Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Final Implementation Report, Fiscal Year 2017 Work Plan and Budget, Fiscal Year 2015 Accomplishment Report

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

June 2016

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

Federal Participant Group

Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
City of Somerton
City of Yuma
Electrical District No. 3, Pinal County, Arizona
Golden Shores Water Conservation District
Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
Town of Fredonia
Town of Thatcher
Town of Wickenburg
Salt River Project Agricultural Improvement and Power District
Unit "B" Irrigation and Drainage District
Wellton-Mohawk Irrigation and Drainage District
Yuma County Water Users' Association
Yuma Irrigation District
Yuma Mesa Irrigation and Drainage District

Other Interested Parties Participant Group

QuadState Local Governments Authority
Desert Wildlife Unlimited

California Participant Group

California Department of Fish and Wildlife
City of Needles
Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
San Diego County Water Authority
Southern California Edison Company
Southern California Public Power Authority
The Metropolitan Water District of Southern California

Nevada Participant Group

Colorado River Commission of Nevada
Nevada Department of Wildlife
Southern Nevada Water Authority
Colorado River Commission Power Users
Basic Water Company

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes
Chemehuevi Indian Tribe

Conservation Participant Group

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

Lower Colorado River Multi-Species Conservation Program

Final Implementation Report, Fiscal Year 2017 Work Plan and Budget, Fiscal Year 2015 Accomplishment Report

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

June 2016

ACRONYMS AND ABBREVIATIONS

AGFD	Arizona Game and Fish Department
AJ	Arizona Juvenile backwater
ALS	airborne light detection and ranging sensing
AMM	Avoidance and Minimization Measure
AMP	Adaptive Management Program
BBCA	Big Bend Conservation Area
BEVI	Arizona Bell's vireo (*Vireo bellii arizonae*)
Bill Williams River NWR	Bill Williams River National Wildlife Refuge
BLCA	Beal Lake Conservation Area
BLM	Bureau of Land Management
BLRA	California black rail (*Laterallus jamaicensis coturniculus*)
BO	Biological and Conference Opinion
BONY	bonytail (*Gila elegans*)
CDFW	California Department of Fish and Wildlife
CEM	conceptual ecological model
CESA	California Endangered Species Act
cfs	cubic feet per second
CI	confidence interval
Cibola NWR	Cibola National Wildlife Refuge
Cibola NWR Unit #1	Cibola National Wildlife Refuge Unit #1 Conservation Area
CLNB	California leaf-nosed bat (*Macrotus californicus*)
CLRA	Yuma clapper rail (*Rallus longirostris yumanensis*)
CMM	Conservation Area Management Measure
CPUE	catch per unit effort
CRCR	Colorado River cotton rat (*Sigmodon arizonae plenus*)
CRTO	Colorado River toad (*Incilius alvarius*)
CVCA	Cibola Valley Conservation Area
CVIDD	Cibola Valley Irrigation and Drainage District
DAR	digital automated recorder
DETO	desert tortoise (*Gopherus agassizii*)
DNA	deoxyribonucleic acid
DO	dissolved oxygen
DPMO	desert pocket mouse (*Chaetodipus penicillatus*)
eDNA	environmental deoxyribonucleic acid
ELOW	elf owl (*Micrathene whitneyi*)
ESA	Endangered Species Act

FLSU	flannelmouth sucker (*Catostomus latipinnis*)
FMA	Funding and Management Agreement
FTHL	flat-tailed horned lizard (*Phrynosoma mcalli*)
FY	fiscal year
g	gram(s)
GIFL	gilded flicker (*Colaptes chrysoides*)
GIS	Geographic Information System
GIWO	Gila woodpecker (*Melanerpes uropygialis*)
Glen Canyon Dam AMP	Glen Canyon Dam Adaptive Management Program
GPS	Global Positioning System
Havasu NWR	Havasu National Wildlife Refuge
HCP	Habitat Conservation Plan
HMF	Habitat Maintenance Fund
HUCH	humpback chub (*Gila cypha*)
Imperial NWR	Imperial National Wildlife Refuge
IPCA	Imperial Ponds Conservation Area
ISC	interim surplus criteria
kHz	kilohertz
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
LDCA	Laguna Division Conservation Area
LEBI	western least bittern (*Ixobrychus exilis*)
LiDAR	light detection and ranging
LLFR	lowland leopard frog (*Lithobates yavapaiensis*)
m	meter(s)
MAPS	Monitoring Avian Productivity and Survivorship
MEFF	mobile electronic field form
mg/L	milligrams per liter
mm	millimeter(s)
MNSW	MacNeill's sootywing (*Hesperopsis gracielae*)
Mora NFH	Mora National Fish Hatchery
MOSI	Monitoreo de Sobrevivencia Invernal
MRM	Monitoring and Research Measure
mtDNA	mitochondrial deoxyribonucleic acid
MVCA	Mohave Valley Conservation Area
NDOW	Nevada Department of Wildlife
NPS	National Park Service

Overton WMA	Overton Wildlife Management Area
Pahranagat NWR	Pahranagat National Wildlife Refuge
PCR	polymerase chain reaction
pH	acidity or alkalinity of a solution
PIT	passive integrated transponder
PTBB	Pale Townsend's big-eared bat (*Corynorhinus townsendii*)
PVER	Palo Verde Ecological Reserve
PVER-South	Palo Verde Ecological Reserve-South
PVID	Palo Verde Irrigation District
PWCA	Pretty Water Conservation Area
RASU	razorback sucker (*Xyrauchen texanus*)
Reclamation	Bureau of Reclamation
RLFR	relict leopard frog (*Lithobates onca*)
RMF	Remedial Measures Fund
SDCWA	San Diego County Water Authority
SNARRC	Southwestern Native Aquatic Resources & Recovery Center
SNWA	Southern Nevada Water Authority
SSA	species status assessment
STBU	sticky buckwheat (*Eriogonum viscidulum*)
SUR	submersible ultrasonic receiver
SUTA	summer tanager (*Piranga rubra*)
SWFL	southwestern willow flycatcher (*Empidonax trailli extimus*)
THMI	threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*)
TL	total length
TLS	terrestrial light detection and ranging sensing
USFWS	U.S. Fish and Wildlife Service
VEFL	vermilion flycatcher (*Pyrocephalus rubinus*)
VES	visual encounter survey
WIFL	willow flycatcher (*Empidonax traillii*)
Willow Beach NFH	Willow Beach National Fish Hatchery
WRBA	western red bat (*Lasiurus blossevilli*)
WYBA	western yellow bat (*Lasiurus xanthinus*)

YBCU	yellow-billed cuckoo (*Coccyzus americanus occidentalis*)
YCNHAC	Yuma Crossing National Heritage Area Corporation
YEW	Yuma East Wetlands
YHCR	Yuma hispid cotton rat (*Sigmodon hispidus eremicus*)
YWAR	Sonoran yellow warbler (*Setophaga petechia sonorana*)
1997 BO	1997 Biological and Conference Opinion

Symbols

°C	degrees Celsius
>	greater than
<	less than
µS/cm	microsiemens per centimeter
%	percent
+	plus (at least)

CONTENTS

Page

Program Overview 1
Program Implementation 2
LCR MSCP Funding 3
Underfunding 4
Funding Credits/Debits 4
FY17 Contributions and Adjustments 5
2001 Biological Opinion Account 5
Habitat Maintenance Fund 6
Remedial Measures Fund 7
Land and Water Fund 8
In-Kind Contributions 8
California Endangered Species Act Permit 8
Proposed FY17 Program Activities and FY15 Accomplishments 9
Compliance Reporting 16
LCR MSCP 16
2001 Biological Opinion 35
California Endangered Species Act Permit 36

Overview of Work Tasks

Fish Augmentation, Monitoring, and Research 39
Fish Augmentation (Section B) 39
FY15 Accomplishments 40
FY16 Activities 42
Proposed FY17 Activities 43
Species Research (Section C) 44
FY15 Accomplishments 44
FY16 Activities 46
Proposed FY17 Activities 47
System Monitoring (Section D) 47
FY15 Accomplishments 48
FY16 Activities 49
Proposed FY17 Activities 49
Post-Development Monitoring (Section F) 50
FY15 Accomplishments 50
FY16 Activities 50
Proposed FY17 Activities 51
Adaptive Management Program (Section G) 51
FY15 Accomplishments 52
FY16 Activities 53
Proposed FY17 Activities 53

Page

Monitoring and Research of Terrestrial, Riparian, and Marsh Habitats and Associated Covered Species 55
Species Research (Section C) 55
FY15 Accomplishments 56
FY16 Activities 59
Proposed FY17 Activities 60
System Monitoring (Section D) 61
FY15 Accomplishments 61
FY16 Activities 64
Proposed FY17 Activities 66
Post-Development Monitoring (Section F) 67
FY15 Accomplishments 68
FY16 Activities 71
FY17 Proposed Activities 71
Adaptive Management Program (Section G) 72
FY15 Accomplishments 72
FY16 Activities 73
FY17 Proposed Activities 74
Conservation Area Development, Maintenance, and Adaptive Management 75
Conservation Area Development and Management (Section E) 75
Site Identification and Selection 77
FY15 Accomplishments 77
FY16 Activities 78
FY17 Activities 79
Development and Maintenance 80
FY15 Accomplishments 95
FY16 Activities 98
FY17 Proposed Activities 99
Adaptive Management Program (Section G) 100
FY15 Accomplishments 100
Soil and Groundwater Salinity Monitoring Network 100
Habitat Manipulation 101
FY16 Activities 102
Soil and Groundwater Salinity Monitoring Network 102
Habitat Manipulation 102
FY17 Proposed Activities 103
Soil and Groundwater Salinity Monitoring Network 103
Habitat Manipulation 103

Page

Work Tasks – Section A (Program Administration)

Work Task A1: Program Administration 105

Work Tasks – Section B (Fish Augmentation)

Work Task B1: Lake Mohave Razorback Sucker Larvae Collections 107
Work Task B2: Willow Beach National Fish Hatchery 110
Work Task B3: Achii Hanyo Native Fish Rearing Facility 113
Work Task B4: Southwestern Native Aquatic Resources & Recovery Center at Dexter 116
Work Task B5: Bubbling Ponds Fish Hatchery 119
Work Task B6: Lake Mead Fish Hatchery 121
Work Task B7: Lake-Side Rearing Ponds 125
Work Task B8: Fish Tagging Equipment 129
Work Task B11: Overton Wildlife Management Area 131
Work Task B12: Maintenance of Alternate Bonytail Broodstock 134

Work Tasks – Section C (Species Research)

Work Task C2: Sticky Buckwheat and Threecorner Milkvetch Conservation 137
Work Task C3: Lower Colorado River Multi-Species Conservation Program Covered Species Profile Development 139
Work Task C4: Relict Leopard Frog 141
Work Task C13: Lake Mead Razorback Sucker Study 143
Work Task C14: Humpback Chub Program Support 146
Work Task C24: Avian Species Habitat Requirements 148
Work Task C25: Imperial Ponds Native Fish Research 152
Work Task C27: Small Mammal Population Studies 155
Work Task C31: Razorback Sucker Genetic Diversity Assessment 157
Work Task C32: Determination of Salinity, Temperature, pH, and Oxygen Limits for Bonytail and Razorback Suckers 160
Work Task C40: Genetic and Demographic Studies to Guide Conservation Management of Razorback Suckers and Bonytail in Off-Channel Habitats 163
Work Task C43: Population Demographics and Habitat Use of the California Leaf-Nosed Bat, a Genetic Evaluation 167
Work Task C52: Gilded Flicker Riparian Habitat Use and Seasonal Movement Research 169
Work Task C53: Sonic Telemetry of Juvenile Flannelmouth Suckers in Reach 3 172

Page

Work Task C57: Sonic Telemetry of Lake Mead Juvenile Razorback Suckers 175
Work Task C59: Selenium Monitoring in Created Backwater and Marsh Habitats 178
Work Task C60: Habitat Manipulation 181
Work Task C61: Evaluation of Alternative Stocking Methods for Fish Augmentation 185
Work Task C62: Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study 189
Work Task C63: Evaluation of Habitat Features that May Influence Success of Razorback Suckers and Bonytail in Backwater Environments 191
Work Task C64: Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail 194
Work Task C65: Evaluation of Immediate Post-Stocking Survival of Razorback Suckers and Bonytail 200
Work Task C66: Marsh Bird Water Depth Analysis 203

Work Tasks – Section D (System Monitoring)

Work Task D1: Marsh Bird Surveys 205
Work Task D2: Southwestern Willow Flycatcher Presence/Absence Surveys 207
Work Task D5: Monitoring Avian Productivity and Survivorship 212
Work Task D6: System Monitoring for Riparian Obligate Avian Species 216
Work Task D7: Yellow-billed Cuckoo Presence/ Absence Surveys 220
Work Task D8: Razorback Sucker and Bonytail Stock Assessment 223
Work Task D9: System Monitoring and Research of Covered Bat Species 228
Work Task D10: System Monitoring of Rodent Populations 232
Work Task D12: Lowland Leopard Frog and Colorado River Toad Surveys 234

Work Tasks – Section E (Conservation Area Development and Management)

Work Task E1: Beal Lake Conservation Area 237
Work Task E4: Palo Verde Ecological Reserve 243
Work Task E5: Cibola Valley Conservation Area 247
Work Task E9: Hart Mine Marsh 251
Work Task E13: McAllister Lake 255
Work Task E14: Imperial Ponds Conservation Area 259
Work Task E16: Conservation Area Site Selection 264
Work Task E17: Topock Marsh Pumping 269
Work Task E18: Law Enforcement and Fire Suppression 272
Work Task E21: Planet Ranch 274
Work Task E24: Cibola National Wildlife Refuge Unit #1 Conservation Area 278

Page

Work Task E25: Big Bend Conservation Area 282
Work Task E27: Laguna Division Conservation Area 286
Work Task E28: Yuma East Wetlands 290
Work Task E31: Hunters Hole 294
Work Task E33: Pretty Water Conservation Area 297
Work Task E34: Salinity and Soil Moisture Monitoring Network 299
Work Task E35: Mohave Valley Conservation Area 302
Work Task E36: Parker Dam Camp 305
Work Task E37: Palo Verde Ecological Reserve-South 307
Work Task E38: Three Fingers Lake 309

Work Tasks – Section F (Post-Development Monitoring)

Work Task F1: Habitat Monitoring at Conservation Areas 313
Work Task F2: Avian Use of Conservation Areas 316
Work Task F3: Small Mammal Colonization of Conservation Areas 320
Work Task F4: Covered Bat Species Monitoring at Conservation Areas 322
Work Task F5: Post-Development Monitoring of Fish at Conservation Areas 325
Work Task F6: Post-Development Monitoring of MacNeill's Sootywings at Conservation Areas 328
Work Task F7: Marsh Bird Monitoring at Conservation Areas 330

Work Tasks – Section G (Adaptive Management Program)

Work Task G1: Data Management 333
Work Task G3: Adaptive Management Research Projects 338
Work Task G4: Science/Adaptive Management Strategy 341
Work Task G6*: Conceptual Ecological Models 346

Work Tasks – Section H (Funding Accounts)

Work Task H1: Habitat Maintenance Fund 349
Work Task H2: Remedial Measures Fund 352

Work Tasks – Section I (Public Outreach)

Work Task I1: Public Outreach 355

Tables

Table Page

1-1 Federal/Non-Federal Funding Requirements for the LCR MSCP 3
1-1a Federal/Non-Federal Makeup Funding Requirements for the LCR MSCP 4
1-2 FY17 Contribution Schedule 5
1-3a HMF Fund – Required 6
1-3b HMF – Actual 6
1-4a RMF – Required (FY14–15) 7
1-4b RMF – Actual (FY14–15) 7
1-4c RMF – Required (FY16–17) 7
1-5 Land and Water Fund 8
1-6 FY17 Proposed Program Funding 9
1-7 Annual Funding Matrix 10
1-8 Conservation Area Land Cover Type 17
1-9 Conservation Area by Species Habitat Creation Conservation Measures 18
1-10a Summary of Fish Augmentation Conservation Measure RASU5 22
1-10b Summary of Fish Augmentation Conservation Measure RASU3 22
1-10c Summary of Fish Augmentation Conservation Measure BONY3 22
1-11 Status of Conservation Measures 23
1-12 LCR MSCP Covered Species Post-Development Monitoring in FY15 68
1-13 Managed Acres by Conservation Area Through FY15 96
1-14 Land Cover Type by Reach and State Through FY15 97

Figures

Figure Page

1-1 Conservation area development and management, 2015. 81
1-2 E1 – Beal Lake Conservation Area managed acreage through 2015. 82
1-3 E4 – Palo Verde Ecological Reserve managed acreage through 2015. 83
1-4 E5 – Cibola Valley Conservation Area managed acreage through 2015. 84
1-5 E9 – Hart Mine Marsh managed acreage through 2015. 85
1-6 E14 – Imperial Ponds Conservation Area managed acreage through 2015. 86
1-7 E21 – Planet Ranch managed acreage through 2015. 87
1-8 E24 – Cibola National Wildlife Refuge Unit #1 Conservation Area managed acreage through 2015. 88
1-9 E25 – Big Bend Conservation Area managed acreage through 2015. 89
1-10 E27 – Laguna Division Conservation Area managed acreage through 2015. 90
1-11 E28 – Yuma East Wetlands managed acreage through 2015. 91
1-12 E31 – Hunters Hole managed acreage through 2015. 92
1-13 E33 – Pretty Water Conservation Area managed acreage through 2015. 93
1-14 E35 – Mohave Valley Conservation Area managed acreage through 2015. 94

Attachments

Attachment

A Letter from Central Arizona Water Conservation District

B Description of Take

- B-1: Federal Flow-Related Covered Actions and Accomplishments, Calendar Year 2015
- B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2015
- B-3: LCR MSCP Non-Federal Covered Activities and Incidental Take Summary, Fiscal Year 2015

C Recommendations from Resource Agencies

D Financial Statement

- D-1: Required Contributions
  - D-1a: Underfunding and Makeup Strategy – Current Year Dollars
- D-2: Funding Credits
  - D-2a: San Diego County Water Authority
  - D-2b: The Metropolitan Water District of Southern California
  - D-2c: Nevada
  - D-2d: Arizona
  - D-2e: Bureau of Reclamation
- D-3: Funding Accounts
  - D-3a: Habitat Maintenance Fund
  - D-3b: Remedial Measures Fund
  - D-3c: Land and Water Fund
- D4: Cumulative Program Accomplishment

E Reports Published in Fiscal Year 2015

PROGRAM OVERVIEW

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a partnership of Federal and non-Federal stakeholders created to respond to the need to balance the use of lower Colorado River (LCR) water resources and the conservation of native species and their habitats in compliance with the Endangered Species Act (ESA). This is a long-term (50-year) plan to conserve at least 26 species along the LCR from Lake Mead to the Southerly International Boundary with Mexico through implementation of a Habitat Conservation Plan (HCP).

Under this long-term program, current water diversions and power production will be accommodated, and opportunities for future water and power development will be optimized to the extent consistent with the law. This 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 LCR MSCP 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 under the LCR MSCP. Of the 26 covered species, 7 are currently listed under the Federal ESA. This program addresses the biological needs of mammals, birds, fish, amphibians, reptiles, invertebrates, and plants.

Implementing the LCR MSCP will help create at least 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 LCR. Under the LCR MSCP, participation in the recovery programs for these fishes may include funding other appropriate activities in lieu of stocking. In addition, there is a substantial research and monitoring component to this program; a $25 million fund was established to support projects implemented by land use managers to protect and maintain existing habitat for covered species.

The estimated cost of this program in 2003 dollars is about $626 million, and it will be adjusted annually 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 and 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. The documents for the LCR MSCP include an environmental impact statement/environmental impact report, a biological assessment, a 2005 Biological and Conference Opinion (BO), a HCP, a Record of Decision, a Funding and Management Agreement (FMA), an Implementation Agreement, and a Section 10 Permit. These documents can be found on the LCR MSCP Web site (www.lcrmscp.gov).

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

1. In December 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 were implemented by Reclamation in conjunction with the LCR MSCP. Section 8.6 of the FMA states that implementation of the 2001 BO 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 Wildlife (CDFW). The requirements of that CESA permit are generally consistent with the LCR MSCP Habitat Conservation Plan. A copy of the memorandum 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 its 50-year term. The FMA also calls for the establishment of a Steering Committee, currently consisting of 57 entities, to provide input and oversight functions in support of LCR MSCP implementation. The Steering Committee includes Federal and non-Federal entities, which are receiving ESA coverage through the LCR MSCP, or stakeholders interested in the environment of the LCR. A complete list of Steering Committee members can be viewed on the LCR MSCP Web site. During fiscal year (FY) 2015, Chris Harris, Colorado River Board of California, served as Chair of the Steering Committee, and Perri Benemelis, Central Arizona Groundwater Replenishment District, served as Vice Chair.

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 current annual report contains a description of conservation activities accomplished during FY15, a summary of work underway during FY16, and proposed work to be performed during FY17. It also documents research and monitoring activities undertaken in support of the LCR MSCP and incidental take for covered actions implemented during FY15. This annual report fully meets the reporting requirements outlined in Section 7.4.1 of the FMA.

LCR MSCP Funding

As outlined in the FMA, the total program cost in 2003 dollars is $626,180,000, which is split in a 50-50 cost share among 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 1-1 provides the annual contribution before inflation, a composite inflation index, and indexed annual program (Federal and non-Federal) contributions. Indexed annual program costs are calculated using the composite inflation index from 2 years prior as outlined in the FMA. A summary of required contributions received to date is provided in attachment D-1.

Table 1-1.—Federal/Non-Federal Funding Requirements for the LCR MSCP

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
2009	$11,214,000	1.210	2007	$13,568,940	$6,784,470	$6,784,470
2010	$11,214,000	1.294	2008	$14,510,916	$7,255,458	$7,255,458
2011	$27,540,000	1.191*	2009	$32,800,140	$16,400,070	$16,400,070
2012	$27,540,000	1.210*	2010	$33,323,400	$16,661,700	$16,661,700
2013	$27,540,000	1.251*	2011	$34,452,540	$17,226,270	$17,226,270
2014	$27,540,000	1.276*	2012	$35,141,040	$17,570,520	$17,570,520
2015	$27,540,000	1.358	2013	$37,399,320	$18,699,660	$18,699,660
2011 – 2014	Underfunding makeup			$7,601,040	$3,800,520	$3,800,520
2016	$22,164,000	1.387	2014	$30,741,468	$15,370,734	$15,370,734
2017	$22,164,000	1.393	2015	$30,874,452	$15,437,226	$15,437,226

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding makeup.

Underfunding

In a letter dated February 14, 2014, the Central Arizona Water Conservation District informed the LCR MSCP parties of an inadvertent error in the calculation of the inflation index for program years 6– 9 (FY11–14). Due to a change in the base year of one of the two indices used to calculate the inflation index, the inflation rate was understated and consequently too low. This resulted in an underpayment by the parties for those years. On October 22, 2014, the Steering Committee passed Resolution 15-001, approving the makeup of $7,601,040 in underfunding for program years FY11–14; the non-Federal amount of $3,800,520 should be used to make up the underfunding in the Habitat Maintenance Fund (HMF), the Remedial Measures Fund (RMF), and to prepay the RMF. Table 1-1a shows the required makeup funding and the distribution between the funds. Because California used funding credits in FY11–14 toward their required contribution, and those credits would be worth more using the revised inflation rate, their credits were recalculated, and the incremental difference was used to reduce the amount they owed in the RMF. Detailed calculations are provided in attachment D-1a. In a letter dated December 19, 2014, the USFWS provided concurrence that the payment amounts and schedule met each funding party's commitments under the program documents, including Sections 6.4, 12, and 15.10 of the Implementation Agreement.

Table 1-1a.—Federal/Non-Federal Makeup Funding Requirements for the LCR MSCP

	Total	Credit	HMF	RMF
Federal	$3,800,520.00			
Non-Federal	$3,800,520.00			
California	*$2,090,286.00*	*$196,836.62*	*$654,015.00*	*$1,239,434.38*
Arizona	*$570,078.00*		*$327,007.50*	*$243,070.50*
Nevada	*$1,140,156.00*		*$327,007.50*	*$813,148.50*
Total	**$7,601,040.00**	**$196,836.62**	**$1,308,030.00**	**$2,295,653.38**

Funding Credits/Debits

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 the funding obligation for a specific year shall be treated as a credit against future funding obligations. Any shortage of funds provided by either a Federal party or a State permittee will be treated as a deficit to future funding obligations. In a letter dated June 5, 2014, the Central Arizona Water Conservation District indicated that Arizona had paid $590,297.36 in underfunding. Since their required underfunding amount was $570,078.00, they received a funding credit of $20,219.36 in 2014 dollars. In a letter dated July 17, 2014, the Colorado River Commission of Nevada indicated that Nevada had paid $1,180,594.72 in underfunding. Since Nevada owed $1,140,156.00, they received a funding credit of $40,438.72 in 2014 dollars. Both Arizona and Nevada used

their funding credits in FY15. Reclamation made up its underfunding in FY14 using $3,800,520 of funding credits. The California parties paid their underfunding makeup as part of their FY15 contribution and, therefore, will not receive a credit. Attachment D-2 provides a summary of funding credits earned and funding credits used.

