) permit on September 26, 2005.

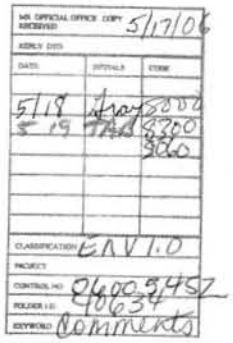
We have reviewed the two new work plan tasks and concur that they are consistent with the terms of the Conservation Plan and the permit. We have no concerns about the use of the Overton Wildlife Area as a replacement for the Boulder City Wetlands Ponds since both sites are near Las Vegas and Lake Mead. Because the LCR MSCP relies on the existing bonytail broodstock, it is consistent with the goals of the program to contribute to the development and maintenance of a second broodstock to ensure that fish are available for the program in the future.

Thank you for the opportunity to provide a consistency review for these two new work tasks. If there are questions regarding our review, please contact me at (602) 242-0210 x244 or Lesley Fitzpatrick at x236.

Sincerely,

for Steven L. Spangle

W:\Lesley Fitzpatrick\LCR MSCP FY06 amendment.doc:bml



## Appendix D. LCR MSCP Closed Work Tasks

| Work Task | | Fiscal Year Closed* |
|---|---|---|
| C17 | Senator Wash Razorback Sucker Stock Assessment | FY05 |
| C18 | Point Count Design and Sample Size Evaluation | FY05 |
| C19 | Southwestern Willow Flycatcher Feather Colorimetry | FY05 |
| C20 | Southwestern Willow Flycatcher Prey Base Study | FY05 |
| C21 | Yellow-Billed Cuckoo Demographics Study | FY05 |
| C22 | Yellow-Billed Cuckoo Survey's, Demographic Study, And Survey Protocol Evaluation | FY05 |
| D11 | Vegetation Type Mapping | FY05 |
| E19 | Needles-Topock (AZ RM 240) Stabilization | FY05 |
| E20 | Pintail Slough | FY05 |
| E21 | Planet Ranch, Bill Williams River | FY05 |
| E22 | Pratt Agricultural Lease | FY05 |
| E23 | Mittry Lake Fire Rehabilitation Project | FY05 |
| B9 | Boulder City Wetland Ponds | FY05 |
| E10 | Walker Lake | FY05 |
| E11 | Draper Lake | FY05 |
| C1 | Brown-Headed Cowbird Trap Assessment | FY06 |

*Fiscal Year Closed is the last fiscal year in which the work task received funding. Information about the work task can be found in the accomplishment report for that fiscal year.