FY17 Contributions and Adjustments

As outlined in table 1-1, the annual funding commitment for FY17 is $22,164,000, based on the 2003 estimate, and $30,874,452 after the final composite inflation index of 1.393 is applied. In accordance with Section 8.3 of the FMA, the Federal share of the cost for FY17 and the non-Federal share of the cost by State are shown in table 1-2. Section 8.3 of the FMA allows for adjusted non-Federal funding during the first 30 years of the program. The FY17 adjusted funding amounts for the three States are also shown in table 1-2 (amounts based on direction from the Central Arizona Water Conservation District (see attachment A).

Table 1-2.—FY17 Contribution Schedule

Funding Entity	FY17 Contributions	FY17 Adjusted Contributions
Federal	$15,437,226.00	$15,437,226.00
Non-Federal	$15,437,226.00	$15,437,226.00
California	*$7,718,613.00*	*$7,351,921.42*
Arizona	*$3,859,306.50*	*$4,592,689.66*
Nevada	*$3,859,306.50*	*$3,492,614.92*
Total	**$30,874,452.00**	**$30,874,452.00**

2001 Biological Opinion Account

A total of $6 million, plus interest, was 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 and was used to meet the financial commitments for these entities. The mitigation requirements outlined in the 2001 BO needed to be implemented on the front end of the LCR MSCP; therefore, funding in excess of the entities' LCR MSCP annual required contribution was requested by Reclamation and resulted in funding credits in the early years of this program. In FY08, requirements under the 2001 BO specifically related to the Secretarial Implementation Agreement were completed, and all remaining funds were withdrawn. In FY09, the SDCWA started using their funding credits to meet their LCR MSCP annual contribution, and they will continue to use these credits to meet their annual obligations until they are exhausted. The Metropolitan Water District of Southern California used their remaining credits in FY13.

Habitat Maintenance Fund

As outlined in Section 8.4.2 of the FMA, a $25 million (2003 dollars) HMF was developed during the first 10 years of LCR MSCP implementation to restore covered species habitats that have been degraded; a share of each State's contribution was set aside in interest-bearing accounts referred to as Habitat Maintenance Fund accounts. While each State is maintaining its own account, interest earned on these accounts will be added to the accounts for the benefit of implementing the LCR MSCP. Table 1-3a provides FY14 contributions, the underfunding makeup amount, FY15 contributions, and total funds contributed through FY15 with interest. Funding for FY15 is $4,848,060, which is the remaining funding amount required for the HMF; the HMF is now fully funded (table 1-3a). Table 1-3b provides information on how the underfunding amounts are being contributed and the resulting changes in the FY15 contributions. Because Arizona and Nevada provided more than their required underfunding makeup amount in FY14, they received a funding credit. Both are using a portion of their funding credit toward their FY15 contribution. California is paying their underfunding makeup amount in FY15 (table 1-3b). No funding is required in FY16, as the HMF funding commitment is now complete. A detailed accounting of the HMF is included in attachment D-3a. No funds have been withdrawn from any of the accounts to date.

Table 1-3a.—HMF – Required

Funding Partner	FY14 Contribution	Underfunding Makeup	FY15 Contribution
California	$3,464,340	$654,015.00	$2,424,030
Arizona	$1,732,170	$327,007.50	$1,212,015
Nevada	$1,732,170	$327,007.50	$1,212,015
Total	**$6,928,680**	**$1,308,030.00**	**$4,848,060**

Table 1-3b.—HMF – Actual

Funding Partner	FY14 Contribution	Underfunding Makeup FY14	Underfunding Makeup FY15	FY15 Contribution	Cumulative through FY15*
California	$3,464,340	$0	$654,015.00	$2,424,030	$16,677,505.33
Arizona	$1,732,170	$338,020.32	$0	$1,201,002.18	$8,137,521.39
Nevada	$1,732,170	$338,020.32	$0	$1,201,002.18	$8,236,569.18
Total	**$6,928,680**	**$676,040.64**	**$654,015.00**	**$4,826,034.36**	**$33,051,595.90**

* Includes interest earned.

Remedial Measures Fund

The HCP requires that contingency funds be set aside to pay for implementing remedial measures in the event that changed circumstances affect program conservation measures (HCP, Section 5.12.13). The amount of funding is set forth in table 7-1 of the HCP, totaling $13,270,000 (2003 dollars) to be paid from year 6 through year 25 of the LCR MSCP. On April 25, 2012, the Steering Committee passed Program Decision Document 12-001, which approved establishment of State interest-bearing RMFs. Table 1-4a provides FY14 contributions, total funds contributed through FY14 with interest, the underfunding makeup amount, and FY15contributions. Table 1-4b provides information on how the underfunding amounts are being contributed and the resulting changes in the FY15 contributions. Because Arizona and Nevada provided more than their required underfunding makeup amount in FY14, they received a funding credit. Both are using a portion of their funding credit toward their FY15 contribution. California is paying their underfunding makeup amount in FY15. Table 1-4c provides the FY16 and projected FY17 contribution amounts. A detailed accounting of the RMF is included in attachment D-3b. No funds have been withdrawn from any of the accounts to date.

Table 1-4a.—RMF – Required (FY14–15)

Funding Partner	FY14 Contribution	Underfunding Makeup	FY15 Contribution
California	$169,708.00	$1,239,434.38	$180,614.00
Arizona	$84,854.00	$243,070.50	$90,307.00
Nevada	$84,854.00	$813,148.50	$90,307.00
Total	**$339,416.00**	**$2,295,653.38**	**$361,228.00**

Table 1-4b.—RMF – Actual (FY14–15)

Funding Partner	FY14 Contribution	Underfunding Makeup FY14	Underfunding Makeup FY15	FY15 Contribution	Cumulative through FY15*
California	$169,708.00	$0	$1,239,434.38	$180,614.00	$2,108,612.89
Arizona	$84,854.00	$252,277.04	$0	$81,100.46	$667,806.00
Nevada	$84,854.00	$842,574.40	$0	$60,881.10	$1,242,877.63
Total	**$339,416.00**	**$1,094,851.44**	**$1,239,434.38**	**$322,595.56**	**$4,019,296.52**

* Includes interest earned.

Table 1-4c.—RMF – Required (FY16–17)

Funding Partner	FY16 Contribution	FY17 Projected Contribution
California	$552,026.00	$554,414.00
Arizona	$276,013.00	$277,207.00
Nevada	$276,013.00	$277,207.00
Total	**$1,104,052.00**	**$1,108,828.00**

Land and Water Fund

A Land and Water Fund has been established by Reclamation to set aside funds for acquisition of land and water resources to implement conservation measures described in the HCP. Through guidelines developed under Work Task E16, Reclamation works with interested parties to secure land and water resources. Once potential sites have been evaluated, including determining financial value through the Federal appraisal process using the U.S. Department of the Interior's designated Appraisal Services Office, land and water resources nominated by Reclamation for acquisition must be approved by the Steering Committee through a Land and Water Resolution. The entire site selection process may extend over multiple years; therefore, this fund has been established to ensure funding will be available to complete these acquisitions. The Land and Water Fund will be limited to the total amount of funding identified in Table 7-1 of the HCP for land and water acquisition, indexed for inflation. Once land and water resources have been approved for acquisition, funds will be withdrawn from the Land and Water Fund and a work task developed. If funds set aside in the Land and Water Fund are no longer required for land or water acquisition, they may be used to implement other actions necessary for conservation measure accomplishment. Table 1-5 lists the funds set aside in the Land and Water Fund through FY15. It is anticipated that an additional $4,100,000 will be contributed in FY16 and an additional $2,100,000 in FY17. In FY16, $8,300,000 was taken out of the fund for securing the land and water at Planet Ranch. A detailed accounting of the Land and Water Fund can be found in attachment D-3c.

Table 1-5.—Land and Water Fund

Funding Partner	FY15 Contribution	Cumulative through FY15	FY16 Contribution	F17 Projected Contribution
Reclamation	$6,100,000	$19,600,000	$4,100,000	$2,100,000

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 October 2007, the Steering Committee passed Program Decision Document 08-001, *In-Kind Credit for Goods and Services*, which provides specific guidelines for the calculation of in-kind credit for goods and services. No in-kind contributions were provided in FY15.

California Endangered Species Act Permit

As discussed earlier 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 among Reclamation and the California partners regarding LCR MSCP conservation actions for the CESA permit discusses Reclamation's commitment to implement the HCP in a manner that facilitates CESA compliance requirements. In exchange, the California partners have made land and water available at no cost 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 FY17 Program Activities and FY15 Accomplishments

The minimum funding required in the LCR MSCP documents for FY17 is $30,874,452: $15,437,226 Federal and $15,437,226 non-Federal. Reclamation is proposing an annual program budget of $30,940,902 which consists of $28,840,902 in work tasks and a $2,100,000 contribution to the Land and Water Fund (table 1-6).

Table 1-6.—FY17 Proposed Program Funding

Program Area	FY17 Funding
Program Administration	$1,418,074
Fish Augmentation	$1,905,000
Species Research	$3,358,000
System Monitoring	$3,310,000
Conservation Area Development and Management	$13,991,000
Post-Development Monitoring	$1,885,000
Adaptive Management Program	$1,740,000
Funding Account – Remedial Measures	$1,108,828
Public Outreach	$125,000
Subtotal	**$28,840,902**
Land and Water Fund	$2,100,000
Total	**$30,940,902**

Table 1-7 shows the following by work task: FY15 approved estimates and actual accomplishment, cumulative program expenditures (FY04–15), FY16 approved program funding, FY17 proposed program funding, and out-year funding for FY18 and FY19. Out-year funding estimates are not adjusted for inflation because the inflation index is not calculated until 5 months prior to the start of each fiscal year. In table 1-7, current year accomplishment is shown as obligations (money that is set aside during the year for program expenses). Cumulative accomplishment is shown as expenditures (actual funding expended).

Table 1-7.—Annual Funding Matrix

Work Task	Name	FY15 Approved Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Projected Estimate[1]	FY19 Projected Estimate[1]
A	**Program Administration**							
A1	Program Administration	$1,382,444.00	$1,140,477.22	$10,995,005.59	$1,411,966.00	$1,418,074.00	$1,418,074.00	$1,418,074.00
Closed[2]	Work Tasks Pre-FY15			$130,535.22				
		$1,382,444.00	**$1,140,477.22**	**$11,125,540.81**	**$1,411,966.00**	**$1,418,074.00**	**$1,418,074.00**	**$1,418,074.00**
B	**Fish Augmentation**							
B1	Lake Mohave Razorback Sucker Larvae Collections	$200,000.00	$183,182.91	$2,158,662.37	$200,000.00	$215,000.00	$215,000.00	$215,000.00
B2	Willow Beach National Fish Hatchery	$325,000.00	$312,306.38	$3,496,327.15	$325,000.00	$325,000.00	$325,000.00	$325,000.00
B3	Achii Hanyo Native Fish Rearing Facility	$160,000.00	$174,637.87	$1,244,414.09	$275,000.00	$50,000.00	$170,000.00	$170,000.00
B4	Southwestern Native Aquatic Resources & Recovery Center at Dexter	$250,000.00	$224,440.99	$2,142,765.08	$260,000.00	$260,000.00	$260,000.00	$260,000.00
B5	Bubbling Ponds Fish Hatchery	$960,000.00	$686,937.96	$2,739,536.89	$315,000.00	$330,000.00	$330,000.00	$330,000.00
B6	Lake Mead Fish Hatchery	$255,000.00	$238,485.46	$651,098.11	$240,000.00	$325,000.00	$325,000.00	$325,000.00
B7	Lake-Side Rearing Ponds	$200,000.00	$181,782.56	$2,050,370.87	$200,000.00	$200,000.00	$200,000.00	$200,000.00
B8	Fish Tagging Equipment	$125,000.00	$115,059.95	$878,805.06	$135,000.00	$135,000.00	$135,000.00	$135,000.00
B11	Overton Wildlife Management Area	$50,000.00	$0.00	$428,954.45	$50,000.00	$0.00	$0.00	$0.00
B12	Maintenance of Alternate Bonytail Broodstock	$0.00	$0.00	$0.00	$50,000.00	$65,000.00	$65,000.00	$65,000.00
Closed[2]	Work Tasks Pre-FY15		$0.00	$558,428.94	$0.00			
		$2,525,000.00	**$2,116,834.08**	**$16,349,363.01**	**$2,050,000.00**	**$1,905,000.00**	**$2,025,000.00**	**$2,025,000.00**
C	**Species Research**							
C2	Sticky Buckwheat and Threecorner Milkvetch Conservation	$11,000.00	$10,673.49	$115,851.18	$11,000.00	$11,000.00	$11,000.00	$11,000.00

Table 1-7.—Annual Funding Matrix

Work Task	Name	FY15 Approved Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Projected Estimate[1]	FY19 Projected Estimate[1]
C3	Lower Colorado River Multi-Species Conservation Program Covered Species Profile Development	$10,000.00	$466.27	$278,663.86	$0.00	$0.00	$0.00	$0.00
C4	Relict Leopard Frog	$11,000.00	$10,843.67	$114,832.84	$0.00	$0.00	$0.00	$0.00
C13	Lake Mead Razorback Sucker Study	$135,000.00	$135,241.40	$1,695,608.41	$0.00	$0.00	$0.00	$0.00
C14	Humpback Chub Program Support	$57,000.00	$87.21	$287,987.11	$57,000.00	$57,000.00	$57,000.00	$57,000.00
C24	Avian Species Habitat Requirements	$310,000.00	$161,927.64	$1,707,382.89	$270,000.00	$340,000.00	$150,000.00	$0.00
C25	Imperial Ponds Native Fish Research	$200,000.00	$184,143.25	$1,644,441.56	$200,000.00	$200,000.00	$200,000.00	$0.00
C27	Small Mammal Population Studies	$50,000.00	$39,005.31	$438,705.18	$40,000.00	$0.00	$0.00	$0.00
C31	Razorback Sucker Genetic Diversity Assessment	$140,000.00	$141,928.74	$650,031.33	$160,000.00	$160,000.00	$160,000.00	$0.00
C32	Determination of Salinity, Temperature, pH, and Oxygen Limits for Bonytail and Razorback Suckers	$115,000.00	$96,353.36	$690,956.97	$110,000.00	$110,000.00	$0.00	$0.00
C40	Genetic and Demographic Studies to Guide Conversation Management of Razorback Suckers and Bonytail in Off-Channel Habitats	$190,000.00	$186,066.42	$760,448.36	$275,000.00	$300,000.00	$300,000.00	$0.00
C43	Population Demographics and Habitat Use of the California Leaf-Nosed Bat, a Genetic Evaluation	$25,000.00	$24,984.19	$110,099.63	$40,000.00	$0.00	$0.00	$0.00
C52	Gilded Flicker Riparian Habitat Use and Seasonal Movement Research	$160,000.00	$107,103.99	$513,269.60	$300,000.00	$300,000.00	$0.00	$0.00
C53	Sonic Telemetry of Juvenile Flannelmouth Suckers in Reach 3	$120,000.00	$117,133.38	$410,889.16	$120,000.00	$100,000.00	$100,000.00	$0.00
C57	Sonic Telemetry of Lake Mead Juvenile Razorback Suckers	$250,000.00	$226,958.99	$541,878.93	$0.00	$0.00	$0.00	$0.00
C59	Selenium Monitoring in Created Backwater and Marsh Habitats	$250,000.00	$65,217.24	$110,385.45	$200,000.00	$160,000.00	$160,000.00	$160,000.00
C60	Habitat Manipulation	$100,000.00	$74,319.36	$120,067.55	$225,000.00	$175,000.00	$175,000.00	$175,000.00

Table 1-7.—Annual Funding Matrix

Work Task	Name	FY15 Approved Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Projected Estimate[1]	FY19 Projected Estimate[1]
C61	Evaluation of Alternative Stocking Methods for Fish Augmentation	$425,000.00	$188,348.83	$209,893.35	$200,000.00	$300,000.00	$300,000.00	$0.00
C62	Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study	$180,000.00	$175,622.04	$251,387.83	$150,000.00	$25,000.00	$0.00	$0.00
C63	Evaluation of Habitat Features that May Influence Success of Razorback Suckers and Bonytail in Backwater Environments	$125,000.00	$102,751.51	$102,751.51	$135,000.00	$150,000.00	$150,000.00	$0.00
C64	Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail	$700,000.00	$686,445.37	$502,874.59	$700,000.00	$750,000.00	$750,000.00	$750,000.00
C65	Evaluation of Immediate Post-Stocking Survival of Razorback Suckers and Bonytail	$60,000.00	$20,738.26	$20,738.26	$120,000.00	$120,000.00	$120,000.00	$0.00
C66	Marsh Bird Water Depth Analysis	$0.00	$0.00	$0.00	$100,000.00	$100,000.00	$20,000.00	$0.00
Closed[2]	Work Tasks Pre-FY15		$363.84	$13,150,900.59				
		$3,624,000.00	**$2,756,723.76**	**$24,430,046.14**	**$3,413,000.00**	**$3,358,000.00**	**$2,653,000.00**	**$1,153,000.00**
D	**System Monitoring**							
D1	Marsh Bird Surveys	$25,000.00	$38,402.79	$290,472.87	$40,000.00	$40,000.00	$40,000.00	$40,000.00
D2	Southwestern Willow Flycatcher Presence/Absence Surveys	$675,000.00	$848,055.38	$7,621,908.70	$750,000.00	$750,000.00	$750,000.00	$750,000.00
D5	Monitoring Avian Productivity and Survivorship	$250,000.00	$300,836.44	$2,851,772.52	$250,000.00	$250,000.00	$250,000.00	$250,000.00
D6	System Monitoring for Riparian Obligate Avian Species	$480,000.00	$368,062.30	$2,316,765.90	$150,000.00	$480,000.00	$480,000.00	$480,000.00
D7	Yellow-Billed Cuckoo Presence/Absence Surveys	$750,000.00	$832,589.27	$5,328,636.18	$750,000.00	$650,000.00	$650,000.00	$650,000.00
D8	Razorback Sucker and Bonytail Stock Assessment	$850,000.00	$846,376.22	$5,723,554.08	$925,000.00	$925,000.00	$925,000.00	$925,000.00

Table 1-7.—Annual Funding Matrix

Work Task	Name	FY15 Approved Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Projected Estimate[1]	FY19 Projected Estimate[1]
D9	System Monitoring and Research of Covered Bat Species	$380,000.00	$404,116.29	$1,670,233.47	$390,000.00	$140,000.00	$140,000.00	$140,000.00
D10	System Monitoring of Rodent Populations	$40,000.00	$37,704.76	$212,226.74	$40,000.00	$40,000.00	$40,000.00	$40,000.00
D12	Lowland Leopard Frog and Colorado River Toad Surveys	$25,000.00	$16,710.85	$437,414.37	$35,000.00	$35,000.00	$0.00	$0.00
Closed[2]	Work Tasks Pre-FY15			$1,298,090.77				
		$3,475,000.00	**$3,692,854.30**	**$27,751,075.60**	**$3,330,000.00**	**$3,310,000.00**	**$3,275,000.00**	**$3,275,000.00**
E	**Conservation Area Development and Management**							
E1	Beal Lake Conservation Area	$300,000.00	$280,221.40	$3,987,475.52	$400,000.00	$250,000.00	$1,300,000.00	$250,000.00
E4	Palo Verde Ecological Reserve	$500,000.00	$822,212.91	$9,320,891.26	$500,000.00	$600,000.00	$600,000.00	$600,000.00
E5	Cibola Valley Conservation Area	$700,000.00	$722,727.85	$11,351,713.78	$750,000.00	$800,000.00	$850,000.00	$850,000.00
E9	Hart Mine Marsh	$250,000.00	$204,369.70	$6,822,956.73	$250,000.00	$250,000.00	$250,000.00	$200,000.00
E13	McAllister Lake	$0.00	$0.00	$127,336.82	$0.00	$50,000.00	$400,000.00	$400,000.00
E14	Imperial Ponds Conservation Area	$800,000.00	$328,870.83	$9,669,214.32	$1,500,000.00	$1,450,000.00	$450,000.00	$350,000.00
E16	Conservation Area Site Selection	$500,000.00	$539,525.37	$2,954,318.83	$1,300,000.00	$700,000.00	$500,000.00	$400,000.00
E17	Topock Marsh Pumping	$1,000.00	$1,450.25	$1,140,618.66	$1,000.00	$1,000.00	$1,000.00	$1,000.00
E18	Law Enforcement and Fire Suppression	$200,000.00	$226,303.00	$1,608,764.76	$250,000.00	$250,000.00	$250,000.00	$250,000.00
E21	Planet Ranch	$40,000.00	$78,302.48	$344,212.22	$10,340,000.00	$2,000,000.00	$3,000,000.00	$4,000,000.00
E24	Cibola National Wildlife Refuge Unit #1 Conservation Area	$1,000,000.00	$655,451.78	$4,479,008.26	$700,000.00	$750,000.00	$750,000.00	$800,000.00
E25	Big Bend Conservation Area	$30,000.00	$24,878.09	$1,189,268.20	$30,000.00	$30,000.00	$30,000.00	$30,000.00
E27	Laguna Division Conservation Area	$3,000,000.00	$1,759,859.79	$26,254,555.45	$900,000.00	$200,000.00	$200,000.00	$100,000.00
E28	Yuma East Wetlands	$600,000.00	$467,563.97	$1,695,711.26	$1,200,000.00	$450,000.00	$400,000.00	$400,000.00
E31	Hunters Hole	$80,000.00	$112,273.39	$440,441.26	$65,000.00	$60,000.00	$60,000.00	$60,000.00

Table 1-7.—Annual Funding Matrix

Work Task	Name	FY15 Approved Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Projected Estimate[1]	FY19 Projected Estimate[1]
E33	Pretty Water Conservation Area	$700,000.00	$970,299.11	$1,268,018.44	$450,000.00	$150,000.00	$50,000.00	$40,000.00
E34	Salinity and Soil Moisture Monitoring Network	$150,000.00	$51,701.73	$133,159.02	$500,000.00	$0.00	$0.00	$0.00
E35	Mohave Valley Conservation Area	$500,000.00	$460,588.99	$324,968.99	$1,250,000.00	$5,500,000.00	$500,000.00	$160,000.00
E36	Parker Dam Camp	$0.00	$0.00	$0.00	$0.00	$100,000.00	$50,000.00	$20,000.00
E37	Palo Verde Ecological Reserve-South	$0.00	$0.00	$0.00	$0.00	$200,000.00	$1,000,000.00	$1,000,000.00
E38	Three Fingers Lake	$0.00	$0.00	$0.00	$0.00	$200,000.00	$4,000,000.00	$3,000,000.00
Closed[2]	Work Tasks Pre-FY15			$5,274,791.93				
		$9,351,000.00	**$7,706,600.64**	**$88,387,425.71**	**$20,386,000.00**	**$13,991,000.00**	**$14,641,000.00**	**$12,911,000.00**
F	**Post-Development Monitoring**							
F1	Habitat Monitoring at Conservation Areas	$650,000.00	$490,889.62	$4,279,379.33	$450,000.00	$950,000.00	$850,000.00	$850,000.00
F2	Avian Use of Conservation Areas	$220,000.00	$134,175.16	$1,647,971.06	$220,000.00	$350,000.00	$350,000.00	$350,000.00
F3	Small Mammal Colonization of Conservation Areas	$55,000.00	$52,897.74	$425,887.03	$65,000.00	$65,000.00	$65,000.00	$65,000.00
F4	Covered Bat Species Monitoring at Conservation Areas	$135,000.00	$141,235.70	$1,053,800.76	$150,000.00	$150,000.00	$150,000.00	$150,000.00
F5	Post-Development Monitoring of Fish at Conservation Areas	$265,000.00	$235,350.31	$1,521,894.58	$250,000.00	$250,000.00	$350,000.00	$350,000.00
F6	Post-Development Monitoring of MacNeill's Sootywings at Conservation Areas	$80,000.00	$71,572.40	$447,717.42	$80,000.00	$80,000.00	$80,000.00	$80,000.00
F7	Marsh Bird Monitoring at Conservation Areas	$30,000.00	$29,091.63	$78,366.68	$30,000.00	$40,000.00	$40,000.00	$40,000.00
		$1,435,000.00	**$1,155,212.56**	**$9,455,016.86**	**$1,245,000.00**	**$1,885,000.00**	**$1,885,000.00**	**$1,885,000.00**

Table 1-7.—Annual Funding Matrix

Work Task	Name	FY15 Approved Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Projected Estimate[1]	FY19 Projected Estimate[1]
G	**Adaptive Management Program**							
G1	Data Management	$850,000.00	$572,953.39	$4,560,746.11	$1,000,000.00	$1,000,000.00	$1,000,000.00	$1,000,000.00
G3	Adaptive Management Research Projects	$300,000.00	$133,374.64	$2,469,533.27	$300,000.00	$300,000.00	$300,000.00	$300,000.00
G4	Science/Adaptive Management Strategy	$400,000.00	$212,457.02	$1,137,386.64	$600,000.00	$400,000.00	$400,000.00	$400,000.00
G6	Conceptual Ecological Models	$0.00	$0.00	$0.00	$40,000.00	$40,000.00	$40,000.00	$40,000.00
		$1,550,000.00	**$918,785.05**	**$8,167,666.02**	**$1,940,000.00**	**$1,740,000.00**	**$1,740,000.00**	**$1,740,000.00**
H	**Funding Accounts**							
H1[3]	Habitat Maintenance Fund	$4,848,060.00	$5,480,049.36	$32,466,770.00	$0.00	$0.00	$0.00	$0.00
H2[3]	Remedial Measures Fund	$361,228.00	$1,562,029.94	$3,994,595.38	$1,104,052.00	$1,108,828.00	$1,108,828.00	$1,108,828.00
		$5,209,288.00	**$7,042,079.30**	**$36,461,365.38**	**$1,104,052.00**	**$1,108,828.00**	**$1,108,828.00**	**$1,108,828.00**
I	**Public Outreach**							
I1	Public Outreach	$100,000.00	$98,604.57	$509,004.93	$100,000.00	$125,000.00	$125,000.00	$125,000.00
Closed[2]	Work Tasks Pre-FY15			$61,059.68				
		$100,000.00	**$98,604.57**	**$570,064.61**	**$100,000.00**	**$125,000.00**	**$125,000.00**	**$125,000.00**
	Program Total:	**$28,651,732.00**	**$26,628,171.48**	**$222,697,564.14**	**$34,980,018.00**	**$28,840,902.00**	**$28,870,902.00**	**$25,640,902.00**

[1] FY17 and FY18 numbers are not adjusted for inflation.
[2] Closed work tasks are shown in appendix D-4.
[3] H1 and H2 cumulative expenditures through FY15 do not include interest.

In accordance with the FMA, a description of the work is being presented to the Steering Committee to ensure that no disputes exist and that the description will subsequently be presented to the USFWS to ensure that the 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 FY17, 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 FY18 or FY19, (3) providing more than the minimum funding required to the RMF, or (4) beginning activities associated with any changed circumstances as defined in Section 5.12.3 of the HCP, should any occur.

In FY15, Reclamation estimated work tasks totaling $28,651,732. Actual LCR MSCP accomplishment (obligations) for FY15 was $26,628,171.48. Actual accomplishment was less than the minimum accomplishment due to funding programed for the Laguna Conservation Area being obligated in the previous year and less than anticipated obligations in species research work tasks. In accordance with the FMA, Reclamation incurred a funding credit of $1,502,469.24 for FY15 (attachment D-2d). Cumulative program accomplishment (expenditures) through FY15 was $222,697,564.14 (attachment D-4).

Compliance Reporting

LCR MSCP

As required in the FMA, the following information is included in this annual report:

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

   To meet species habitat creation requirements, goals are provided in the HCP for habitat creation based on land cover types. These land cover types are described using the Anderson and Ohmart vegetation classification system. In total, 8,132 acres of cottonwood-willow, mesquite, marsh, and backwater land cover types are directed to be designed and created under the LCR MSCP. This is the minimum amount of land cover type to be created to meet species habitat requirements. Table 1-8 shows how much land cover by type has been created at each conservation area. Total land cover established through FY15 is 4,769 acres.

Table 1-8.—Conservation Area Land Cover Type

Land Cover Type	Management Unit	Established Acres FY15	Established Acres Total
Cottonwood-willow	E1 Beal Lake Conservation Area (Arizona)	0	107
	E4 Palo Verde Ecological Reserve (California)	0	945
	E5 Cibola Valley Conservation Area (Arizona)	0	265
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area (Arizona)	0	365
	E27 Laguna Division Conservation Area (California and Arizona)	1,129	1,129
	E28 Yuma East Wetlands (Arizona)	0	183
	E31 Hunters Hole (Arizona)	0	44
Total		**1,129**	**3,038**
Mesquite	E4 Palo Verde Ecological Reserve (California)	0	78
	E5 Cibola Valley Conservation Area (Arizona)	72	477
	E27 Laguna Division Conservation Area (California and Arizona)	42	42
	E28 Yuma East Wetlands (Arizona)	0	131
	E33 Pretty Water Conservation Area (California)	566	566
Total		**680**	**1,294**
Marsh	E1 Beal Lake Conservation Area (Arizona)	0	9
	E9 Hart Mine Marsh (Arizona)	0	255
	E14 Imperial Ponds Conservation Area (Arizona)	0	12
	E28 Yuma East Wetlands (Arizona)	0	66
Total		**0**	**342**
Backwater	E14 Imperial Ponds Conservation Area (Arizona)	0	80
	E25 Big Bend Conservation Area (Nevada)	0	15
Total		**0**	**95**
	TOTAL	**1,809**	**4,769**

The HCP specifies that created land cover types will be designed in an integrated mosaic and managed for more than one covered species, including habitat elements for each species. The HCP contains habitat creation conservation measures for 20 of the 26 species. Table 1-9 shows the total creditable acres for each species habitat creation conservation measure by conservation area.

The creditable acres established exceed species habitat creation conservation measure requirements for WRBA2, WYBA3, CRCR2, YHCR2, ELOW1, GIWO1, SUTA1, and MNSW2.

Table 1-9.—Conservation Area by Species Habitat Creation Conservation Measures

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres FY15	Creditable Acres Total	Percent of Acres Creditable by Species Conservation Measure
CLRA1 (512 acres)	E9 Hart Mine Marsh	0	255	
	E14 Imperial Ponds Conservation Area	0	12	
	E28 Yuma East Wetlands	0	66	
Total		**0**	**333**	**65%**
WIFL1 (4,050 acres)	E1 Beal Lake Conservation Area	0[1]	0	
	E4 Palo Verde Ecological Reserve	945	945	
	E5 Cibola Valley Conservation Area	0[1]	0	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0[1]	0	
Total		**945**	**945**	**23%**
BONY2 (360 acres)	E14 Imperial Ponds Conservation Area	0[2]	0	
	E25 Big Bend Conservation Area	0	15	
Total		**0**	**15**	**4%**
RASU2 (360 acres)	E14 Imperial Ponds Conservation Area	0[2]	0	
	E25 Big Bend Conservation Area	0	15	
Total		**0**	**15**	**4%**
WRBA2 (765 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	719	
	E5 Cibola Valley Conservation Area	0	670	
	E24 Cibola National Wildlife Refuge Unit1	0	270	
Total		**0**	**1,775[3]**	**> 100%**
WYBA3 (765 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	719	
	E5 Cibola Valley Conservation Area	0	670	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	270	
Total		**0**	**1,775[3]**	**> 100%**
CRCR2 (125 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	1,023	
	E5 Cibola Valley Conservation Area	0	670	
	E9 Hart Mine Marsh	0	255	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	270	
Total		**0**	**2,334[3]**	**> 100%**
YHCR2 (76 acres)	E28 Yuma East Wetlands	0	183	
Total		**0**	**183[3]**	**> 100%**

Table 1-9.—Conservation Area by Species Habitat Creation Conservation Measures

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres FY15	Creditable Acres Total	Percent of Acres Creditable by Species Conservation Measure
LEBI1 (512 acres)	E9 Hart Mine Marsh	0	255	
	E14 Imperial Ponds Conservation Area	0	12	
	E28 Yuma East Wetlands	0	66	
Total		**0**	**333**	**65%**
BLRA1 (130 acres)	E9 Hart Mine Marsh	0[4]	0	
	E14 Imperial Ponds Conservation Area	0	12	
	E28 Yuma East Wetlands	0	66	
Total		**0**	**78**	**60%**
YBCU1 (4,050 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	270	
	E38 Yuma East Wetlands	0	183	
Total		**0**	**1,779**	**44%**
ELOW1 (1,784 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	797	
	E5 Cibola Valley Conservation Area	0	670	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	270	
	E28 Yuma East Wetlands	0	314	
Total		**0**	**2,167[3]**	**> 100%**
GIFL1 (4,050 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	719	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	270	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,553**	**38%**
GIWO1 (1,702 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	344	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,853[3]**	**> 100%**

Table 1-9.—Conservation Area by Species Habitat Creation Conservation Measures

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres FY15	Creditable Acres Total	Percent of Acres Creditable by Species Conservation Measure
VEFL1 (5,208 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	1,023	
	E5 Cibola Valley Conservation Area	0	670	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	344	
	E28 Yuma East Wetlands	0	314	
Total		**0**	**2,467**	**47%**
BEVI1 (2,983 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	1,023	
	E5 Cibola Valley Conservation Area	265[5]	670	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	190	
	E28 Yuma East Wetlands	0	314	
Total		**0**	**2,313**	**78%**
YWAR1 (4,050 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 National Wildlife Refuge	0	945	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	344	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,853**	**46%**
SUTA1 (602 acres)	E1 Beal Lake Conservation Area	0	116	
	E4 Palo Verde Ecological Reserve	0	499	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	270	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,333[3]**	**> 100%**
FLSU1 (85 acres)	E25 Big Bend Conservation Area	0	15	
Total		**0**	**15**	
MNSW2 (222 acres)	E4 National Wildlife Refuge	0	40	
	E5 Cibola Valley Conservation Area	0	405	
	Total	**265**	**445[3]**	**> 100%**

[1] WIFL1 – Although these conservation areas provide the appropriate structure type (cottonwood-willow I–IV) as defined in WIFL1, Reclamation is in the process of gathering the appropriate hydrologic data to determine saturated soils, moist soils, or slow-moving water at each of those conservation areas. During FY15, hydrologic data were collected at the Palo Verde Ecological Reserve (PVER), and it was determined that the PVER does meet both structure type and moist soils requirements. Once this has been determined at the other conservation areas, they will be evaluated.

[2] BONY2 and RASU2 – Reclamation and the USFWS have completed a 5-year management strategy, which calls for stocking native fish in FY17. Acres will be considered creditable at that time.

[3] The total for creditable acres established exceeds the species habitat creation conservation measure requirements. For many species, creditable acres established beyond conservation measure requirements is due to habitat creation efforts for other species.

[4] BLRA1 – Reclamation is in the process of determining the land and water interface and the method for delineating California blackrail marsh habitat at <1 inch deep. Once this has been determined, Hart Mine Marsh will be evaluated.

[5] BEVI1 – Reclamation received approval to change the conservation measure for BEVI1 to include cottonwood-willow I–II habitats per program Decision Document 14-002.

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*

   Tables 1-10a–c provide a summary of fish repatriation. Table 1-11 provides a matrix showing the work tasks and their related conservation measures. Attachment E lists the technical reports that were published in FY15.

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 FY15 is reported in attachment 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 HCP, as long as conservation measures and avoidance and minimization measures are in place. Due to the wide range and scope of this program, surrogate measures were used in the program compliance documents to quantify impacts. These same surrogates are used to determine the types and levels of any incidental take known to have occurred in FY15. As described in the 2005 BO, the surrogate measures for incidental take are:

   Flow-Related

   Total loss of suitable habitat for covered species that use cottonwood-willow, marsh, and backwaters resulting from the changes in points of diversions, extension of the interim surplus guidelines, and implementation of the shortage criteria.

   As total habitat loss is calculated for all of these actions, take is being documented as the 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.

Attachment 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.

Table 1-10a.—Summary of Fish Augmentation Conservation Measure RASU5

Reach	Razorback Suckers FY15	Total Razorback Suckers
2	15,899	113,104[1]
Total	**15,899**	**113,104[1]**

Table 1-10b.—Summary of Fish Augmentation Conservation Measure RASU3

Reach	Razorback Suckers FY15	Total Razorback Suckers
3	6,348	73,013[1]
4 and 5	5,291	80,588[1]
Total	**11,639**	**153,601[1]**

Table 1-10c.—Summary of Fish Augmentation Conservation Measure BONY3

Reach	Bonytail FY15	Bonytail Program
2	0[2]	0[2]
3	5,729	48,443[1]
4 and 5	4,864	24,484[1]
Total	**10,593**	**72,927[1]**

[1] Native fish stocking numbers reported in FY14 inadvertently included fish stocked within the calendar year. Totals reported in these tables represent fish stocked in FY15 and include fish that were incorrectly counted in FY14 tables 1-10a-c. Fish stocked between October 1, 2014, through December 31, 2014, should not have been counted in the FY14 accomplishment report. These include: Reach 2 RASU = 528, Reach 3 RASU = 5, Reach 3 BONY = 4,028, and Reach 4/Reach 5 BONY = 346.

[2] Bonytail stocking into Reach 2 commenced in FY16 as part of a pilot stocking study.

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Yuma Clapper Rail	CLRA1	Create habitat, 512 acres	C3 E9 E14 E16 E21 E26 E27 E28 E34 F2 F7 G1 G4	C3 E9 E14 E16 E21 E26 E27 E28 E34 F2 F7 G1 G4	E9 E14 E16 E21 E26 E27 E28 E34 E38 F2 F7 G1 G4 G6
	CLRA2	Maintain existing important habitat	C3 G1 G4 H1	C3 G1 G4 H1	G1 G4 G6 H1
	MRM1	Define habitat characteristics	C3 C24 D1 E21 F2 F7 G1 G4	C3 C24 D1 E21 F2 F7 G1 G4	C24 C66 D1 E21 F2 F7 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C59 D1 F1 F2 F7 G1 G4	C3 C24 C59 D1 F1 F2 F7 G1 G4	C24 C59 C60 C66 D1 F1 F2 F7 G1 G4 G6
	MRM5	Monitor selenium levels in backwater	C59	C59	C59
	CMM1	Reduce risk of loss to wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4
Southwestern Willow Flycatcher	WIFL1	Create habitat, 4,050 acres	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	E1 E4 E5 E8 E16 E21 E24 E27 E28 E34 E37 G1 G4 G6
	WIFL2	Maintain existing important habitat	C3 D2 D3 D4 E21 F1 G1 G4 H1	C3 D2 D3 D4 E21 F1 G1 G4 H1	D2 D4 E21 F1 G1 G4 G6 H1
	MRM1	Define habitat characteristics	C3 C5 C24 C37 C42 D2 D3 D4 D5 D6 E21 F2 G1 G4	C3 C5 C24 C37 C42 D2 D3 D4 D5 D6 E21 F2 G1 G4	C24 C42 D2 D4 D5 D6 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C55 C60 D2 D3 D4 D5 D6 F1 F2 G1 G4	C24 C55 C60 D2 D3 D4 D5 D6 F1 F2 G1 G4	C24 C55 C60 D2 D5 D6 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation	D2 G1 G4	D2 G1 G4	D2 G1 G4
	CMM1	Reduce risk of loss to wildfire	C55 E18 G1 G4	C55 E18 G1 G4	C55 E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4
Desert Tortoise	**DETO1**	**Acquire, protect 230 acres – Completed**			
	DETO2	Avoid impacts on individuals and burrows	C3 G1 G4	C3 G1 G4	G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Bonytail	BONY1	Coordinate conservation efforts with the USFWS and recovery programs	A1	A1	A1
	BONY2	Create 360 acres of bonytail habitat	C3 C25 C30 C32 C40 E2 E14 E15 E16 E25 E26 E32 E34 G1 G4	C3 C25 C30 C32 C40 E2 E14 E15 E16 E25 E26 E32 E34 G1 G4	C25 C32 C40 E1 E14 E15 E16 E25 E26 E32 E34 E38 G1 G4 G6
	BONY3	Rear/stock 620,000: 5,000 subadults per year for 40 years at Lake Mohave 4,000 subadults per year for 50 years from Davis Dam to Parker Dam 4,000 subadults per year – experimental augmentation from Parker Dam to Imperial Dam for 10 consecutive years 4,000 subadults per year from Parker Dam to Imperial Dam for 45 years	C11 C30 C32 C39 C41 C46 C47 C49 C56 C61 G1 G4	C30 C32 C41 C46 C47 C56 C61 C64 G1 G4	B2 B3 B4 B6 B7 B8 B12 C32 C61 C63 C64 C65 G1 G4 G6
	BONY4	Develop (if necessary) additional rearing capacity	B2 B3 B4 B7 B8 C11 C30 C46 C47 C49 G1 G4	B2 B3 B4 B7 B8 C30 C46 C47 C49 C61 G1 G4	B2 B3 B4 B6 B7 B8 B12 C47 C49 C61 C64 C65 G1 G4
	BONY5	Monitor, research, and adaptively manage augmentations and created habitat	B7 B8 C11 C23 C30 C32 C39 C40 C41 C44 C46 C47 C49 C56 C58 C59 C61 D8 F5 G1 G4	B7 B8 C23 C30 C32 C40 C44 C46 C47 C56 C59 C61 C63 C64 D8 F5 G1 G4	B7 B8 C32 C40 C47 C56 C59 C61 C63 C64 C65 D8 F5 G1 G4 G6
	MRM5	Monitor selenium levels in backwater	C59 G1 G4	C59 G1 G4	C59 G1 G4
Humpback Chub	HUCH1	$500,000 to existing programs	C14 G1	C14 G1	B4 G1

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Razorback Sucker	RASU1	Coordinate conservation efforts with the USFWS and recovery programs	A1	A1	A1
	RASU2	Create 360 acres of razorback sucker habitat	C3 C25 C30 C31 C32 C40 E2 E14 E15 E16 E25 E26 E32 E34 G1 G4	C3 C25 C30 C31 C32 C40 E2 E14 E15 E16 E25 E26 E32 E34 G1 G4	C25 C31 C32 C40 E1 E14 E15 E16 E25 E26 E32 E34 E38 G1 G4 G6
	RASU3	Rear/stock 660,000: 6,000 subadults per year for 10 years from Davis Dam to Parker Dam, and 6,000 subadults per year for 10 years from Parker Dam to Imperial Dam 6,000 subadults per year for 45 years from Davis Dam to Parker Dam 6,000 subadults per year for 45 years from Parker Dam to Imperial Dam	B1 B2 B3 B4 B5 B6 B7 B8 B11 C10 C26 C30 C31 C32 C33 C41 C46 C48 C49 C56 C61 G1 G4	B1 B2 B3 B4 B5 B6 B7 B8 B11 C26 C30 C31 C32 C33 C46 C48 C56 C61 C63 C64 G1 G4	B1 B2 B3 B4 B5 B6 B7 B8 C31 C32 C61 C63 C64 C65 G1 G4 G6
	RASU4	Develop (if necessary) additional rearing capacity	B2 B3 B4 B5 B6 B7 B8 B11 C10 C26 C30 C46 C48 C49 G1 G4	B2 B3 B4 B5 B6 B7 B8 B11 C10 C26 C30 C46 C48 C64 G1 G4	B2 B3 B4 B5 B6 B7 B8 C10 C64 C65 G1 G4
	RASU5	Support ongoing Lake Mohave conservation efforts	B1 B2 B7 B8 C30 C31 C32 C41 C61 G1 G4	B1 B2 B7 B8 C30 C31 C32 C41 C61 G1 G4	B1 B2 B7 B8 C31 C32 C61 C63 G1 G4
	RASU6	Monitor, research, and adaptively manage augmentations and created habitat	B2 B7 B8 B11 C8 C10 C23 C30 C31 C32 C33 C40 C41 C44 C45 C46 C49 C56 C57 C59 C61 D8 F5 G1 G4	B2 B7 B8 B11 C8 C23 C30 C31 C32 C33 C40 C44 C46 C56 C57 C59 C61 C63 D8 F5 G1 G4	B7 B8 C31 C32 C40 C59 C61 C63 C64 C65 D8 F5 G1 G4 G6
	RASU7	Funding for ongoing Reclamation/Southern Nevada Water Authority Lake Mead studies	B6 B11 C13 G1 G4	B6 B11 C13 G1 G4	B6 G1 G4
	RASU8	Continue razorback sucker conservation measure identified in the 2001 BO	B1 B6 B11 C26 C30 G1 G4	B1 B6 B11 C26 C30 G1 G4	B1 B6 G1 G4
	MRM5	Monitor selenium levels in backwater	C59 G1 G4	C59 G1 G4	C59 G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Western Red Bat	WRBA1	Status/habitat surveys	C3 D9 F4 G1 G4	C3 D9 F4 G1 G4	D9 F4 G1 G4
	WRBA2	**Create 765 acres — Creditable acres established exceed requirement**	C3 D9 E1 E3 E4 E5 E8 E16 E21 E24 E33 E34 G1 G4	C3 D9 E1 E3 E4 E5 E8 E16 E21 E24 E33 E34 G1 G4	D9 E1 E4 E5 E8 E16 E21 E24 E33 E34 E36 E37 G1 G4
	MRM1	Define habitat characteristics	C3 C5 C35 D9 E21 F4 G1 G4	C3 C5 C35 D9 E21 F4 G1 G4	C35 E21 F4 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 F1 F4 G1 G4	C3 F1 F4 G1 G4	F1 F4 G1 G4 G6
	CMM1	Reduce risk of loss of habitat to wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire			
Western Yellow Bat	WYBA1	Conduct surveys for species distribution	C3 D9 G1 G4	C3 D9 G1 G4	D9 G1 G4
	WYBA2	Avoid removal of roost trees (palms)	E16 F4 G1 G4	E16 F4 G1 G4	E16 F4 G1 G4
	WYBA3	**Create 765 acres – Creditable acres established exceed requirement**	C3 D9 E1 E3 E4 E5 E8 E21 E24 E33 E34 F4 G1 G4	C3 D9 E1 E3 E4 E5 E8 E21 E24 E33 E34 F4 G1 G4	D9 E1 E4 E5 E8 E21 E24 E33 E34 E37 F4 G1 G4 G6
	MRM1	Define habitat characteristics	C3 C5 C35 D9 E21 F4 G1 G4	C3 C5 C35 D9 E21 F4 G1 G4	C35 D9 E21 F4 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 F1 F4 G1 G4	C3 F1 F4 G1 G4	F1 F4 G1 G4 G6
	CMM1	Reduce risk of loss of habitat to wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire			
Desert Pocket Mouse	DPMO1	Locate occupied habitat, restore disturbed habitat	C3 F3 G1 G4	C3 F3 G1 G4	D10 F3 G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Colorado River Cotton Rat	CRCR1	Status/habitat surveys — define habitat first 5 years	C3 C27 F3 G1 G4	C3 C27 F3 G1 G4	F3 G1 G4
	CRCR2	**Create 125 acres – Creditable acres established exceed requirement**	C3 C54 E9 E16 E21 E34 G1 G4	C3 C54 E9 E16 E21 E34 G1 G4	C54 E9 E16 E21 E34 E38 G1 G4
	MRM2	Monitor and adaptively manage created habitat	C3 C54 C60 F1 F3 G1 G4	C3 C54 C60 F1 F3 G1 G4	C54 C60 D10 F1 F3 G1 G4 G6
	CMM1	Reduce risk of loss of habitat to wildfire	C54 E18 G1 G4	C54 E18 G1 G4	C54 E18 G1 G4
	CMM2	Replace created habitat affected by wildfire			
Yuma Hispid Cotton Rat	YHCR1	Status/habitat surveys — define habitat first 5 years	C3 C27 G1 G4	C3 C27 G1 G4	G1 G4
	YHCR2	**Create 76 acres – Creditable acres established exceed requirement**	C3 C54 E16 E27 E28 E34 G1 G4	C3 C54 E16 E27 E28 E34 G1 G4	C54 E16 E27 E28 E34 G1 G4
	MRM2	Monitor and adaptively manage created habitat	C3 C54 C60 F1 F3 G1 G4	C3 C54 C60 F1 F3 G1 G4	C54 C60 D10 F1 F3 G1 G4 G6
	CMM1	Reduce risk of loss of habitat to wildfire	C54 E18 G1 G4	C54 E18 G1 G4	C54 E18 G1 G4
	CMM2	Replace created habitat affected by wildfire			
Western Least Bittern	LEBI1	Create 512 acres	C3 E9 E14 E16 E21 E26 E27 E28 E34 F7 G1 G4	C3 E9 E14 E16 E21 E26 E27 E28 E34 F7 G1 G4	E9 E14 E16 E21 E26 E27 E28 E34 E38 F7 G1 G4
	MRM1	Define habitat characteristics	C3 C24 D1 E21 F2 F7 G1 G4	C3 C24 D1 E21 F2 F7 G1 G4	C24 C66 D1 E21 F2 F7 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 D1 F1 F2 F7 G1 G4	C3 C24 D1 F1 F2 F7 G1 G4	C24 C66 D1 F1 F2 F7 G1 G4 G6
	MRM5	Monitor selenium levels	C59	C59	C59
	CMM1	Reduce risk of loss of habitat affected by wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
California Black Rail	BLRA1	Create 130 acres	C3 E14 E16 E26 E27 E28 E34 F7 G1 G4	C3 E14 E16 E26 E27 E28 E34 F7 G1 G4	C60 E14 E16 E26 E27 E28 E34 E38 F7 G1 G4 G6
	BLRA2	Maintain existing occupied habitat	C3 G1 G4 H1	C3 G1 G4 H1	G1 G4 H1
	MRM1	Define habitat characteristics	C3 C24 D1 F2 G1 G4	C3 C24 D1 F2 G1 G4	C24 C66 D1 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C59 D1 F1 F2 G1 G4	C3 C24 C59 D1 F1 F2 G1 G4	C24 C59 C66 D1 F1 F2 G1 G4 G6
	MRM5	Monitor selenium levels	C59	C59	C59
	CMM1	Reduce risk of loss of habitat affected by wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4
Yellow-billed Cuckoo	YBCU1	Create 4,050 acres	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	E1 E4 E5 E8 E16 E21 E24 E27 E28 E34 E37 G1 G4 G6
	YBCU2	Maintain existing habitat	C3 D7 E21 G1 G4 H1	C3 D7 E21 G1 G4 H1	D7 E21 G1 G4 H1
	MRM1	Define habitat characteristics	C3 C5 C24 C37 C42 D5 D6 D7 E21 F2 G1 G4	C3 C5 C24 C37 C42 D5 D6 D7 E21 F2 G1 G4	C24 D5 D6 D7 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C55 C60 D5 D6 D7 F1 F2 G1 G4	C3 C24 C55 C60 D5 D6 D7 F1 F2 G1 G4	C24 C55 C60 D5 D6 D7 F1 F2 G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	C55 E18 G1 G4	C55 E18 G1 G4	C55 E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Elf Owl	**ELOW1**	**Create 1,784 acres in Reaches 3–5 – Creditable acres established exceed requirement**	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 G1 G4	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 G1 G4	E1 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 E36 E37 G1 G4 G6
	ELOW2	Install elf owl boxes before Gila woodpeckers established	C3 G1 G4	C3 G1 G4	G1 G4
	MRM1	Define habitat characteristics	C3 C24 C36 C37 C42 D5 D6 E21 F2 G1 G4	C3 C24 C36 C37 C42 D5 D6 E21 F2 G1 G4	C24 D5 D6 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C55 D5 D6 F1 F2	C3 C24 C55 D5 D6 F1 F2	C24 D5 D6 F1 F2 G6
	MRM3	Research nest competition of European starlings	C3 G1 G4	C3 G1 G4	G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	C55 E18 G1 G4	C55 E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4
Gilded Flicker	GIFL1	Create 4,050 acres in Reaches 3–7	C3 C52 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	C3 C52 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	C52 E1 E4 E5 E8 E16 E21 E24 E27 E28 E34 E37 G1 G4 G6
	GIFL2	Install artificial snags until vegetation has matured			
	MRM1	Define habitat characteristics	C3 C5 C24 C37 C42 C52 D5 D6 E21 F2 G1 G4	C3 C5 C24 C37 C42 C52 D5 D6 E21 F2 G1 G4	C24 C52 D5 D6 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C55 D5 D6 F1 F2 G1 G4	C3 C24 C55 D5 D6 F1 F2 G1 G4	C24 D5 D6 F1 F2 G1 G4 G6
	MRM3	Research nest competition of European starlings	C3 G1 G4	C3 G1 G4	G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	C55 E18 G1 G4	C55 E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Gila Woodpecker	**GIWO1**	**Create 1,702 acres in Reaches 3–6 – Creditable acres established exceed requirement**	C3 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	C3 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	E4 E5 E8 E16 E21 E24 E27 E28 E34 E37 G1 G4 G6
	GIWO2	Install artificial snags			
	MRM1	Define habitat characteristics	C3 C5 C24 C37 C42 D5 D6 E21 F2 G1 G4	C3 C5 C24 C37 C42 D5 D6 E21 F2 G1 G4	C24 D5 D6 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C55 D5 D6 F1 F2 G1 G4	C3 C24 C55 D5 D6 F1 F2 G1 G4	C24 D5 D6 F1 F2 G1 G4 G6
	MRM3	Research nest competition of European starlings	C3 G1 G4	C3 G1 G4	G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	C55 E18 G1 G4	C55 E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4
Vermilion Flycatcher	VEFL1	Create 5,208 acres	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 G1 G4	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 G1 G4	E1 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 E36 E37 G1 G4 G6
	MRM1	Define habitat characteristics	C3 C5 C24 C37 C42 C51 D5 D6 E21 F2 G1 G4	C3 C5 C24 C37 C42 C51 D5 D6 E21 F2 G1 G4	C24 D5 D6 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C51 C55 C60 D5 D6 F1 F2 G1 G4	C3 C24 C51 C55 C60 D5 D6 F1 F2 G1 G4	C24 C60 D5 D6 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation			
	CMM1	Reduce risk of loss of habitat affected by wildfire	C55 E18 G1 G4	C55 E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Arizona Bell's Vireo	BEVI1	Create 2,983 acres	C3 C5 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 G1 G4	C3 C5 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 G1 G4	E1 E4 E5 E8 E16 E21 E24 E27 E28 E33 E34 E37 G1 G4 G6
	MRM1	Define habitat characteristics	C3 C37 C42 D5 D6 E21 F2 G1 G4	C3 C37 C42 D5 D6 E21 F2 G1 G4	C42 D5 D6 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C55 D5 D6 F1 F2 G1 G4	C3 C24 C55 D5 D6 F1 F2 G1 G4	C24 C55 D5 D6 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation			
Sonoran Yellow Warbler	YWAR1	Create 4,050 acres	C3 E1 E3 E4 E5 E8 E16 E21 E27 E28 E34 G1 G4	C3 E1 E3 E4 E5 E8 E16 E21 E27 E28 E34 G1 G4	E1 E4 E5 E8 E16 E21 E27 E28 E34 E37 G1 G4 G6
	MRM1	Define habitat characteristics	C3 C5 C24 C37 C42 D5 D6 E21 F2 G1 G4	C3 C5 C24 C37 C42 D5 D6 E21 F2 G1 G4	C24 D5 D6 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C55 C60 D5 D6 F1 F2 G1 G4	C3 C24 C55 C60 D5 D6 F1 F2 G1 G4	C24 D5 D6 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation			
	CMM1	Reduce risk of loss of habitat affected by wildfire	C55 E18 G1 G4	C55 E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Summer Tanager	**SUTA1**	**Create 602 acres — Creditable acres established exceed requirement**	C3 E1 E3 E4 E5 E8 E16 E21 E27 E28 E34 G1 G4	C3 E1 E3 E4 E5 E8 E16 E21 E27 E28 E34 G1 G4	E1 E4 E5 E8 E16 E21 E27 E28 E34 E37 G1 G4 G6
	MRM1	Define habitat characteristics	C3 C5 C24 C37 C42 D5 D6 E21 F2 G1 G4	C3 C5 C24 C37 C42 D5 D6 E21 F2 G1 G4	C24 D5 D6 E21 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 C24 C55 D5 D6 F1 F2 G1 G4	C3 C24 C55 D5 D6 F1 F2 G1 G4	C24 D5 D6 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation			
	CMM1	Reduce risk of loss of habitat affected by wildfire	C55 E28 G1 G4	C55 E28 G1 G4	E28 G1 G4
	CMM2	Replace created habitat affected by wildfire	F2 G1 G4	F2 G1 G4	F2 G1 G4
Flat-tailed Horned Lizard	**FTHL1**	**Acquire and protect 230 acres – Completed**	C3 G1 G4	C3 G1 G4	G1 G4
	FTHL2	Implement conservation measures to avoid take	C3 E30 G1 G4	C3 E30 G1 G4	G1 G4
Relict Leopard Frog	RLFR1	**$10,000 per year for 10 years to conservation program – Completed**	C4 G1	C4 G1	
Flannelmouth Sucker	FLSU1	85 acres – Reach 3	C3 C53 E15 E16 E25 E32 E34 G1 G4	C3 C53 E15 E16 E25 E32 E34 G1 G4	C53 E16 E25 E32 E34 G1 G4 G6
	FLSU2	**$80,000 per year for 5 years – Completed**	C15 G1 G4	C15 G1 G4	
	FLSU3	Develop management needs/strategies	C15 C53 G1 G4	C15 C53 G1 G4	C53 G1 G4
	MRM2	Monitor and adaptively manage created habitat	C3 C59 G1 G4	C3 C59 G1 G4	C59 G1 G4 G6
	MRM5	Monitor selenium levels in backwaters	C59 G1 G4	C59 G1 G4	C59 G1 G4

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
MacNeill's Sootywing Skipper	MNSW1	Status surveys/habitat – define habitat first 5 years	C3 F6 G1 G4	C3 F6 G1 G4	F6 G1 G4
	MNSW2	**Create 222 acres – Creditable acres established exceed requirement**	C3 E1 E3 E4 E5 E16 E21 E34 G1 G4	C3 E1 E3 E4 E5 E16 E21 E34 G1 G4	E1 E4 E5 E16 E21 E34 E37 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 F1 F6 G1 G4	C3 F1 F6 G1 G4	F1 F6 G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4 G6
	CMM2	Replace created habitat affected by wildfire			
Sticky Buckwheat	STBU1	$10,000 per year until 2030 to conservation program	C2 G1	C2 G1	C2 G1
Threecorner Milkvetch	THMI1	$10,000 per year until 2030 to conservation program	C2 G1	C2 G1	C2 G1
California Leaf-nosed Bat	CLNB1	Distribution surveys	C3 C34 D9 G1 G4	C3 C34 D9 G1 G4	D9 G1 G4 G6
	CLNB2	Create habitat near roost sites (priority when creating cottonwood-willow, mesquite habitat for other species)	C3 C34 E1 E3 E4 E5 E8 E16 E21 E24 E34 G1 G4	C3 C34 E1 E3 E4 E5 E8 E16 E21 E24 E34 G1 G4	E1 E4 E5 E8 E16 E21 E24 E34 G1 G4 G6
	MRM1	Define habitat characteristics	C3 C5 D9 E21 F4 G1 G4	C3 C5 D9 E21 F4 G1 G4	D9 E21 F4 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 F4 G1 G4	C3 F4 G1 G4	F4 G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habit affected by wildfire			

Table 1-11.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY15 Approved	FY16 Approved	FY17 Proposed
Pale Townsend's Big-eared Bat	PTBB1	Distribution surveys	C3 D9 G1 G4	C3 D9 G1 G4	D9 G1 G4
	PTBB2	Create habitat near roost sites	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	C3 E1 E3 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4	E1 E4 E5 E8 E16 E21 E24 E27 E28 E34 G1 G4 G6
	MRM1	Determine habitat characteristics	C3 C5 D9 E21 F4 G1 G4	C3 C5 D9 E21 F4 G1 G4	D9 E21 F4 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C3 F4 G1 G4	C3 F4 G1 G4	F4 G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire			
Colorado River Toad	CRTO1	Distribution surveys, habitat affinity, limiting factors	C3 C62 D12 G1 G4	C3 C62 D12 G1 G4	G1 G4 G6
	CRTO2	Protect existing occupied habitat	C3 C62 G1 G4 H1	C3 C62 G1 G4 H1	C62 G1 G4 H1
	CRTO3	Research to establish in unoccupied habitat	C3 C62 G1 G4	C3 C62 G1 G4	C62 G1 G4
Lowland Leopard Frog	LLFR1	Distribution surveys, habitat affinity, limiting factors	C3 C62 D12 G1 G4	C3 C62 D12 G1 G4	C62 D12 G1 G4 G6
	LLFR2	Protect existing occupied habitat	C3 C62 G1 G4 H1	C3 C62 G1 G4 H1	C62 G1 G4 H1
	LLFR3	Research to establish in unoccupied habitat	C3 C62 G1 G4	C3 C62 G1 G4	C62 G1 G4
Other					
Topock Marsh Pumping	**AMM2**	**Avoid flow-related impacts on covered species – Completed**	E17	E17	E17
Law Enforcement and Fire Suppression	CMM1	Reduce effects of fire and vandalism on created habitats	E18	E18	E18

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

   The July 28, 2015, consistency letter from the USFWS for the *Final Implementation Report, Fiscal Year 2016 Work Plan and Budget, Fiscal Year 2014 Accomplishment Report* is included in attachment C. Also included in attachment C is the June 30, 2015, letter documenting northern Mexican gartersnake within the Planning Area of the LCR MSCP, the July 29, 2015, letter documenting completion of the conservation measure to provide funding to support existing flannelmouth sucker conservation programs (FLSU2), the October 13, 2015, letter confirming the Conference Opinion for the threatened yellow-billed cuckoo western distinct population segment, and the May 16, 2016, letter documenting completion of the conservation measure to provide funding to support existing relict leopard frog conservation programs (RLFR1).

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

   No minor modifications were made to the LCR MSCP in FY15.

2001 Biological Opinion

In addition to fulfilling the requirements in the LCR MSCP Habitat Conservation Plan, the work plans also satisfied conservation measures required in the 2001 BO. The requirements listed in the 2001 BO were integrated into this program and are being implemented by Reclamation in conjunction with the LCR MSCP. According to the Record of Decision signed on January 16, 2001, the interim surplus criteria (ISC) will expire on December 31, 2015. Requirements under the 2001 BO specifically related to the Secretarial Implementation Agreement were completed in FY08. Monitoring under Conservation Measure 4, Tier 1a was to continue until 5 years after implementation of all water transfers covered under the 2001 BO. A review of the current monitoring program, including the methodology and results from the first 5 years, was completed, and a decision was made to discontinue this monitoring. A concurrence letter was received from the USFWS on August 14, 2012.

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 Work Task C13. A 10-year summary report for the Lake Mead Razorback Sucker Study has been compiled and is currently being used by the newly formed Lake Mead Razorback Sucker Work Group to determine actions to be implemented during the final 10-year duration of the ISC.

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 the water levels of Lake Mead from February through April of each year during the 15 years that the 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 razorback suckers in Lake Mead during the spawning season following this determination.*

   During the February through April 2012 period, water levels at Lake Mead were recorded below the 1,160 mean sea level elevation. Low lake levels were the result of a continuing drought rather than due to ISC activities. Although not required under the 2001 BO, Reclamation, the Southern Nevada Water Authority, and the Nevada Division of Wildlife cooperatively reared razorback sucker larvae captured from Lake Mead for future repatriation into Lake Mead. Both the Lake Mead Fish Hatchery and Overton Wildlife Management Area were used for rearing during FY15 (Work Tasks B6 and B11, respectively).

California Endangered Species Act Permit

In conjunction with Federal ESA coverage, California State law requires CESA permitting for California activities. The California partners applied for and received a CESA Incidental Take Permit pursuant to California Department of Fish and Game Code Sections 2081(a) and 2081(b). The California partners negotiated the terms of the CESA permit with the CDFW 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. By meeting LCR MSCP requirements in FY15, CESA program requirements were also met for FY15.

Listed below are the CESA requirements that are more detailed than those in the LCR MSCP Habitat Conservation Plan:

1. Requirements for various types of coordination with the CDFW during identification, development, construction, and maintenance of habitat created or restored within the State of California under the LCR MSCP.

2. Various reporting requirements to be made to the CDFW, including annual status reports and notifications.

3. Riparian, marsh, and backwater replacement plans are to be submitted to the CDFW for approval of 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 the CDFW for approval.

5. Locations of all habitats replaced or restored in the State of California under the LCR MSCP must be approved by the CDFW.

6. A minimum of 2,614 acres of the LCR MSCP riparian replacement habitat is to be located in the State of 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. A minimum of 194 acres of LCR MSCP backwater habitat is to be created or restored within the State of California.

9. Habitat created within the State of California will be protected in perpetuity.

10. An endowment fee of $295 per acre (in 2005 dollars) will be provided to the CDFW for each acre of habitat that is transferred to them in Fee Title at the time of transfer.

11. A total of 270,000 razorback suckers and 200,000 bonytail of at least 12 inches in length will be stocked into Reaches 4 and 5.

Through FY15, 80,588 razorback suckers and 24,484 bonytail (305 millimeters [mm] or greater in total length [TL]) have been stocked into Reaches 4 and 5 (see tables 1-10b–c.). Since the start of the LCR MSCP, 105,072 native fishes have been stocked into Reaches 4 and 5 of the LCR in California.

In FY15, land covers were established at the Laguna Division Conservation Area (LDCA) and the Pretty Water Conservation Area (PWCA). At the LDCA, 150 acres of cottonwood-willow and 16 acres of honey mesquite, for a total of 166 acres, were created in California. At the PWCA, 566 acres of honey mesquite were established.

During FY15, LCR MSCP staff gathered hydrologic data at the Palo Verde Ecological Reserve (PVER) that determined it met the riparian replacement habitat requirements related to saturated soils, moist soils, or slow-moving water for cottonwood-willow habitat. Through FY15, 985 acres of cottonwood-willow and honey mesquite land cover met all requirements for riparian replacement habitat under the CESA permit.

OVERVIEW OF WORK TASKS

Fish Augmentation, Monitoring, and Research

Monitoring and Research of Terrestrial, Riparian, and Marsh Habitats and Associated Covered Species

Conservation Area Development, Maintenance, and Adaptive Management

FISH AUGMENTATION, MONITORING, AND RESEARCH

As described in the HCP, 17 conservation measures for 4 native fish species will be implemented under the LCR MSCP: 8 conservation measures for the razorback sucker, 5 for the bonytail, 3 for the flannelmouth sucker, and 1 for the humpback chub. These conservation measures are addressed through the numerous work plans presented in this report. A brief summary of the work completed, ongoing activities, and proposed future work is provided below.

The work accomplished in support of native fishes is divided into six sections: Fish Augmentation (Section B), Species Research (Section C), System Monitoring (Section D), Conservation Area Development and Management (Section E) (covered in the "Conservation Area Development, Maintenance, and Adaptive Management" overview), Post-Development Monitoring (Section F), and Adaptive Management Program (Section G). Each of these sections has an important relationship to the other sections. In general, fish augmentation and species habitat goals tend to drive the efforts described in other sections. Under Section C, information on how to more efficiently augment native fish populations (Section B) and how to build effective habitats for native fish (Section E) is provided. Under Section F, feedback on the relative success of these created habitats is provided and may also provide data to make adaptive management recommendations (Section G). Section D may also identify areas in which additional research is needed (Section C). The general progression of these work tasks is as follows: Valuable information gained from research (Section C) becomes incorporated into a regular process or protocol in augmentation activities (fish handling protocol, stocking technique, etc.), habitat creation (appropriate water depth, substrates, etc.), or management regimes (maintaining particular levels of water quality, water levels, etc.) through the adaptive management process. When research-based monitoring, which has been conducted during the development of a conservation area (under Section C), evolves into a standardized set of protocols and the development phase of that conservation area is complete, this monitoring may continue as part of Section F. Similarly, a monitoring regime that is implemented within the system as part of research investigations may eventually become covered under Section D. The level of frequency and intensity of this additional monitoring may be reduced as appropriate to meet the goals of the Sections D and F work tasks. A number of these specific work task progressions are detailed in the sections below.

Fish Augmentation (Section B)

The goal of the LCR MSCP Fish Augmentation Program is to provide the effort to stock a total of 660,000 subadult razorback suckers and 620,000 subadult bonytail for reintroduction into the Colorado River over a

50-year period. Between 2005 and the end of FY15, 226,528 native fishes have been stocked toward completing this goal. This includes 153,601razorback suckers that have been stocked in Reaches 3–5 (RASU3) and 72,927 bonytail that have been stocked in Reaches 2–5 (BONY3). In addition, 113,104 razorback suckers have been stocked into Reach 2 during this period in support of maintaining a genetic refuge in Lake Mohave (RASU5) (see tables 1-10a–c). This rate of stocking is expected to meet augmentation program goals. An updated fish augmentation plan for the LCR MSCP was finalized in FY15 and is available on the LCR MSCP Web site (www.lcrmscp.gov).

To obtain sufficient numbers of young fish for grow-out and eventual stocking, an adult broodstock for each species must be maintained under the LCR MSCP. The adult razorback sucker population in Lake Mohave is the most genetically diverse among razorback sucker populations and is the primary broodstock for this species. Under the LCR MSCP, offspring are captured from this stock directly from the lake and are reared at the Willow Beach National Fish Hatchery (Willow Beach NFH) in Arizona. The fish are then stocked into the LCR. A second broodstock of razorback suckers, developed by the USFWS from Lake Mohave offspring, is maintained at the Southwestern Native Aquatic Resources & Recovery Center (SNARRC) in Dexter, New Mexico. Additional fish rearing capacity is located at the Achii Hanyo Native Fish Rearing Facility (Arizona), Lake Mead Fish Hatchery (Nevada), Overton Wildlife Management Area (Nevada), and the Bubbling Ponds Fish Hatchery (Arizona). In 2007, the exotic quagga mussel was found in Lake Mead. To ensure that quagga mussels do not gain access to the Bubbling Ponds Fish Hatchery, razorback sucker larvae are being provided to the hatchery from the SNARRC broodstock.

The SNARRC maintains the only bonytail broodstock in the world (the parents of these fish also came from Lake Mohave). A genetic management plan for this stock has been developed by the USFWS and is in effect. LCR MSCP funding is provided to the SNARCC to: (1) support the maintenance of this broodstock, (2) hatch out bonytail, and (3) deliver the young to grow-out facilities. A second bonytail broodstock has been developed by the USFWS and is intended to be moved in FY16 to Mora National Fish Hatchery in Mora, New Mexico. The second broodstock is intended to be used as a refuge population (not for additional bonytail production) at this time. Its purpose is to provide a backup to guard against any potential catastrophic event (disease, etc.) that may limit production or loss of the genetic stock of the bonytail broodstock maintained at the SNARRC.

FY15 Accomplishments

Fish production levels were similar to those in FY14. Production goals are still on track to be ramped up in FY19–30. As part of the preparation for this expanded effort, the four new ponds constructed at the SNARRC (completed in FY14) were tested and are now being employed as part of the bonytail production

goals of the LCR MSCP. Major infrastructure repairs were expected in FY15 at the Bubbling Ponds Fish Hatchery; however, these did not occur. Some infrastructure repairs originally planned for FY15 are expected to be funded in FY16. The first year of a new 5-year agreement for fish production at the Bubbling Ponds Fish Hatchery was pre-obligated with FY15 funds and will start in FY16.

Production in FY15–18 will continue to focus on providing fish for meeting augmentation goals. Stocked native fishes have been found to persist in some reaches of the LCR, but because research and monitoring information has indicated that post-stocking survival is still low, augmentation research needs to focus on improving post-stocking survival. Therefore, long-term research that targets improvements in augmentation effectiveness has continued in FY15. These investigations have focused on two areas of the augmentation program: (1) stocking/handling techniques and (2) stocking more "fit" fish. Investigations of stocking/handling techniques involve comparing survival of fish stocked: during day versus night, at different locations, during different seasons, different batch sizes, and at larger stocking sizes. Studies being conducted to improve fish fitness as a way to improve post-stocking survival include flow conditioning fish to improve physical attributes and training fish to recognize and avoid predators. Some of these specific augmentation research efforts and accomplishments are detailed in "Species Research (Section C)" below.

Fish augmentation work tasks were presented in "Fish Augmentation (Section B)." Key accomplishments for FY15 include:

- Successful capture of 17,841 wild razorback sucker larvae from Lake Mohave (B1).

- Tagging and stocking of 17,243 razorback suckers from the Willow Beach NFH (B2). This number includes fish stocked into Reach 2 lake-side rearing ponds.

- Tagging and stocking of 477 razorback suckers and 5,168 bonytail from the Achii Hanyo Native Fish Rearing Facility (B3). These numbers represent fish that were stocked in December 2014 (FY15).

- Tagging and stocking of 5,417 bonytail from the SNARRC and maintenance of the bonytail broodstock at the SNARRC (B4).

- Transfer of 65,000 larval razorback suckers to the Bubbling Ponds Fish Hatchery from the SNARRC (B4).

- Tagging and stocking 9,613 razorback suckers from the Bubbling Ponds Fish Hatchery (B5).

- The Lake Mead Fish Hatchery (B6) received 100 razorback suckers from Lake Mead and 4,000 larvae and 5,800 fingerling razorback suckers from Lake Mohave.

- Stocking 750 razorback suckers into lake-side rearing ponds (B7).

FY16 Activities

Fish augmentation actions currently underway in FY16 are similar to those conducted in FY15, with some notable exceptions.

A new agreement with the Arizona Game and Fish Department was initiated in FY16 to continue fish production at the Bubbling Ponds Fish Hatchery through FY20; however, no long-term agreement was reached, and it is not anticipated that fish production will be conducted at this facility after FY20. Replacement of the hatchery's water supply pipe is scheduled for FY16. At this time, increased fish production is not possible at the hatchery. Options are being explored to identify areas where increased native fish production can be achieved to prepare for future increased production goals of the Fish Augmentation Program.

Production numbers at the SNARRC are similar in FY16, at approximately 10,000 bonytail. The Willow Beach NFH will maintain razorback sucker production at a target of 8,000 to 10,000. In FY16, the Willow Beach NFH will continue its implementation of a new rearing strategy to produce larger fish (> 400 mm) for Lake Mohave. In past years, large numbers of fishes have been produced for the lake; however, data collected under Work Tasks C12 (closed) and D8 suggest that stocking larger fish would have a more pronounced effect on increasing population size through greater survival. Fish > 400 mm also have a higher probability of contributing to the genetic diversity of Lake Mohave within the first year of their repatriation. The approach is somewhat conservative but also has incorporated the logistic realities of the hatchery's capacity as well as economic considerations. The plan is to increase the number of fish > 400 mm stocked into Lake Mohave without having an unacceptable decline in total stocking numbers of fish per year. To do this, the hatchery is decreasing densities in year classes of fish over the next 5 years to encourage greater growth, which will result in a slow ramp up of fish > 400 mm. The expectation is to have an entire year class (8,000–10,000 fish) averaging > 400 mm. Larval collection goals will again be reduced accordingly in FY16. Under this scenario, the number of fish stocked per year is expected to remain in the range of 8,000–10,000 razorback suckers. In 5 years, the expectation is to have an entire year class that averages > 400 mm TL.

The Lake Mead Fish Hatchery is expected to produce approximately 2,000 razorback suckers toward annual augmentation goals; the stocking reach will be determined. In FY16, the Lake Fish Mead Hatchery will start preparations to expand razorback sucker production for a goal of 6,000 per year

expected in FY18–19. This will likely require a number of infrastructure upgrades to the hatchery and a corresponding increase in budget expenditures (B6) in FY16 and out-years. Larvae collections will also need to be increased to achieve these goals and will impact the effort and expenditures in Work Task B1 in FY16.

A number of bonytail donated from the Wahweap State Fish Hatchery in FY14 may reach stocking size by FY16; the number of fish and stocking location is yet to be determined. Some of these fish may also be used in experiments such as those for conditioning or habitat selection. Some of these fish may also be used in pilot stocking (research under Work Task C64) of bonytail, which will commence in Reach 2 in FY16.

A new work task, Work Task B12, will be implemented in FY16. This work task will support the relocation and maintenance of a second bonytail broodstock at the Mora National Fish Hatchery. Bonytail are considered functionally extirpated from the LCR, so in terms of species conservation, the establishment of a second bonytail broodstock location is one of the most important measures that can be achieved. Having a redundant source to house the genetics of bonytail provides a safeguard against total loss in the case of a catastrophic event at one of these locations. It also provides additional security and potentially another source of bonytail production for the LCR MSCP augmentation program in the future.

Research (Section C) continues to focus on improving post-stocking survival of razorback suckers and bonytail. To ascertain if fish conditioning translates to improved survival, implementing experimental stocking treatments using these conditioned fishes will continue. If these treatments show improvements to the post-stocking survival of stocked native fishes and are cost effective, they may be implemented as regular stocking practices.

Proposed FY17 Activities

Routine fish augmentation plans for FY17 will repeat the successful activities conducted in previous years of the program and are described in Work Tasks B1–B8 and B11–B12. Fish rearing facility infrastructure repairs, improvements, and expansion may be necessary to secure current production and to meet increases in augmentation goals for FY19. Potential locations will be evaluated based on feasibility and cost effectiveness.

If production capacity permits, experimental stocking of both razorback suckers and bonytail in Reaches 4 and 5 will commence in FY17. This action will require an additional 6,000 razorback suckers and 4,000 bonytail per year to be stocked into these reaches for a period of 10 years.

Species Research (Section C)

Research is being conducted on covered fish species and their habitats to: (1) guide selection and application of conservation techniques, (2) document successful implementation of conservation measures, and (3) develop alternatives to conservation actions that prove ineffective through the Adaptive Management Program (AMP). This strategy will allow researchers to quantify existing knowledge, identify data gaps, and design and implement species research to fill these data gaps. Conceptual ecological models (CEMs) have been developed for the razorback sucker, bonytail, and flannelmouth sucker (under Work Task G4) and will assist in further identifying these data gaps and help to prioritize and redefine research topics.

FY15 Accomplishments

Fish research work tasks presented in this section detail the accomplishments for FY15. Some of the more significant findings from FY15 were:

Fish Augmentation and Distribution Research

- Preliminary efforts were made to document bird predation on native fishes using remote passive integrated transponder (PIT) tag scanners as well as scanning beneath known roosts of piscivorous birds under Work Tasks C65 and G3. PIT tags were detected on bird roosts within 24 hours of a stocking event, and additional scanning under a known roost documented 23 tags (considered mortalities because the tags did not move) from fish that were presumably eaten by a roosting bird. These tags were from fish that had been released throughout the LCR MSCP planning area, and some were from fish released as early as 2003.

- The results from Work Task C47 (closed) research entitled *Genetic Monitoring and Management of Recruitment in Bonytail Rearing Ponds* indicated that unwanted bonytail recruitment could be effectively controlled using a native predator to target spawned larval bonytail. It is expected that this technique will be incorporated as part of the regular rearing practice at the SNARRC. This will likely result in better growth rates of bonytail in rearing ponds and eliminate any genetic concerns associated with bonytail recruitment. A report of the same title will be posted on the LCR MSCP Web site in FY16.

- Ongoing work in Reach 3 conducted under Work Task C64 has indicated higher contact rates (based on catch per unit effort) for razorback suckers in the Park Moabi backwater than in the seven other backwaters surveyed within this reach. Bonytail released in Park Moabi exhibited higher initial survival (based on both telemetry and PIT scanning data) than at other release sites and were often detected in association with bulrush habitats.

General Species Research

- Research conducted under Work Task C32 during FY15 focused on suggesting threshold pH levels for successful bonytail egg development and larval survival. Greater success was observed at lower pH levels, with percent hatch ranging from 51–58% at pH 7, 8, and 9. Percent hatch was reduced at higher pH levels and ranged from 35–51% at pH 9.5, 6–12% at pH 10, and 0% at pH 10.5. Larvae were exposed to pH ranging from 8 to 10.5 in three replicate treatments through two separate trials run at 20 and 25 degrees Celsius (°C) for up to 20 days. Mortality at 20 °C ranged from 7–15% at pH 8 to 10 and from 92–100% at pH 10.5. Mortality was slightly higher at 25 °C, ranging from 7–22% at pH 8 to 9.5, 39–53% at pH 10, and 100% at pH10.5.

Created Habitat Research

- A chemical renovation was implemented for the ponds at the Imperial Ponds Conservation Area (IPCA) (C25) in FY15. After intensive native fish removal efforts were completed and pre-renovation preparations were made, two applications of rotenone were completed on the ponds approximately 1 month apart. Data collected from the salvage efforts indicated that in Pond 1, recruitment of both razorbacks and bonytail had occurred.

- A water management plan for the ponds at the IPCA was completed. The plan incorporated data collected during the water management study and included considerations for both logistical constraints and the water delivery infrastructure present onsite.

The following project was completed in FY15:

1. *Work Task C47 (closed): Genetic Monitoring and Management of Recruitment in Bonytail Rearing Ponds.* This work task was intended to be closed in FY14. Due to delays in funding transfers, a no-cost extension for this work was granted. Research was completed in FY15 using obligated FY14 funds; no costs were incurred in FY15.

The efficacy of fin clipping all razorback suckers for genetic samples during tagging at the Willow Beach NFH was explored in FY15. By collecting tissue samples for genetic testing during tagging, the genetics of each fish stocked could be sampled. Genetic samples would be held for future analyses and only run if the fish was contacted. Because of the increased effectiveness of PIT scanners in re-contacting fish, there is potential that this process may greatly increase the precision of the genetic stock assessment of Lake Mohave over time. It would also likely reduce the need for netting fish during the spawning season, resulting in lower long-term costs. Unfortunately, available off-the-shelf systems did not

contain preservatives compatible with long-term storage for genetic samples; therefore, this process was not implemented in FY15. Additional discussions and strategies are being explored to evaluate the cost-benefit of this effort. With reduced numbers of total razorback suckers being reared at the Willow Beach NFH, this process may be possible but would not be employed until FY17 at the earliest. An independent review of the genetic research will be initiated to help identify long-term genetic monitoring needs of the LCR MSCP as part of the adaptive management process.

FY16 Activities

Research in FY16 will continue to focus on post-stocking survival, genetics, and habitat use and needs of native fishes. Much of this work represents ongoing long-term efforts. Because re-contact rates for stocked fish are low, multi-year studies are typically needed to adequately assess stocking treatment affects.

Research work tasks that assess the genetics for razorback suckers and bonytail will continue through FY18. Because Lake Mohave is being managed as the broodstock for razorback sucker genetic studies along the LCR, some degree of long-term genetic monitoring will be necessary to appropriately inform conservation efforts for the duration of the program. This is also true for other river reaches, as well as for created backwater habitats, although the intensity of this monitoring effort will likely vary depending on location. Genetic monitoring of backwaters will be necessary to describe the long-term dynamics from a genetics sustainability standpoint and may require directed research to help guide the management of native fish populations. The knowledge and tools to effectively develop a standardized genetic monitoring program that would be more appropriately implemented, carried out, and reported on as a system-wide monitoring work task under System Monitoring (Section D) is expected to be acquired by FY19. As part of an effort to transition these research investigations into regular monitoring, some changes will be implemented regarding how genetic material is gathered to help improve data collection and help suggest long-term genetic monitoring needs. To assist in this effort, an independent review of the current genetic monitoring program used under the LCR MSCP was initiated. Results of this review are expected in FY16.

Alternate stocking treatments will also continue to be evaluated in FY16, as will flow conditioning research and predator avoidance trials (C61). Assessments of riverine habitat use (C64) by razorback suckers and bonytail and habitat features important in backwater creation (C63) are ongoing. Field investigations of immediate post-stocking mortality (C65) will also continue in FY16. Monitoring will continue at the Imperial ponds (C25) in FY16 to evaluate the effectiveness of the water delivery schedule (implemented in FY16) in maintaining water quality parameters for native fishes.

Previous research findings that have identified ways of improving fish propagation and culturing will be incorporated into regular practices whenever possible and practical. No new Species Research (Section C) work tasks are beginning in FY16. A contribution to the razorback sucker species status assessment that is being produced through a cooperative effort with the Upper Colorado River Basin recovery programs (Upper Colorado River Endangered Fish Recovery Program, San Juan River Basin Recovery Implementation Program, and Glen Canyon Dam Adaptive Management Program) is being funded under Work Task G3 in FY16.

Proposed FY17 Activities

The efforts in FY16 will continue to focus on three major research goals: (1) identifying areas where native fishes show persistence and capitalizing on these areas for future stocking and research efforts, (2) providing information to improve post-stocking survival, and (3) identifying important habitat and life history needs to help guide backwater creation. Research to be conducted under Work task C64 will help identify areas of persistence and will provide a means to monitor post-stocking treatments (C61) for their effect on survival. Investigations will continue under Work Task C63 and will identify habitat features important to native fishes. Research for life history requirements will continue in FY17 under Work Task C32 and will again focus on identifying water quality thresholds for native fishes.

Genetic research will continue in FY17 in order to provide guidance for long-term management of both the Lake Mohave genetic broodstock and created backwater populations. Specific to Lake Mohave, the potential benefits and tradeoffs of collecting genetic samples at the time of stocking at the Willow Beach NFH may be explored by implementing a pilot test during razorback sucker tagging in early FY17. Genetic research on backwater populations of stocked fish will be expanded and transitioned to conservation area created backwaters in FY17–18 at the IPCA.

System Monitoring (Section D)

System-wide monitoring is conducted on existing populations of covered fish species to determine their population status, distribution, density, migration, productivity, and other ecologically important parameters. System-wide monitoring for razorback suckers and bonytail is covered under Work Task D8. Monitoring data for flannelmouth suckers were included in the research actions covered under Work Task C15 (closed). Additional flannelmouth sucker monitoring data will continue to be collected to support Conservation Measure FLSU3 and will be accomplished simultaneously through monitoring efforts under C64, D8, and F5.

FY15 Accomplishments

Multi-agency, lake-wide fish surveys were conducted on Lakes Mead, Mohave, and Havasu and on river reaches between these reservoirs. Surveys were completed using nets and electrofishing boats.

Research studies conducted in each reach added additional fishery status information.

No Lake Mead razorback sucker population estimate is provided for the 2014–15 study year, as low recapture rates produced an unrealistic estimate in the program MARK. Low recapture rates were likely due to a reduction in sampling effort combined with a potentially earlier start of the spawning season on Lake Mead. Additional sampling efforts are planned for FY16 so that a reliable estimate may be obtained. Population estimates have, however, been consistent for the previous five study years (2010 – 541, 2011 – 733, 2012 – 596, 2013 – 597, and 2014 – 589). Larvae and juvenile fish were observed along with active spawning in four separate areas in the lake. A total of 339 larvae were captured on the lake, and larvae were present at all major spawning sites (Las Vegas Bay, Echo Bay, and the Muddy River/Virgin River inflow) over the course of the spawning season. No bonytail were contacted in FY15, and they are considered absent from Reach 1.

Reach 2 had an estimated population of 3,505 repatriated razorback suckers. This estimate is higher but similar to the 2014 estimate of 3,284. Reach 3 had a razorback sucker population estimate of 4,795, which was a slight increase in the estimate from 2014 of 4,456. Some measure of caution should be used when applying this information; the confidence intervals associated with these estimates also indicate that substantial year-to-year variation may exist. In addition, in some cases, these confidence intervals may actually be greater than the changes in yearly population estimates. Bonytail contacts using PIT scanning are still rare in this reach and typically only occur for the first several months post-release.

A total of 3,494 razorback suckers were stocked above Headgate Rock Dam (Reach 4) during FY15; all fish were released with a PIT tag. A total of 1,797 razorback suckers and 4,864 bonytail were stocked below Palo Verde Diversion Dam (Reaches 4 and 5) during the fiscal year; all fish were released with a PIT tag. Monthly PIT tag scanning and one netting survey in February yielded 258 bonytail and 236 razorback suckers contacted in Reaches 4 and 5. Only one fish, a razorback sucker, was contacted by remote scanning in Reach 5. Additionally, 18 razorback larvae were contacted in Reach 4 below Palo Verde Diversion Dam, and 3 razorback larvae were contacted in Reach 5 near Martinez Lake.

Overall re-contacts of stocked fish are low in these reaches, and population estimates were not calculated due to the low number of contacts. System-wide monitoring under Work Task D8 has resulted in the identification of a number of

connected backwaters where razorback sucker populations appear to be persisting. Although the creation of disconnected backwaters as habitat for native fishes is a priority under this program, these observations suggest that connected backwaters are used by razorback suckers and can provide value for species conservation. Additional investigation of post-stocking distribution and survival in these reaches is being conducted under Work Task C64.

The first year of a 3-year demonstration project was initiated in FY15. A comparison was made between the traditional use of trammel netting versus using remotely deployed PIT scanners during the March razorback roundup. No inference should be drawn until this longer-term comparison is complete, but preliminary data continue to show that remote PIT scanners can provide greater numbers of overall contacts and commonly greater numbers of unique contacts per unit of effort. This research was initiated and is again summarized in the "Adaptive Management Program (Section G)" section of this document (G4).

FY16 Activities

Monitoring data will be collected for Reaches 1–5. Information will be gleaned from ongoing fish research activities as well as through fish monitoring field work. Field work will include collecting larvae, trammel netting, electrofishing, remote sensing of PIT-tagged fish, and active and passive tracking of sonic-tagged fish. Monitoring will be conducted in Reaches 4 and 5, with an emphasis on remote sensing in available backwater locations, particularly in areas where previous contacts of native fishes were made.

The use of PIT tag scanners has been embraced to increase precision in calculating population estimates and to contact fish that likely would not have been captured through discreet netting events. This technology has shown great promise in its utility for many fish monitoring applications, and it will continue to be explored and refined for the LCR MSCP into the future. Expanding the use of these devices in other river reaches and attempting to increase the spatial coverage of deployed units to provide a more robust estimator of abundance will necessarily increase program expenditures to procure and maintain these units. In the long term, better data will be available to inform management decisions and will reduce the need for more invasive and labor-intensive sampling techniques.

Proposed FY17 Activities

Monitoring will continue in all reaches as previously outlined, and participation in multi-agency field surveys will proceed. Monitoring efforts will continue to rely on and expand the use of remote PIT scanning technology, as this technology has proven effective in increasing both contact probabilities and precision in population estimates. The use of both sonic and radio telemetry tags is expected to be expanded in Reaches 4 and 5 to help identify additional locations where native fishes might persist in these reaches.

Post-Development Monitoring (Section F)

Post-development monitoring will be conducted at each conservation area following completion of habitat creation activities in order to evaluate both the maturation of the site as it develops into covered species habitat and the use of the habitat by the covered species. Under Work Task F5, funding is provided to support post-development monitoring of the Beal Lake Conservation Area (BLCA) and the Big Bend Conservation Area (BBCA). Monitoring of the Imperial ponds is being covered under Work Task C25, as operational procedures for the ponds are still under development.

FY15 Accomplishments

The water quality of Beal Lake was monitored throughout the backwater using permanently deployed multi-parameter instruments. Low levels of dissolved oxygen and high temperatures were observed locally but not lake-wide. Conductivity has decreased to nearly 6,000 microsiemens per centimeter following some inlet canal maintenance and the opening of valves that reconnected the backwater to Topock Marsh. Zooplankton and phytoplankton results continue to show relatively low levels of plankton biomass. No golden algae have been detected in Beal Lake since May 2013.

Routine monitoring at the BBCA continued in FY15; native fish contacts included 12 razorback and 3 flannelmouth suckers. All but one of the razorback suckers originated from localized stocking events from the past 3 years. Larval flannelmouth and razorback suckers were captured at rates similar to previous years. Multiple telemetered juvenile flannelmouth suckers (C53) were again contacted in the dense bulrush stands near the center of the backwater. Water quality parameters remained within thresholds for all native fishes.

FY16 Activities

Monitoring activities of Beal Lake will be focused on water quality and plankton, with limited fish monitoring. Golden algae sampling will continue throughout the year. Research projects will be outlined for the next few years, and official study plans will be completed in FY16.

A drawdown of Beal Lake is planned for FY16. This management action will be employed to induce surface and groundwater flow into the lake to improve water quality and potentially reduce the likelihood of future golden algae outbreaks.

The BBCA will be monitored at a level similar to FY15. Semipermanent remote PIT scanners will be deployed in an effort to increase scanning contacts for all species.

Proposed FY17 Activities

The activities from FY16 will continue into this year. Future plans for Beal Lake depend on the ability to address and manage water quality issues, particularly golden algae. Additional future research (Section C work tasks) will focus on fish use of cover and the impact of piscivorous bird predation in the lake.

BBCA activities will be similar to those of the previous year and will include trammel netting, remote PIT scanning, larval surveys, and water quality monitoring.

Adaptive Management Program (Section G)

Under the LCR MSCP Adaptive Management Program, uncertainties encountered during implementation of the conservation measures outlined in the HCP will be addressed. 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.

The *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. The *Final Five-Year Monitoring and Research Priorities for the Lower Colorado River Multi-Species Conservation Program: 2013–2017* report was completed in FY12.

Implementation of the AMP to address uncertainties, evaluate the effectiveness of research and monitoring activities, and improve management is allocated under Work Task G4. 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 decisionmaking process. Funding allocated under Work Task G3 to begin research studies identified as priorities, when applicable, will continue.

The current needs under the AMP involve data collection and organization so that the information can be readily accessed and used to inform management decisions. Native fish stocking and tagging data developed under the LCR MSCP are maintained in an electronic database. Another need is a toolbox of evaluation techniques that can gauge the effectiveness of conservation measures as they are completed. Work Task G3 will allow for the development of these tools. Funds allocated from this work task are used to initiate reconnaissance-level

investigations. If more research is needed, the work is written up as a separate research study and submitted for funding under "Species Research (Section C)" above.

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

Fisheries research investigations that are initiated through Work Task G3 can include periphery research that may be discreet and answer a simple question with no future commitments, be an additional part of a larger research effort captured under an existing work task, or lay the foundation for research to be conducted in a new work task.

FY15 Accomplishments

In FY15, CEMs were initiated for the bonytail and flannelmouth sucker under Work Task G4 and will be completed in early FY16. The CEMs will provide a clear framework for identifying data gaps and can thus help to prioritize future research and monitoring as well as guide management actions.

An independent review of current fisheries genetic research and monitoring activities was initiated in FY15 to assess the present approach for sampling and evaluating the genetics of razorback suckers in Lake Mohave, with an ultimate goal of developing a standardized long-term fisheries genetic monitoring program.

In FY15, fish research and monitoring projects were evaluated to determine if changes were needed in the process to include them into the LCR MSCP database, which includes development of program-wide standards for data collection, documentation of data collection processes in the field, and automating data collection using mobile devices. Spatial fish detections from system-wide monitoring activities on Lake Mohave continued to be analyzed. Maintenance of the fish augmentation database continued.

A literature review was completed in FY15, and cursory techniques for assessing predation were initiated under Work Task G3. Radio tags are now being used in conjunction with sonic telemetry research in Reach 3. Radio tags are capable of being detected even if they are removed from the river, which will provide additional opportunities to identify the fate of some stocked fish. Remote PIT scanning of known bird roosts in Laughlin Lagoon, located south of Laughlin, Nevada, accompanied releases of razorbacks and bonytail. Initial scanning efforts

were on a trial basis to test its efficacy in detecting PIT tags in avian predators. This method was effective and will be incorporated into additional releases in order to quantify this predation pressure. All future work relative to avian predation will be incorporated into Work Task C65.

FY16 Activities

The bonytail and flannelmouth sucker CEMs will be completed in early FY16.

During this fiscal year, the independent review to assess the current fisheries genetic research and monitoring activities will be completed. It is expected to provide recommendations regarding the appropriate level of effort and long-term needs for monitoring razorback sucker genetics in Lake Mohave as required to satisfy LCR MSCP goals.

During FY16, fish research and monitoring projects will continue to be evaluated for changes in the LCR MSCP data management process, which includes development of program-wide standards for data collection, documentation of data collection processes in the field, and automating data collection using mobile devices. Data dictionaries or mobile electronic field forms (MEFFs) continue to be developed for fish projects on a priority basis. Spatial fish detections from system-wide monitoring activities on Lake Mohave continue to be analyzed. Recommendations for inclusion of standardized localities are expected to continue during this fiscal year. Maintenance of the fish augmentation database will continue.

Under the LCR MSCP, funds are being contributed to a cooperative adaptive management initiative with the Upper Colorado River Basin recovery programs (Upper Colorado River Endangered Fish Recovery Program, San Juan River Basin Recovery Implementation Program, and Glen Canyon Dam Adaptive Management Program). Under the initiative, information will be compiled on razorback suckers throughout their range, with the goal of producing a species status assessment. The assessment will characterize the current status and potential future viability of razorback suckers, including risks to the species, and key uncertainties in the assessment of the species. It will also provide vital information that can be used to help generate a 5-year status review (or other documents) by the USFWS for assessing species status with respect to the ESA.

Proposed FY17 Activities

In FY17, technical, independent, and peer reviews of fisheries projects, as part of the adaptive management process, will continue under the AMP (G4). Once the CEMs are finalized, they will be used in the adaptive management process to prioritize future research and monitoring as well as guide management actions. LCR MSCP database structure development and creation of MEFFs will continue, with other data modules being constructed on a priority basis. Funding is available for emerging research needs under Work Task G3.

MONITORING AND RESEARCH OF TERRESTRIAL, RIPARIAN, AND MARSH HABITATS AND ASSOCIATED COVERED SPECIES

As described in the HCP, conservation measures for 22 covered and 5 evaluation wildlife species that rely on terrestrial, riparian, and marsh habitat will be implemented under the LCR MSCP. These conservation measures are addressed through the numerous work tasks presented in this report. A brief summary of the work completed, ongoing activities, and proposed future work is provided below.

The work accomplished in support of terrestrial wildlife and plants is divided into five sections: Species Research (Section C), System Monitoring (Section D), Conservation Area Development and Management (Section E) (covered in the "Conservation Area Development, Maintenance, and Adaptive Management" overview), Post-Development Monitoring (Section F), and Adaptive Management Program (Section G). Each of these sections has an important relationship to the other sections.

A habitat-based approach for the conservation of covered species is used under the LCR MSCP. It involves the maintenance of existing habitat and the development and management of habitats that are created under the program (Section E), which requires knowledge of the key environmental characteristics (vegetation and abiotic) important for each species. Species' populations are also monitored to determine if and to what extent they are using the habitat (Section F) and includes monitoring to evaluate the ongoing status of covered species and their habitats in the LCR planning area (Section D).

For some species, fundamental information is lacking, and research projects (Section C) are implemented to fill those gaps. This research includes developing effective methods to detect species and monitor populations as well as identifying important characteristics of their habitat. For other species, research focuses on the types and frequency of management activities required to maintain functional habitats over the term of the LCR MSCP (Sections C and G).

Species Research (Section C)

Research is being conducted on covered wildlife species and their habitats to: (1) guide the selection and application of conservation techniques, (2) document successful implementation of conservation measures, and (3) develop alternatives to conservation actions that prove ineffective. This strategy will allow for

quantification of existing knowledge, identification of data gaps, and design and performance of species research to fill data gaps that will inform implementation of the conservation measures.

The LCR MSCP conservation measures direct that habitat characteristics should be characterized for 21 species either under Conservation Measure MRM1, species-specific conservation measures requiring distribution and/or habitat surveys (CRCR1, YHCR1, MNSW1, CRTO1, and LLFR1), or species-specific conservation measures requiring the creation and management of covered species habitat. These species include:

- Yuma clapper rail
- Southwestern willow flycatcher
- Western red bat
- Western yellow bat
- Colorado River cotton rat
- Yuma hispid cotton rat
- MacNeill's sootywing
- Western least bittern
- California black rail
- Yellow-billed cuckoo
- Elf owl
- Gilded flicker
- Gila woodpecker
- Vermilion flycatcher
- Arizona Bell's vireo
- Sonoran yellow warbler
- Summer tanager
- California leaf-nosed bat
- Pale Townsend's big-eared bat
- Colorado River toad
- Lowland leopard frog

Species research work tasks focus on key priorities set in the *Five-year Monitoring and Research Priorities for the Lower Colorado River Multi-Species Conservation Program (2013–2017)* report.

FY15 Accomplishments

In 2015, Reclamation implemented 7 research projects focused on 11 terrestrial covered and evaluation species. This research was concentrated on developing effective survey methods, assessing population size and habitat connectivity through genetic analyses, and measuring characteristics of habitats to determine the components that are critical to support these species.

Prior to FY15, methods to detect covered and evaluation species with known levels of accuracy were identified and approved for many LCR MSCP terrestrial species. In FY15, research continued in order to improve detection methods for the elf owl (C24), gilded flicker (C52), and lowland leopard frog and Colorado River toad (C62).

- *Work Task C24*: *Avian Species Habitat Requirements*. The study continued in order to test the elf owl's responsiveness to call-playback at short distances (50–250 meters [m]) in obstructed habitats, record their use of riparian habitats, and, on a broad scale, document what type of riparian habitat elf owls are using. This study was needed because, under previous surveys for the elf owl along the LCR, only one was detected near Blankenship Bend during a 2-year period. In FY15, over 100 elf owls were located in areas with riparian habitat in Arizona (outside the LCR), confirming they do use riparian woodlands and there is an adequate sample size of animals to use for the study.

- *Work Task C52*: *Gilded Flicker Riparian Habitat Use and Seasonal Movement Research.* Testing continued on capture and radio telemetry tracking, and additional information on the breeding chronology of the gilded flicker was gathered. This study was initiated to: (1) estimate time periods of breeding and post-breeding stages and document breeding season behaviors to help interpret results of sightings, (2) document gilded flicker travel distances during and after nesting season to document if it is possible that birds nesting in saguaro habitat may also use disconnected riparian habitat, and (3) help define habitat use of the gilded flicker during the breeding and non-breeding seasons.

- *Work Task C62*: *Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study*. Field work continued in order to locate occupied breeding habitat of the lowland leopard frog and Colorado River toad at study sites within the watershed of the Bill Williams River and also along the Aqua Fria River and Verde River watersheds, as a sufficient sample size of sites was not available along the Bill Williams River. Over 60 lowland leopard frog egg masses were found, and habitat data were collected. No egg masses were found for the Colorado River toad in FY15.

The genetics study to characterize California leaf-nosed bat populations at roost sites continued in FY15 (C43). Tissue sampling at roosts was completed. Microsatellite-enriched whole genome data for six individuals were received from the genome sequencing laboratory. The data were combined across the six individuals to allow for selection of an informative microsatellite dataset that will be used to determine population genetic patterns of genetic samples from 91 individuals. This sequencing is designed to identify specific genetic markers that will best contribute to the full-scale analyses of genetic diversity and relatedness among roosts.

Habitat characteristics in areas occupied by covered and evaluation species were studied under two work tasks to determine the components that are critical to support breeding populations. Research focused on the lowland leopard frog and Colorado River toad (C62), California black rail, western least bittern, and Yuma clapper rail (C66).

- *Work Task C27*: *Small Mammal Population Studies*. The field work for the Colorado River cotton rat and Yuma hispid cotton rat mark-recapture/habitat study was completed in FY15, and the project will be closed out in FY16. Data suggest that cotton rats need dense herbaceous vegetation at least 0.5 m in height; it is presumed to provide cover for their activities to protect them from predators.

- *Work Task C62*: *Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study*. Habitat data were collected where Colorado River toads egg masses were detected, including: location, associated vegetation, water depth, water temperature, egg mass dimensions, pH, air temperature, and distance to cover and land. Sufficient lowland leopard frog egg and breeding habitat data were collected in FY15 for analyses; therefore, egg mass searches will not be needed in FY16. Surveys were conducted for Colorado River toad breeding sites, but no egg masses were found in FY15.

- *Work Task G3*: *Adaptive Management Research Projects*. A new study was initiated to analyze variation in water depths in occupied marsh bird breeding sites to refine the current habitat management criteria for California black rail (no greater than 1 inch deep) and western least bittern and Yuma clapper rail (no more than 12 inches deep). This work will continue under Work Task C66: *Marsh Bird Water Depth Analysis* in FY16.

Research also involved reviewing the current scientific information available for covered and evaluation species to identify new knowledge that will facilitate LCR MSCP activities. The existing knowledge was incorporated into CEMs (G4). In addition to the CEMs, the species account publication was prepared to summarize the state of the science pertinent to LCR MSCP activities (C3) for the following covered and evaluation species: Arizona Bell's vireo, yellow warbler, Yuma clapper rail, California black rail, western least bittern, western yellow bat, relict leopard frog, lowland leopard frog, Colorado River toad, Yuma hispid cotton rat, Colorado River cotton rat, desert pocket mouse, elf owl, Gila woodpecker, desert tortoise, flat-tailed horned lizard, humpback chub, sticky buckwheat, and three-corner milkvetch. Work commenced on the MacNeill's sootywing species account in FY15, as additional information was available.

LCR MSCP funds were provided to the National Park Service (NPS) at Lake Mead National Recreation Area to support implementation of conservation measures for sticky buckwheat and threecorner milkvetch (C2) and relict leopard

frog (C4) in accordance with Conservation Measures STBU1, THMI1, and RLFR1. Sticky buckwheat and threecorner milkvetch population monitoring and invasive species control activities were conducted to protect the populations at Lake Mead National Recreation Area (supported by C2 funds). Relict leopard frog conservation activities (supported by C4 funds) were completed by the NPS at 19 sites within southern Nevada and northwestern Arizona and included the release of tadpoles and juvenile frogs at 6 experimental sites and diurnal and nocturnal surveys conducted year round at all 20 natural and experimental sites.

The following research projects were closed in FY15:

1. *Work Task C4: Relict Leopard Frog*. FY15 was the final year funding was provided to support conservation activities for the relict leopard frog. Conservation Measure RLFG1 is now complete.

2. *Work Task C35*: *Western Red Bat and Western Yellow Bat Roosting Characteristics Study.* Data analyses were completed for the western red bat and western yellow bat roosting study in FY14, and the report was finalized in FY15. The study documented western yellow bats using cottonwood-willow and mesquite forests primarily for foraging along the LCR, unlike western red bats, which use the cottonwood-willow and mesquite forests for both roosting and foraging.

FY16 Activities

Research will be conducted at locations occupied by LCR MSCP covered and evaluation species to fill gaps in knowledge. Section C work tasks will continue to focus on:

1. Developing effective methods to detect covered and evaluation species with known levels of accuracy. Studies will continue on the elf owl (C24), gilded flicker (C52), and lowland leopard frog and Colorado River toad (C62).

2. Evaluating habitat use in areas occupied by covered and evaluation species to determine the components that are critical to support breeding populations. Research will focus on the elf owl (C24), western least bittern, Yuma clapper rail (C66), and lowland leopard frog and Colorado River toad (C62).

3. Implementing conservation measures for sticky buckwheat and threecorner milkvetch (C2) in accordance with Conservation Measures STBU1 and THMI1. Under the LCR MSCP, funds will be provided to the NPS at the Lake Mead National Recreation Area to support existing conservation activities.

The following projects are scheduled to be completed in FY16:

1. *Work Task C27*: *Small Mammal Population Studies*. The field work for the Colorado River cotton rat and Yuma hispid cotton rat mark-recapture/habitat study was completed in FY15, and the project will be closed out in FY16. Data suggest that cotton rats need dense herbaceous vegetation at least 0.5 m in height; it is presumed to provide cover for their activities to protect them from predators.

2. *Work Task C43: Population Demographics and Habitat Use of the California Leaf-nosed Bat, a genetic Evaluation.* A genetic analysis will be completed, and the analysis of population demographics of California leaf-nosed bats based on the genetic results will be completed. The final report will be written, which can be utilized under the adaptive management process to inform future management actions for the California leaf-nosed bat along the LCR.

In addition, in FY16, accomplishments and research needs will be reviewed for the southwestern willow flycatcher to identify if additional research is needed. If research is identified, new work tasks will be initiated.

Proposed FY17 Activities

Research will be conducted at locations occupied by LCR MSCP covered and evaluation species to fill gaps in knowledge. Section C work tasks will continue to focus on:

1. Developing effective methods to detect covered and evaluation species with known levels of accuracy for the elf owl (C24), gilded flicker (C52), and lowland leopard frog and Colorado River toad (C62).

2. Evaluating habitat use in areas occupied by covered and evaluation species to identify habitat characteristics that may be critical to support breeding populations. Research will focus on the elf owl (C24), gilded flicker (C52), California black rail, western least bittern, and Yuma clapper rail (C66). Research will be completed for the lowland leopard frog and Colorado River toad (C62).

3. Implementing conservation measures for sticky buckwheat and threecorner milkvetch (C2) in accordance with Conservation Measures STBU1 and THMI1. LCR MSCP will provide funds to the NPS at Lake Mead National Recreation Area to support existing conservation activities.

In addition, in FY17, accomplishments and research needs for the yellow-billed cuckoo will be reviewed in order to identify additional research needs. If research is identified, new work tasks will be initiated.

System Monitoring (Section D)

System-wide monitoring is being conducted to evaluate the ongoing status of covered species and their habitats in the LCR MSCP planning area. Information from these projects provides context to population abundance and incidental observations of covered species on conservation areas.

System-wide monitoring for terrestrial and marsh species was planned to be implemented annually early in program implementation and then with decreasing intensity over the term of the LCR MSCP as data gaps are filled and as additional conservation areas are developed. In FY14 and FY15, existing literature and program data were reviewed to identify if any efforts could be reduced, as sufficient knowledge had been gathered, or if the efforts should be focused to inform specific needs. Post-development monitoring has shown that many covered species are using the land covers on the conservation areas without the need for additional research to inform habitat creation methods. Bat acoustic and capture monitoring (D6) was assessed, and it was found that by limiting data collection to June – August every year, the covered and evaluation bat species could still be detected with acceptable levels of accuracy. This resulted in a 2-month reduction in monitoring. Monitoring of yellow-billed cuckoos (D7) was also assessed. The data show that yellow-billed cuckoos have colonized many LCR MSCP conservation areas and that breeding is occurring and young are fledging and returning the following year. As a result, in FY16, monitoring will be focused on documenting presence and breeding, and there will not be continued focus on tracking individuals and intensive monitoring of nests. This level of analysis will continue in FY17 and FY18. System-wide monitoring objectives will be defined, and system-wide, post-development monitoring and any remaining research efforts will be divided into separate work tasks for FY18.

FY15 Accomplishments

Under the LCR MSCP, system-wide monitoring of marsh birds, southwestern willow flycatchers, yellow-billed cuckoos, bats, rodents, lowland leopard frogs, Colorado River toads, avian productivity, and riparian birds along the LCR and adjacent river systems continued.

Marsh bird surveys (D1) were conducted at Topock Gorge and the upper reaches of Lake Havasu during March, April, and May 2015 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. Yuma clapper rails and western least bitterns were encountered: 85 Yuma clapper rail detections in March, 12 in April, and 109 in April – May; 18 western least bittern detections in March, 8 in April, and 45 in April – May. California black rails were not detected in 2015. The April survey was only 1 day due to high winds.

Presence surveys for the southwestern willow flycatcher (D2) were conducted at 116 sites along the LCR and its tributaries in FY15. System-wide surveys were

conducted at the Pahranagat National Wildlife Refuge, (Pahranagat NWR) Meadow Valley Wash, Muddy River, Topock Marsh, Bill Williams River NWR, and Alamo Lake. In addition, the portion of the river below the Cibola National Wildlife Refuge (Cibola NWR) to the Northerly International Border with Mexico was also surveyed in FY15. This stretch of the river will be surveyed once every 3 years in accordance with an agreement between Reclamation and the USFWS. Life history studies were conducted at 41 sites and included banding, nest monitoring, habitat threat analyses, and microclimate analyses. A total of 143 resident (observed after migration has ended) or breeding southwestern willow flycatchers were detected, and 84 territories were identified within the following 8 study areas: Key Pittman, Pahranagat NWR, Meadow Valley Wash, Muddy River, Warm Springs, Topock Marsh, Bill Williams River NWR, and Alamo Lake. Sixty-seven of those territories were confirmed to have breeding flycatchers. In FY15, 30 previously unbanded adults and 75 nestling southwestern willow flycatchers were captured and color-banded. Five adults banded in previous years were recaptured, an additional 58 adults banded in previous years were re-detected, and six individuals were re-detected but did not have their color combinations confirmed. Results for observations of southwestern willow flycatchers at conservation areas conducted under Work Task D2 are discussed under "Post-Development Monitoring (Section F)" below.

System-wide monitoring for the yellow-billed cuckoo (D7) continued in FY15 with presence/absence surveys at 19 system-wide sites along the LCR and Bill Williams River, nest monitoring, banding of young and adults, telemetry, and migration tracking using a Global Positioning System (GPS). A total of two confirmed breeding territories and an additional two probable and nine possible breeding territories were detected in FY15. There were two nests found at the Bill Williams River NWR. Up to 102 breeding territories were estimated within the LCR MSCP planning area based on surveys of system-wide and LCR MSCP conservation area plots. A total of two nests were monitored on system-wide plots. Mayfield nest success was estimated to be 42%. Work Task D7 also included post-development monitoring at LCR MSCP conservation areas. Those results are discussed under "Post-Development Monitoring (Section F)" below.

Multi-species survey protocols have been developed to monitor other avian species covered under the LCR MSCP. Under Work Task D5, intensive site-specific data were collected on avian species using a standardized protocol, which enabled a comparison of species occurrence trends along the LCR with those throughout North America. Data collected were reported to the Institute for Bird Populations as part of their national bird monitoring effort. Data were also used on a site-specific level to provide insight on bird use within LCR MSCP conservation areas. Banding was conducted at three conservation areas using the Monitoring Avian Productivity and Survivorship (MAPS) protocol. During the breeding season, there were 184 captures at the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1), 126 total captures at the BLCA, and 82 captures at the Cibola Valley Conservation Area (CVCA). The

value of continuing MAPS monitoring at the BLCA, the CVCA, and Cibola NWR Unit #1 was evaluated. The CVCA MAPS station is located 3 miles from the Cibola NWR Unit #1 MAPS station and is consistently getting fewer captured birds than that station. The covered species detected here are also being documented under post-development riparian bird surveys (F2), southwestern willow flycatcher surveys (D2), and yellow-billed cuckoo surveys (D7). It appears that there is limited value with continuing with an annual MAPS station at the CVCA; therefore, the MAPS banding station at the CVCA was discontinued after FY15.

Under Work Task D6, a multi-species protocol and sample plan were used to document long-term population trends and habitat use of riparian bird species throughout the LCR MSCP area. In FY15, 80 system-wide plots were surveyed for riparian birds (D6), recording approximately 169 species, which included territorial and non-territorial breeding individuals, migrants, and non-breeders. Many species were detected breeding at some survey plots but present and not breeding at other survey plots. The estimated number of territories of focal species within the LCR MSCP planning area during FY15 were:

- Sonoran yellow warbler (1,721)
- Arizona Bell's vireo (1,263)
- Gila woodpecker (829)
- Summer tanager (221)

No vermilion flycatchers were detected during the Work Task D6 surveys in FY15. There were not enough pairs of gilded flickers detected in FY15 to calculate population estimates. There were two breeding gilded flicker pairs detected near Lincoln Ranch along the Bill Williams River. The territories were mostly outside the plot in upland habitat; the birds were not detected nesting within the plot but were foraging within it.

Under Work Task D9, acoustic monitoring and mine outflight counts continued, and a foraging distance study of California leaf-nosed bats and Townsend's big-eared bats was initiated. The five permanent acoustic monitoring stations were operated from June – August to detect bat presence. In FY15, data collected at an acoustic monitoring station at the 'Ahakhav Tribal Preserve, previously reported under Work Task F4, was moved to Work Task D9 as a system-wide monitoring site, as the 'Ahakhav Tribal Preserve is not a LCR MSCP conservation area. California leaf-nosed and Townsends big-eared bat roost outflight counts were conducted in winter and early summer at 10 mines along the LCR. Based on the roost outflight counts, populations at these roosts continue to appear stable. There will be sufficient system-wide mine outflight baseline data after winter FY16 to inform conservation area analysis; therefore, roost outflight counts will no longer be necessary on an annual basis. Preliminary data from the

foraging distance study suggest that California leaf-nosed bats have the ability to travel up to and possibly more than 10 miles to forage on a given night during the winter season.

Surveys were conducted in selected areas of suitable habitat at Pintail Slough, in the Havasu National Wildlife Refuge, and the Pratt Agricultural Lease near Yuma, Arizona, to document the presence of covered rodent populations (D10). One Colorado River cotton rat and four desert pocket mice were captured at Pintail Slough. No cotton rats or desert pocket mice were captured at the Pratt Agricultural Lease.

System-wide monitoring also continued for the lowland leopard frog and Colorado River toad (D12). Presence surveys for lowland leopard frogs were conducted using visual encounter surveys, call-playback surveys, minnow trap surveys, digital automated recorders, and environmental deoxyribonucleic acid (eDNA). The visual encounter surveys, call-playback surveys, minnow trap surveys, and digital automated recorder methods were successful in detecting lowland leopard frogs. The results of the eDNA analysis will be available in FY16. Presence surveys for Colorado River toads were conducted using visual encounter surveys, call-playback surveys, and digital automated recorders. Six Colorado River toads were observed during visual encounter surveys, but no frogs were heard on the digital automated recorders. Minnow traps and eDNA were not used in FY15 because the study site remained dry for the entire season.

FY16 Activities

System-wide monitoring of marsh birds, southwestern willow flycatchers, yellow-billed cuckoos, bats, rodents, lowland leopard frogs, Colorado River toads, and avian productivity will continue along the LCR and adjacent river systems.

Marsh bird surveys (D1) will be conducted along the LCR in Topock Gorge and the upper reaches of Lake Havasu during March, April, and May as part of a multi-agency, system-wide monitoring effort in coordination with the USFWS.

Presence surveys for the southwestern willow flycatcher (D2) will be conducted along the LCR, Bill Williams River, Alamo Lake, lower Gila River, and Pahranagat NWR, Key Pittman, Meadow Valley Wash, Warm Springs, and Muddy River in southern Nevada. Life history studies will be conducted at Pahranagat NWR, Key Pittman, Meadow Valley Wash, Warm Springs, Muddy River, the Bill Williams River NWR, Alamo Lake, and Topock Marsh. Activities will include banding, nest monitoring, and microclimate analyses. Surveys will not be conducted on the Virgin River in 2016. The monitoring objectives will be reviewed in light of the results from 2008–15, and changes will be made, if necessary, to focus the monitoring methods to inform habitat creation design

and management; and to monitor southwestern willow flycatcher occupancy at conservation areas. The results of this evaluation may be incorporated into future protocols, and a 10-year monitoring plan will be developed.

Yellow-billed cuckoo (D7) presence surveys will continue at LCR MSCP conservation areas but will not be conducted in system-wide existing habitat in FY16. System-wide areas will not be monitored in FY16, as nesting continues to occur primarily on LCR MSCP conservation areas. Call-playback surveys will be conducted only at conservation areas with cottonwood and willow at least 2 years old. The LDCA will be surveyed for the first time. Followup surveys to detect breeding will be conducted at conservation areas where breeding has yet to be documented. Intensive nest monitoring and capture and banding of birds to document activities of specific individuals will no longer be conducted, as successful breeding and nesting have been documented within LCR MSCP created habitat, and birds have continued to use the habitat for multiple years.

Followup visits will be conducted to locate birds fitted with GPS devices during FY15; if found, the birds will be captured and the data downloaded and analyzed. Birds banded in previous years will be re-sighted incidentally to these activities.

Some multi-species surveys used to monitor other avian species covered under the LCR MSCP will continue in FY16. Under Work Task D5, the MAPS banding stations will continue to operate at Cibola NWR Unit #1 and the BLCA during the 2016 breeding season. Color banding of LCR MSCP covered species will continue to be implemented to evaluate the recapture rate.

System-wide surveys will not be conducted in FY16. The protocol will be reviewed in light of the results from study and peer reviews, and changes will be made, if necessary, to system-wide (D6) and post-development (F2) avian monitoring to improve the accuracy of the monitoring methods and to clarify the management questions the data will address. A 10-year monitoring plan will be developed. System-wide surveys will resume in FY17.

The five permanent bat acoustic monitoring stations will continue to operate in FY16 (D9). Data will be collected and analyzed for covered and evaluation species presence during the summer peak activity period. Station data from the five non-LCR MSCP managed sites will be analyzed together with the nine habitat creation area stations (F4) as a single acoustic monitoring network to document trends in LCR MSCP species activity levels across the program area. Archived acoustic data will be organized, analyzed, and compiled so that it may be entered into the LCR MSCP database. California leaf-nosed bat outflight counts will continue in winter. This will complete the baseline data collection effort. The foraging distance study of California leaf-nosed bats and Townsend's big-eared bats will continue. In February, up to 12 California leaf-nosed bats were captured at known winter roosts and were radio tracked for approximately 2 weeks.

Surveys will be conducted to detect the presence of the Colorado River cotton rat and Yuma hispid cotton rat within selected areas that have potential habitat along the LCR outside LCR MSCP conservation areas (D10). System-wide monitoring objectives for 2017–27 will be defined. If potential habitat is discovered in areas that can inform LCR MSCP habitat creation, monitoring may be conducted to document their presence.

System-wide monitoring is also continuing for the lowland leopard frog and Colorado River toad (D12). Tests will continue with the five sampling methods in spring for the lowland leopard frog and summer for the Colorado River toad. An analysis of the monitoring protocols for the Colorado River toad will be prepared to inform future presence monitoring efforts.

Proposed FY17 Activities

System-wide monitoring of marsh birds, southwestern willow flycatcher, bats, rodent populations, lowland leopard frogs, Colorado River toads, and avian productivity along the LCR and adjacent river systems will continue in FY17.

Marsh bird surveys (D1) will be conducted along the LCR in Topock Gorge and the upper reaches of Lake Havasu during March, April, and May as part of a multi-agency, system-wide monitoring effort in coordination with the USFWS.

Southwestern willow flycatcher presence/absence surveys will be conducted at approximately 15 study areas along the LCR, lower Bill Williams River, Virgin River, and other riparian areas in southern Nevada. Life history studies will be conducted at the riparian areas in southern Nevada, the Bill Williams River NWR, Alamo Lake, and Topock Marsh. Activities will include banding, nest monitoring, and microclimate analyses. Testing of the LCR MSCP southwestern willow flycatcher database will be finalized and fully implemented.

Call-playback surveys will be conducted for the yellow-billed cuckoo (D7) at conservation areas with cottonwood and willow at least 2 years old. Followup surveys to detect breeding will be conducted at conservation areas where breeding has yet to be documented. Birds banded in previous years will be re-sighted incidentally to these activities. The monitoring objectives will be reviewed in light of the results from FY07–16, and changes will be made, if necessary, to focus the monitoring methods to inform habitat creation and management and to monitor yellow-billed cuckoo occupancy at conservation areas. System-wide, post-development monitoring and any remaining research efforts will be divided into separate work tasks for FY18. The results of this evaluation may be incorporated into future protocols, and a 10-year monitoring plan will be developed.

Multi-species surveys to monitor additional avian species covered under the LCR MSCP will continue. Under Work Task D5, collection of natural history data on avian species utilizing restoration sites will continue at sites determined in FY16 to meet system-wide and conservation area monitoring needs.

System-wide surveys under Work Task D6 will resume in FY17. The protocols will be updated, as needed, following the evaluation in FY16, and a 10-year monitoring plan will be finalized, which will incorporate the FY16 review.

The five permanent acoustic monitoring stations will continue to operate, and data will be analyzed for covered and evaluation species presence during the summer peak activity period (D9). Data will also be analyzed using the nine habitat creation area stations. The foraging study will continue in order to track bats from foraging areas and to identify the foraging distance of California leaf-nosed bats and roosts associated with some of the conservation areas. Standardization and consolidation of data and development of MEFFs for bat monitoring activities will continue. System-wide monitoring objectives will be defined, and a 10-year monitoring plan will be developed for FY18–28. Monitoring frequency and sample size are expected to decrease in FY17 in order to shift effort to monitoring additional conservation area acreage.

System-wide surveys (D10) will be conducted to detect the presence of the Colorado River cotton rat and Yuma hispid cotton rat within selected areas that have potential habitat along the LCR outside LCR MSCP conservation areas.

System-wide monitoring will also continue for the lowland leopard frog and Colorado River toad (D12). After two spring seasons of collecting lowland leopard frog detection data, an analysis of the methods and draft protocols will be prepared to inform LCR MSCP decisions regarding methods to be used for future presence monitoring.

Post-Development Monitoring (Section F)

Extensive monitoring of created habitats is necessary to evaluate the implementation and effectiveness of habitat creation projects. To accomplish this task, pre-development monitoring is conducted to document baseline conditions prior to habitat creation. After habitat creation has been initiated, post-development monitoring for biotic and abiotic habitat characteristics is conducted to document implementation success and to record both the maturation of the site as it develops into covered species habitat and the use of the habitat by the covered species.

FY15 Accomplishments

In FY15, post-development monitoring for LCR MSCP covered species use was conducted at 10 conservation areas (table 1-12). In general, habitat creation projects are created to establish land cover types with the intent that the vegetation is managed for covered species. To evaluate effectiveness in providing these habitat requirements (F1), pre- and post-development monitoring was conducted for targeted covered species, including avian species (F2), small mammals (F3), bats (F4), insects (F6), and marsh birds (F7). Post-development monitoring was also conducted at LCR MSCP conservation areas for southwestern willow flycatchers (D2) and yellow-billed cuckoos (D7) under system-wide work tasks.

Table 1-12.—LCR MSCP Covered Species Post-Development Monitoring in FY15

Conservation Area	Marsh Birds	Southwestern Willow Flycatcher	Yellow-billed Cuckoo	Other Riparian Birds	Bats	Small Mammals	MacNeill's Sootywing
Beal Lake Conservation Area	X	X	X	X	X	X	X
Big Bend Conservation Area	X	NS	NS	NS	NS	X	X
Cibola National Wildlife Refuge Unit #1 Conservation Area	NS	X	X	X	X	X	NS
Cibola Valley Conservation Area	NS	X	X	X	X	X	X
Hart Mine Marsh	X	NS	NS	NS	NS	NS	X
Hunters Hole	NS*	X	X	X	X	X	X
Imperial National Wildlife Refuge	X	NS	NS	NS	NS	NS	NS
Laguna Division Conservation Area	X	NS	NS	NS	NS	NS	NS
Palo Verde Ecological Reserve	NS	X	X	X	X	X	X
Yuma East Wetlands	X	X	X	X	X	X	NS

X = surveyed, NS = not surveyed, and * = The marsh at Hunters Hole has transitioned from marsh to willow.

One resident southwestern willow flycatcher was observed at LCR MSCP conservation areas in FY15 (D2). It was detected at PVER Phase 4 in the same general area on seven consecutive visits from May 31 to June 14. The resident southwestern willow flycatcher was observed defending a territory and engaged in lengthy songs, which were not solicited by call-playback. This is the first time a resident southwestern willow flycatcher has been detected under the LCR MSCP south of Parker Dam since 2003, when the LCR survey protocol was revised to

more accurately identify southwestern willow flycatchers from other migrant willow flycatchers. One willow flycatcher was observed at the BLCA on June 24, but no breeding evidence or band was observed; therefore, it could not be confirmed as a southwestern willow flycatcher. Work Task D2 also included system-wide monitoring discussed in "System Monitoring (Section D)" above.

Post-development monitoring for the yellow-billed cuckoo (D7) continued in FY15 with presence surveys at the BLCA, the PVER, the CVCA, and Cibola NWR Unit #1; nest monitoring; banding of young and adults; telemetry; and migration tracking using GPS. A total of 46 confirmed breeding territories were detected: 1 at the BLCA, 41 at the PVER (Phases 2–7), and 4 at Cibola NWR Unit #1 (Crane Roost). An additional 18 probable and 31 possible breeding territories were detected at these 3 LCR MSCP conservation areas in FY15. There were 37 nests found and monitored at LCR MSCP conservation areas. Mayfield nest success was estimated to be 42%. Thirteen banded adults were recaptured, including the oldest known yellow-billed cuckoo. It is an 8-year-old male banded as a chick in 2008 at CVCA Phase 01. It was recaptured at Cibola NWR Unit #1 (Crane Roost) and successfully nested in FY15. This male had not been observed since FY08. Three of seven birds fitted with GPS units in FY14 were also recaptured after they returned to the survey plots. Another two previously banded birds were re-sighted and included two at the BLCA; one male was captured in 2012 at the CVCA, approximately 152 kilometers (94.5 miles) from the BLCA, and a female was banded in 2014 at Cibola NWR Unit #1, approximately 157.5 kilometers (97.5 miles) from the BLCA. Work Task D7 also included system-wide monitoring discussed in "System Monitoring (Section D)" above.

Three LCR MSCP listed species were captured and color banded during the MAPS season (D5). There was one vermilion flycatcher at Cibola NWR Unit #1, nine yellow warblers and six summer tanagers at the BLCA, and two summer tanagers at the CVCA. Two LCR MSCP listed species were captured and banded but not color banded. There was one Bell's vireo at the BLCA and one Gila woodpecker at Cibola NWR Unit #1. One yellow warbler and one summer tanager were recaptured at the BLCA. They had both been captured and color banded in 2015. The value of continuing MAPS monitoring at the BLCA, the CVCA, and Cibola NWR #1 was evaluated. The CVCA MAPS station is located 3 miles from the Cibola NWR Unit #1 MAPS station and is consistently getting fewer captured birds than that station. The covered species detected here are also being documented under post-development riparian bird surveys (F2), southwestern willow flycatcher surveys (D2), and yellow-billed cuckoo surveys (D7). It appears that there is limited value with continuing an annual MAPS station at the CVCA; therefore, the MAPS banding station at the CVCA will be discontinued after FY15.

Under Work Task D6, a multi-species protocol and sample plan were used to document long-term population trends and habitat use of riparian bird species

throughout the LCR MSCP area. In FY15, 80 system-wide plots were surveyed for riparian birds (D6), recording 148 species LCR MSCP covered bird species and other territorial riparian breeding birds at conservation areas:

- BLCA – There were 121 pairs of territorial breeding birds comprising 18 species detected. These included 13 pairs of Sonoran yellow warblers, 20 pairs of Arizona Bell's vireos, and four pairs of summer tanagers.

- Cibola NWR Unit #1 – There were 213 pairs of territorial breeding birds comprising 22 species detected. These included four pairs of Arizona Bell's vireos and two pairs of Sonoran yellow warblers.

- CVCA – There were 261 pairs of territorial breeding birds comprising 22 species detected. This included one pair of summer tanagers.

- PVER – There were 565 pairs of territorial breeding birds comprising 25 species detected. These included seven pairs of Sonoran yellow warbler sand one Gila woodpecker pair.

- Yuma East Wetlands (YEW) – There were 190 pairs of territorial breeding birds comprising 29 species detected. These included one Gila woodpecker pair, one summer tanager pair, and one Sonoran yellow warbler pair.

- Hunters Hole –There were nine pairs of territorial breeding birds comprising nine species detected. No LCR MSCP covered species were detected breeding here.

Live trapping surveys to detect Colorado River cotton rats and Yuma hispid cotton rats were conducted in the fall of 2014 and the spring of 2015. Surveys were conducted at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, the BBCA, YEW, and Hunters Hole to detect the presence of cotton rats. Colorado River cotton rats were captured at the PVER, the CVCA, Cibola NWR Unit #1, and the BBCA. Yuma hispid cotton rats were captured at YEW.

Bat presence was monitored at conservation areas (F4). Acoustic monitoring was conducted the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, YEW, and Hunters Hole. Data will be analyzed in FY16. Capture surveys were conducted at five LCR MSCP conservation areas (BLCA, PVER, CVCA, Cibola NWR Unit #1, and YEW). Western red bats were captured at Cibola NWR Unit #1 and the CVCA. Western yellow bats were captured at the PVER, the CVCA, Cibola NWR Unit #1, and YEW. California leaf-nosed bats were captured at all five sites. Townsend's big-eared bats were captured at the BLCA.

MacNeill's sootywings were monitored (F6) at the BBCA, the BLCA, the CVCA, PVER (Phases 1, 4, and 6), Hart Mine Marsh, and Hunter's Hole. Sootywings were detected at the BLCA, the CVCA, the PVER (Phases 1, 4, and 6), Hart Mine Marsh, and Hunter's Hole.

Marsh bird surveys were conducted at the BBCA, the BLCA, Hart Mine Marsh, the LDCA, Field 18 in the IPCA, and YEW. Western least bitterns were detected at Hart Mine Marsh, the BLCA, the LDCA, and YEW. Yuma clapper rails were detected at the BLCA (both at Beal Lake and Willow Marsh), the BBCA, Hart Mine Marsh, the IPCA in Field 18, and YEW. No California black rails were detected during the surveys.

FY16 Activities

Post-development monitoring for LCR MSCP covered species continues to be conducted at conservation areas to evaluate how effective the program has been in providing the habitat requirements (F1) in conservation areas. Activities will focus on avian species (F2), small mammals (F3), bats (F4), insects (F6), and marsh birds (F7). Pre-development surveys will be conducted for any new conservation areas as needed. MAPS banding stations will continue to operate at Cibola NWR Unit #1 and the BLCA during the 2015 breeding season.

The level of effort and scope of yellow-billed cuckoo surveys (D7) will be reduced in FY16, as baseline data have been collected. Yellow-billed cuckoo nest monitoring, captures, and banding will not be conducted, and call-playback surveys will be conducted only at conservation areas with cottonwood and willow at least 2 years old. The LDCA will be surveyed for the first time. Followup surveys to detect breeding will be conducted at conservation areas where breeding has yet to be documented. Additional followup visits will be conducted to locate birds fitted in 2015 with GPS devices; if found, the birds will be captured and the data downloaded and analyzed. Birds banded in previous years will be re-sighted incidentally to these activities.

MacNeill's sootywing surveys (F6) will also be reduced to focus on conservation areas where no sootywings have been detected in Reaches 3–5 (BBCA, Cibola NWR Unit #1, and the IPCA). Methods tested and refined in FY14–15 will also be finalized.

FY17 Proposed Activities

Post-development monitoring for LCR MSCP covered species will be conducted at conservation areas to evaluate how effective the program has been in providing the habitat requirements (F1) in conservation areas. Activities will focus on avian species (F2), small mammals (F3), bats (F4), insects (F6), and marsh birds (F7). Pre-development surveys will be conducted for any new conservation areas.

Adaptive Management Program (Section G)

Under the LCR MSCP Adaptive Management Program, uncertainties encountered during implementation of the conservation measures outlined in the HCP will be addressed. 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.

The *Final Science Strategy* details the AMP process for the research and monitoring programs at 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. The *Final Five-Year Monitoring and Research Priorities for the Lower Colorado River Multi-Species Conservation Program: 2013–2017* report was completed in FY12.

Implementation of the AMP to address uncertainties, evaluate the effectiveness of research and monitoring activities, and improve management is allocated under Work Task G4. 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 decisionmaking process. Funding allocated under Work Task G3 to begin research studies identified as priorities, when applicable, will continue.

FY15 Accomplishments

CEM development for the Yuma clapper rail, California black rail, western least bittern, western red bat, western yellow bat, Colorado River cotton rat, Yuma hispid cotton rat, elf owl, gilded flicker, Gila woodpecker, vermilion flycatcher, Arizona Bell's vireo, Sonoran yellow warbler, summer tanager, southwestern willow flycatcher, yellow-billed cuckoo, and MacNeill's sootywing (G4) began in FY15.

Following the independent bat research and monitoring program review in FY14, research and monitoring efforts were reduced to covered and evaluation species and to peak activity periods in FY15. The review of avian system monitoring (D6) was conducted in FY15. A review of the elf owl study plan was conducted in which recommendations were made to refine the study plan to include Geographic Information System-based distance sampling, instead of on-the-ground measurements, and adjustments to the proposed analysis.

A standardized structure to collect and store data for species and their habitat continued to be created. Automated data collection techniques were used where appropriate to reduce errors. Documentation of data collection processes using

mobile units was provided after specific MEFFs were developed. These forms ensured collected data were consistent. Database module development and management continued in FY15 for the southwestern willow flycatcher (D2 and F2), yellow-billed cuckoo (D7 and F2), bats (D9 and F4), and avian species (D6 and F2). MEFFs were developed, and testing was conducted for the southwestern willow flycatcher, yellow-billed cuckoo, MacNeill's sootywing (F6), cotton rat (D10 and F3), lowland leopard frog and Colorado River toad studies (C62 and D12), and bat telemetry monitoring projects (C43). A review of the data collection processes for the southwestern willow flycatcher and yellow-billed cuckoo for remaining modules continued, and remaining MEFFs will be developed for testing in the FY16 field season.

Funding allocated under Work Task G3 to begin research studies identified as priorities, when applicable, will continue. The evaluation of water management requirements listed in Conservation Measures CLRA1 and LEBI1 (no more than 12 inches deep) and BLRA1 (no greater than 1 inch deep) had been identified as a priority in FY15. Reconnaissance surveys using existing locations will be used to prepare a study plan for further evaluation of the Yuma clapper rail, California black rail, and western least bittern water management characteristics at the patch scale and at larger manageable scales.

FY16 Activities

In FY16, CEMs (G4) for the Yuma clapper rail, California black rail, western least bittern, western red bat, western yellow bat, Colorado River cotton rat, Yuma hispid cotton rat, elf owl, gilded flicker, Gila woodpecker, vermilion flycatcher, Arizona Bell's vireo, Sonoran yellow warbler, summer tanager, southwestern willow flycatcher, yellow-billed cuckoo, and MacNeill's sootywing will be completed. Once completed, the CEMs will be used to identify the next 5-year research and monitoring priorities, including refinement of management questions and monitoring protocols.

A standardized structure to collect and store data for species and their habitats continues to be created and tested as new project modules are added. Automated data collection is used where appropriate to reduce errors. Documentation of data collection processes using mobile units are provided after specific MEFFs are developed. These forms ensure collected data are consistent.

Database development and management modules continues in FY16 on the southwestern willow flycatcher (D2 and F2), yellow-billed cuckoo (D7 and F2), bats (D9 and F4), vegetation (F1), cotton rats (D10 and F3), and avian species (D6 and F2). Review and testing of the data collection processes for the remaining data collection modules for the southwestern willow flycatcher, yellow-billed cuckoo, MacNeill's sootywing (F6), lowland leopard frog and Colorado River toad (C62 and D12), and bat telemetry monitoring projects (D9) will continue.

FY17 Proposed Activities

In FY17, technical, independent, and peer reviews of wildlife projects and habitat monitoring will continue under the AMP. A new 5-year research and monitoring priorities report will be written using information from the completed CEMs. LCR MSCP database structure development and creation of MEFFs will continue, with other species data modules being constructed on a priority basis. Funding is available for emerging research needs under Work Task G3.

CONSERVATION AREA DEVELOPMENT, MAINTENANCE, AND ADAPTIVE MANAGEMENT

A major component of the LCR MSCP is the creation and management of habitat. Conservation Area Development and Management (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 intent that the vegetation is managed for or developed into a species-specific habitat for covered species.

Conservation Area Development and Management (Section E)

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 ground cover are typically planted or seeded to create the desired type. For backwater land cover types, which include open water and associated emergent marsh, the habitat is defined by the evaluation of the physical, chemical, and biological conditions suitable for the establishment and maintenance of healthy populations of fish and other species associated with backwaters. Maturation and management of the land cover types ultimately create the habitat.

As described in the HCP, habitat creation goals of the LCR MSCP include establishing:

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

   8,132 total acres

To the extent practicable based on site conditions, cottonwood-willow, honey mesquite, marsh, and backwaters will each be restored in proximity to other land cover types to create integrated mosaics of habitat that approximate the relationships among aquatic and terrestrial communities historically present along the LCR flood plain. 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 (www.lcrmscp.gov). 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 followed a different selection and evaluation process from those established primarily for native fishes.

Conservation areas developed primarily for riparian and honey mesquite land cover types such as the PVER (E4), the CVCA (E5), and Cibola NWR Unit #1 (E24) involve the conversion of existing land cover types (such as active agricultural, fallow agricultural, and undeveloped land) to native riparian species.

Restoration research priorities were developed in accordance with the *Final Science Strategy*. The requirements included methods to cost effectively establish and manage planned land cover types while limiting growth of non-native plant species. Terrestrial restoration research projects included those under Work Tasks E1, E3 (closed), E6 (closed), E7 (closed), E8 (closed), and E34.

Conservation areas that are being developed primarily as disconnected backwaters for native fish prioritize: (1) delivery of non-native fish-free replacement water and (2) the ability to completely drain and renovate the ponds without the use of piscicides. There is also value in connected backwaters, and creation of connected backwaters is an option in Reaches 3–5. Backwaters created in Reach 3 will continue to be connected to the main stem river to address the life history requirements of the flannelmouth sucker. Restoration research priorities for backwater development 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.

Developing, maintaining, and managing the appropriate habitats as dictated by the conservation measures presents several challenges. Present flow regimes of the LCR have been altered considerably from dynamic pre-development flows. Introduced and invasive species exist throughout the LCR MSCP 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, five components of habitat creation have been developed: (1) site identification, (2) site selection, (3) development, (4) maintenance, and (5) adaptive management of conservation areas. The following sections describe the distinctions among the components of habitat creation and how they are interconnected within the context of an adaptive management approach.

Site Identification and 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. Although this objective appears obvious, it is obscured by a number of variables that can affect both cost-effective development and habitat success: (1) logistical – site accessibility, available infrastructure, and availability of sufficient resources (water); (2) physical – depth to groundwater, soil texture and chemistry, water quality, and eutrophic stage; and (3) administrative – 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 LCR MSCP proceeds, this newly acquired knowledge will be incorporated into the site selection processes. Appropriate adaptations are being made through the AMP to properly address and apply newly acquired information, allowing for a more accurate assessment of development costs and success potential for future habitat creation projects.

FY15 Accomplishments

Coordination with resource agencies and attendance at planning meetings were expanded with the need to identify additional lands for the LCR MSCP. A workshop with representatives of the California parties was held to evaluate the status of establishing new conservation areas within the State of California.

PVER-South: Two adjacent landowners expressed an interest in selling small, undeveloped parcels that would expand the footprint of PVER-South. A Federal appraisal was conducted for each property. For the first property, an agreement on the fair market value could not be reached, and negotiations have ended. The second property was sold to another party. No more actions or land and water resolutions are anticipated.

Parker Dam Camp: A summary report titled *30% Design Report MSCP Native Fish Ponds Project* was completed. The camp was proposed as a conservation area consisting primarily of honey mesquite, with the caveat that ponds and a riparian component may be added at a future date. Parker Dam Camp is identified as Work Task E36 in FY16.

Three Fingers Lake: A light detection and ranging (LiDAR) survey, which provides topographic information, was completed; however, the data are not expected until the start of FY16.

Davis Lake: LiDAR information (topography) was collected and will be used to calculate earth-moving quantities to generate a restoration concept, if feasible, which would define the restoration effort.

Mohave Valley Conservation Area (*MVCA*)*:* This conservation area was evaluated under Work Task E16 and is now being implemented as Work Task E35. It became the 12th established conservation area and, when complete, should provide 50 acres of backwater within the State of California.

Virgin River: The Virgin River lands owned by the Nevada Division of Wildlife on the Overton Wildlife Management Area have been identified for potential restoration. For safety reasons, the data loggers installed in FY13 are no longer monitored. Data collection may resume at a later date, but no data were collected during FY15.

Figure 1-1 depicts the geographical distribution of 12 established conservation areas as well as 1 potential conservation area (Planet Ranch). Figures 1-2 through 1-14 depict each conservation area. Acreage proposed for development, but not yet restored, is shown in yellow. Acreage already restored or stabilized is considered managed and is shown in green. Lands managed by the LCR MSCP partners are shown in brown.

FY16 Activities

Conservation Areas

Although coordination with resource agencies and attendance at planning meetings is expected to be similar to that in FY15, obligations will be significantly less. The reduced budget is a direct result of the lack of backwater areas to be evaluated in FY16 that require exploratory drilling.

The following potential conservation areas, primarily in California, are being evaluated, and the findings will be brought back to the Steering Committee.

PVER-South: Negotiations for undeveloped lands adjacent to PVER-South have ended. A Restoration, Development, and Monitoring Plan will be drafted and discussed with the landowner (CDFW). The plan, along with the drafting of an amendment to the existing Land Use Agreement, is anticipated.

Parker Dam Camp: A Restoration, Development, and Monitoring Plan will be drafted.

Three Fingers Lake: This lake was identified during a workshop with representatives of the California parties. It has the potential to provide both backwater and marsh land cover types for the LCR MSCP. The lake is located on the CNWR within the State of California on lands owned by the USFWS. A LiDAR survey, which provides topographic information, will allow the development of multiple options for creation of a conservation area. It is anticipated that a Restoration, Development, and Monitoring Plan will be drafted late in FY16.

Davis Lake: This lake was also identified during a workshop with representatives of the California parties. The concept being evaluated includes creation of a shallow marsh similar in size to Hart Mine Marsh. The remnant lake is located on the CNWR within the State of California on lands owned by the USFWS. LiDAR information (topography) was collected and will be used to calculated earth-moving quantities to generate a restoration concept, if feasible, which would define the restoration effort.

Backwaters and Marsh within Reach 4: Reach 4 has the highest potential for establishment of marsh and backwater in California based on the needs of the LCR MSCP. Increased efforts to identify these areas on lands withdrawn by Reclamation, typically between the bank line and levee, are ongoing.

Topock Marsh Inlet Canal: An opportunity may exist to create a connected backwater in Reach 3 using the former Topock Marsh Inlet Canal. However, prior to any technical investigations, land ownership needs to be verified. An action with the Bureau of Land Management to conduct the survey has been initiated.

FY17 Activities

Coordination with resource agencies will continue. The proposed budget reflects the reduction of sites to be evaluated and the difficulty in identifying areas to meet the specific land cover type requirements under the LCR MSCP. The following potential sites are likely to be evaluated:

PVER-South: The Restoration, Development, and Monitoring Plan will guide restoration activities. Obligations and expenditures will be tracked under Work Task E37.

Parker Dam Camp: Obligations and expenditures will be tracked under Work Task E36.

Three Fingers Lake: A decision for inclusion as a conservation area or to discontinue investigations is expected in late FY16 but may carry over into FY17. Inclusion into the LCR MSCP as a conservation area would require opening a new Section E work task.

Davis Lake: Based on the incorporation of LiDAR data and the generation of a restoration concept, Davis Lake will either be recommended for inclusion as a marsh complex into the LCR MSCP, or investigations will be closed.

Topock Marsh Inlet Canal: Pending the results of a cadastral survey, a restoration concept and preliminary cost estimate would be prepared.

Backwaters and Marsh within Reach 4: Reach 4 has the highest potential for establishment of marsh and backwater in California based on the needs of the LCR MSCP. Preliminary cost estimates for restoration on sites identified in FY16 are anticipated.

Development and Maintenance

Habitat development and maintenance are strongly connected. Created habitat is achieved through the process of development, establishment, and modification of the site as well as 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 toward 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, achieving the desired habitat under the LCR MSCP calls for establishing and managing for a snapshot in time and ecological succession, which may require actively creating disturbances 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 surface to reduce biological oxygen demand and maintaining acceptable levels of water quality. In any case, habitat creation does not necessarily end with the establishment of the proper vegetation type or isolation of a backwater.

Over the course of identifying and selecting sites, conducting research studies and demonstration projects, and developing and managing created land cover types, information is gathered that may help to better understand these processes. This feedback, in turn, may serve to modify site selection or establishment approaches for future projects. The information can also reveal program needs not previously anticipated. For example, during collections for Work Task E7 (closed), 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 the time and costs associated with collection. These nurseries were incorporated into the phased development plans for Work Tasks E4 and E5.

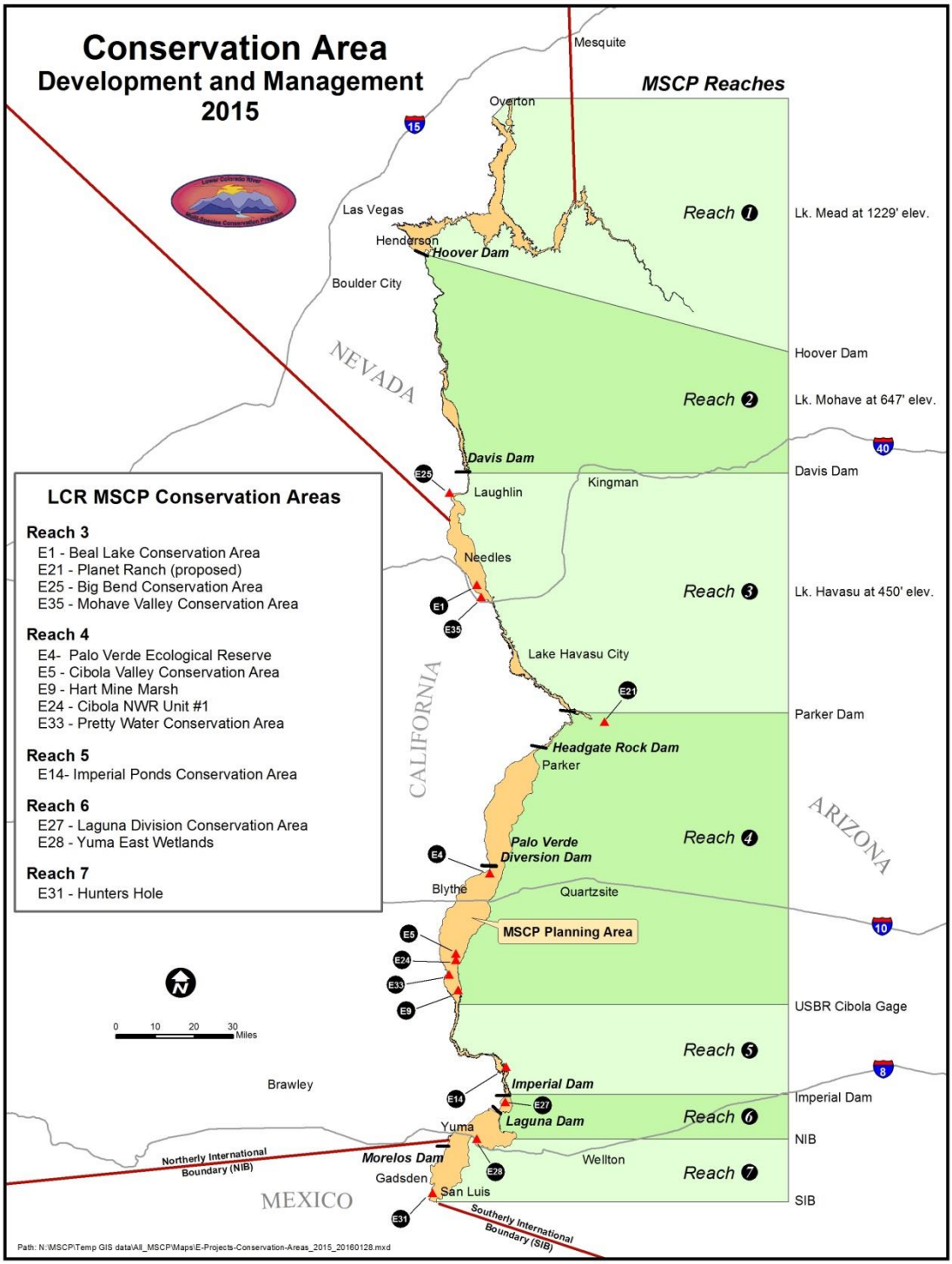
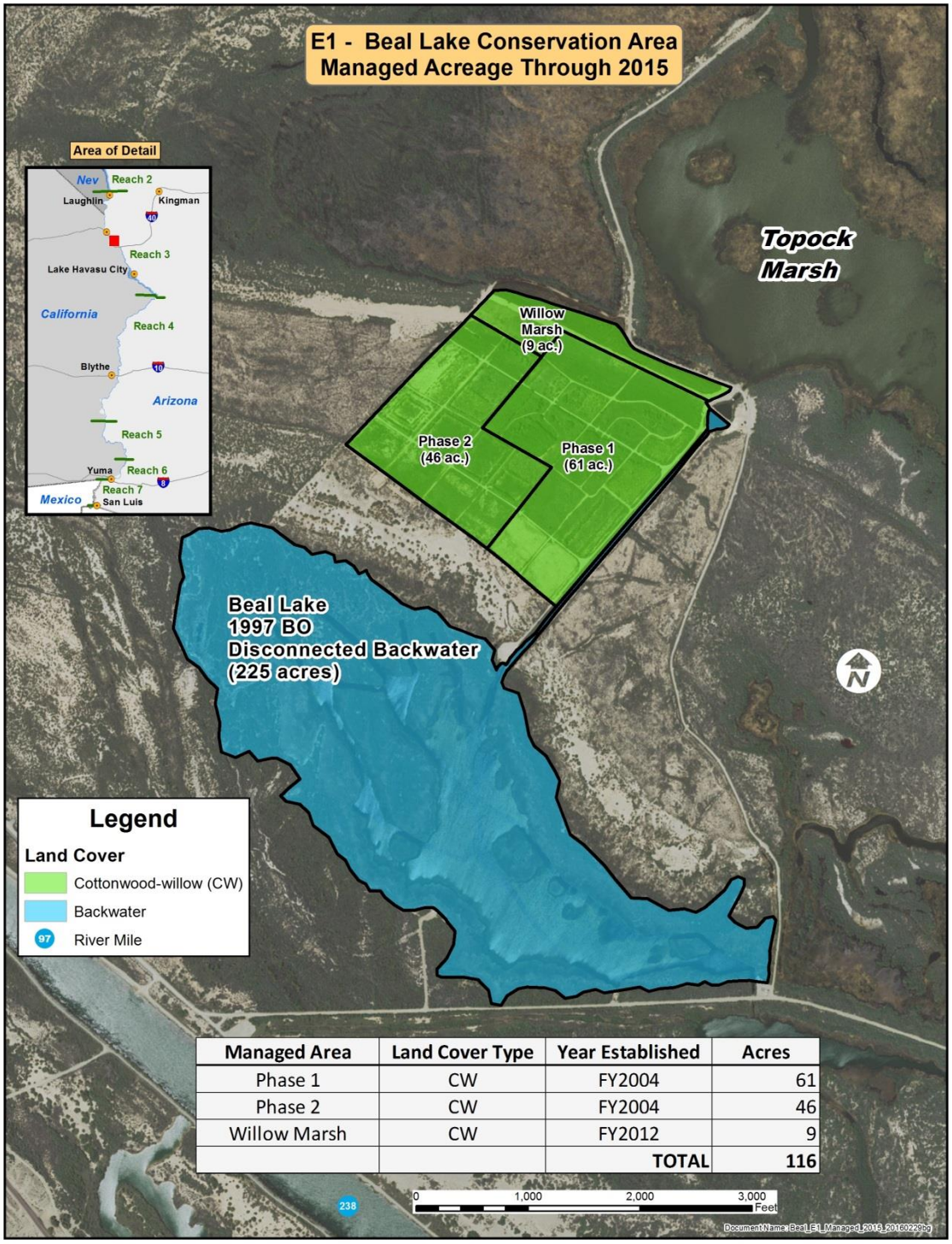
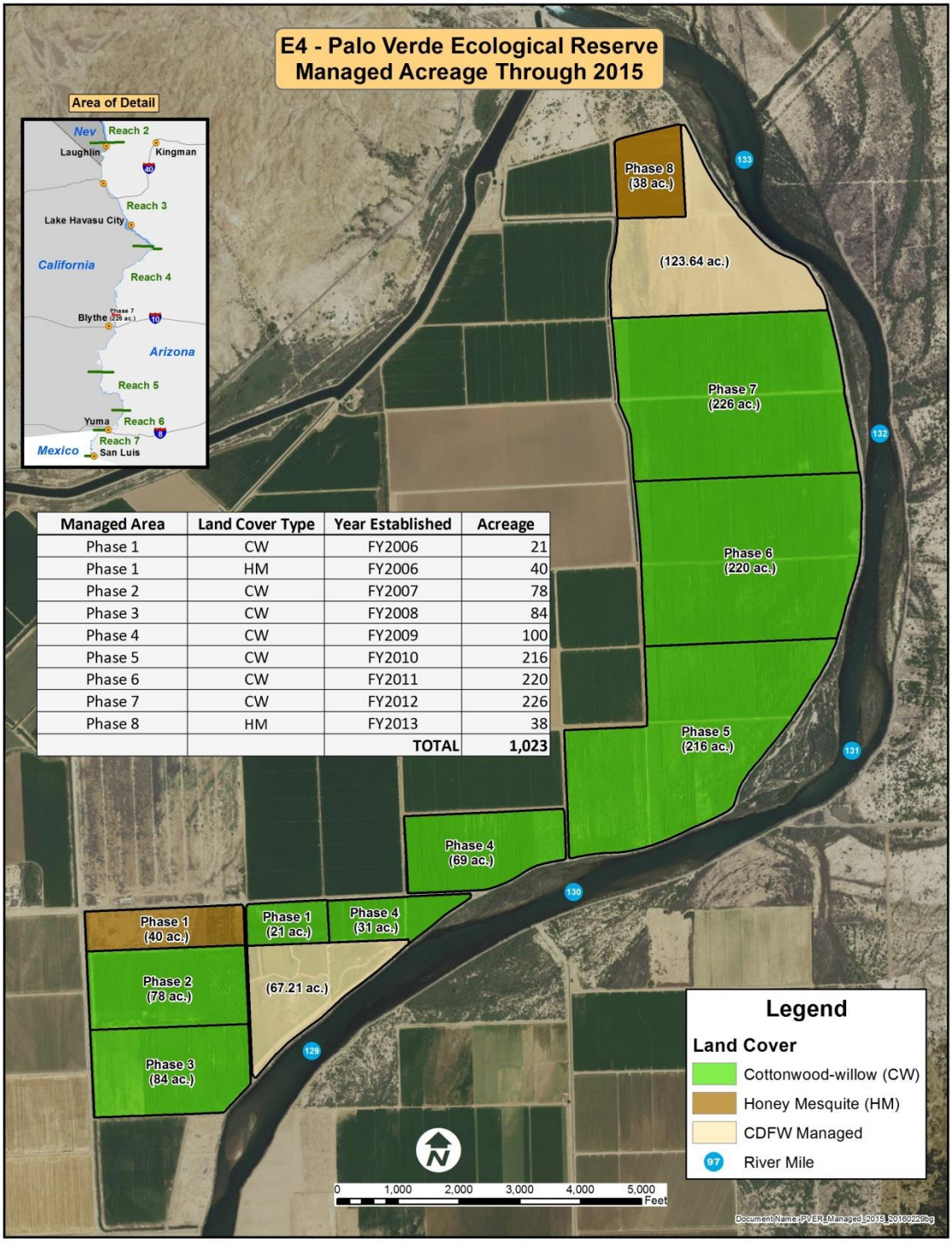


Figure 1-1.—Conservation area development and management, 2015.



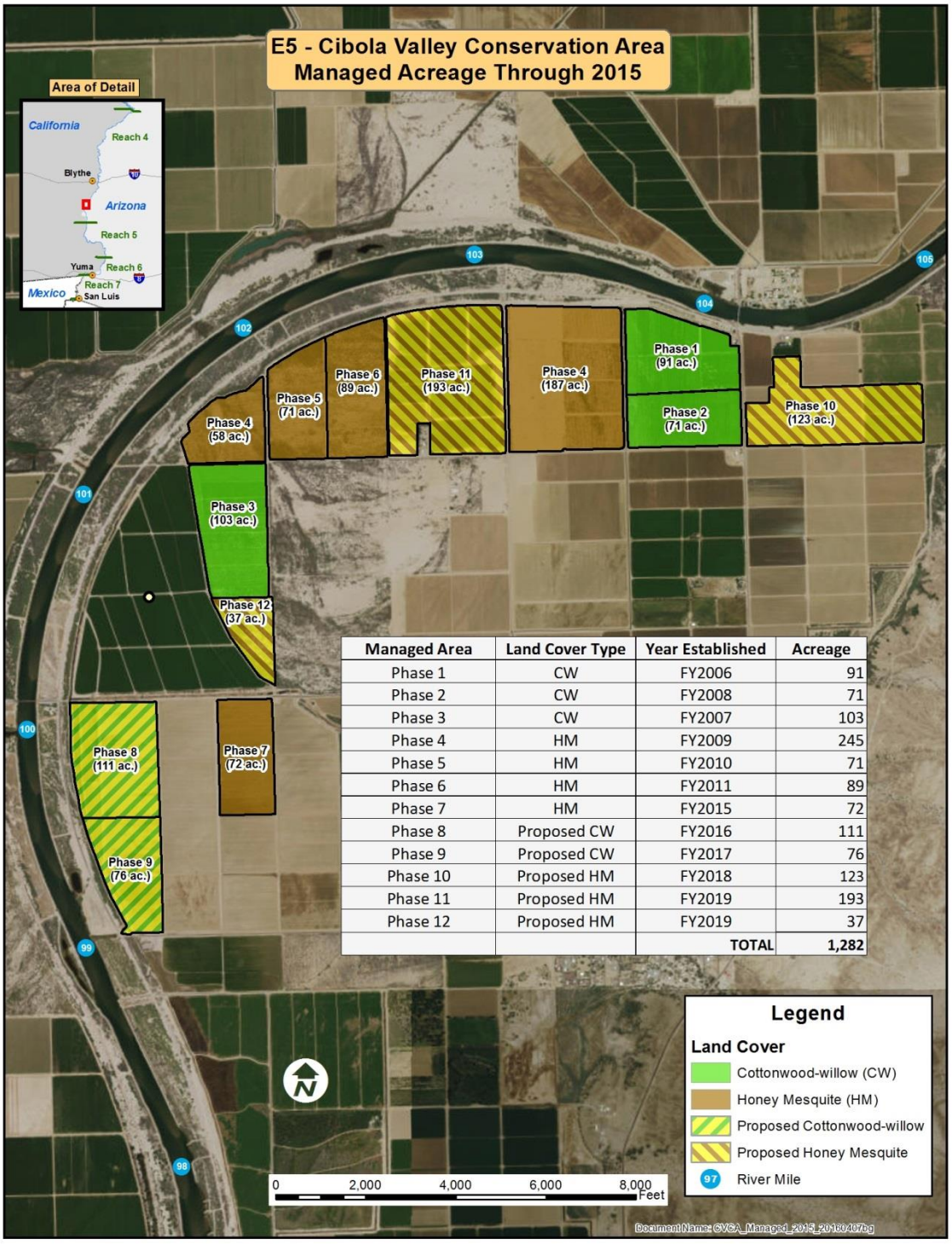
Managed Area	Land Cover Type	Year Established	Acres
Phase 1	CW	FY2004	61
Phase 2	CW	FY2004	46
Willow Marsh	CW	FY2012	9
		TOTAL	116

Figure 1-2.—E1 – Beal Lake Conservation Area managed acreage through 2015.



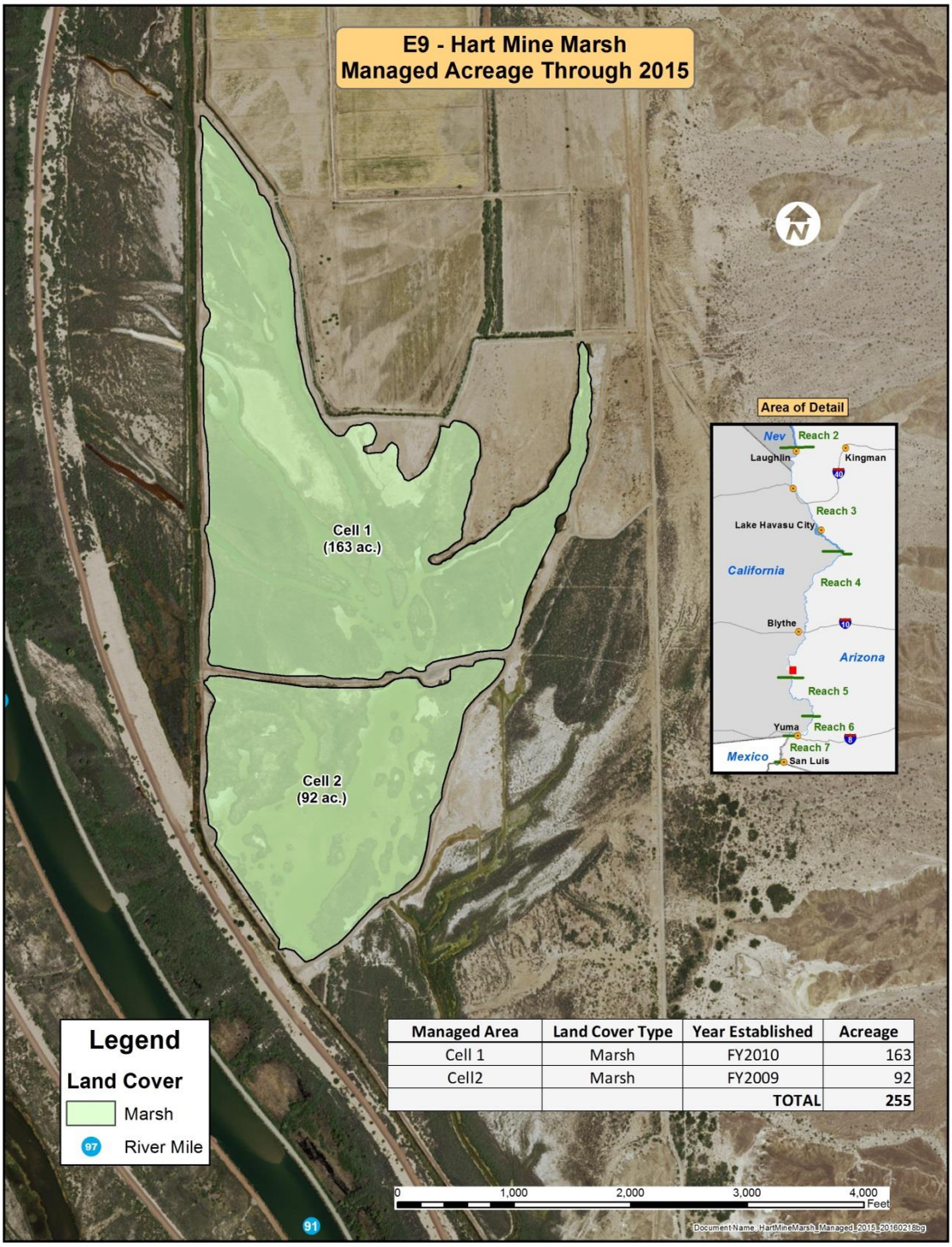
Managed Area	Land Cover Type	Year Established	Acreage
Phase 1	CW	FY2006	21
Phase 1	HM	FY2006	40
Phase 2	CW	FY2007	78
Phase 3	CW	FY2008	84
Phase 4	CW	FY2009	100
Phase 5	CW	FY2010	216
Phase 6	CW	FY2011	220
Phase 7	CW	FY2012	226
Phase 8	HM	FY2013	38
		TOTAL	1,023

Figure 1-3.—E4 – Palo Verde Ecological Reserve managed acreage through 2015.



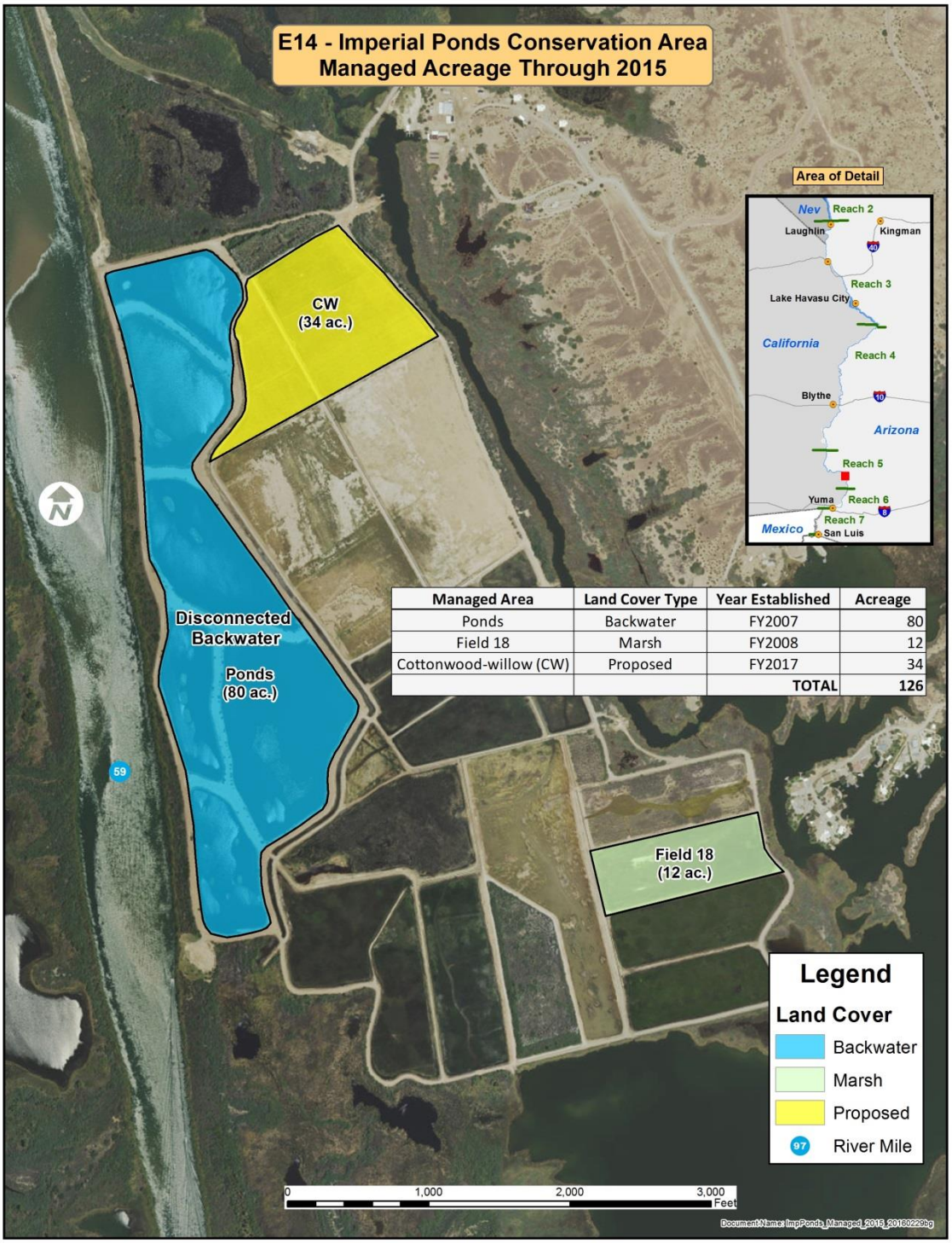
Managed Area	Land Cover Type	Year Established	Acreage
Phase 1	CW	FY2006	91
Phase 2	CW	FY2008	71
Phase 3	CW	FY2007	103
Phase 4	HM	FY2009	245
Phase 5	HM	FY2010	71
Phase 6	HM	FY2011	89
Phase 7	HM	FY2015	72
Phase 8	Proposed CW	FY2016	111
Phase 9	Proposed CW	FY2017	76
Phase 10	Proposed HM	FY2018	123
Phase 11	Proposed HM	FY2019	193
Phase 12	Proposed HM	FY2019	37
		TOTAL	1,282

Figure 1-4.—E5 – Cibola Valley Conservation Area managed acreage through 2015.



Managed Area	Land Cover Type	Year Established	Acreage
Cell 1	Marsh	FY2010	163
Cell2	Marsh	FY2009	92
		TOTAL	255

Figure 1-5.—E9 – Hart Mine Marsh managed acreage through 2015.



Managed Area	Land Cover Type	Year Established	Acreage
Ponds	Backwater	FY2007	80
Field 18	Marsh	FY2008	12
Cottonwood-willow (CW)	Proposed	FY2017	34
		TOTAL	126

Figure 1-6.—E14 – Imperial Ponds Conservation Area managed acreage through 2015.

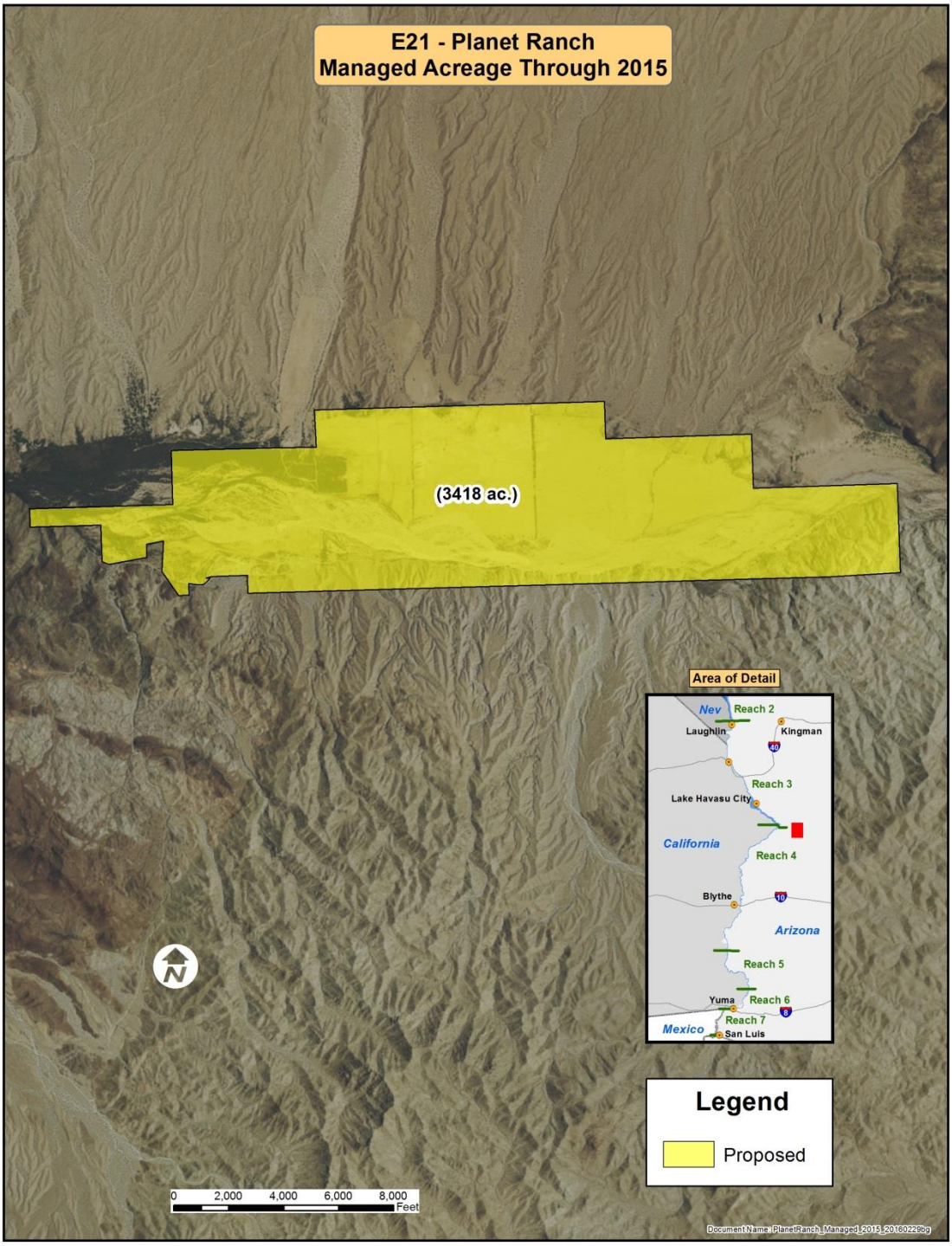
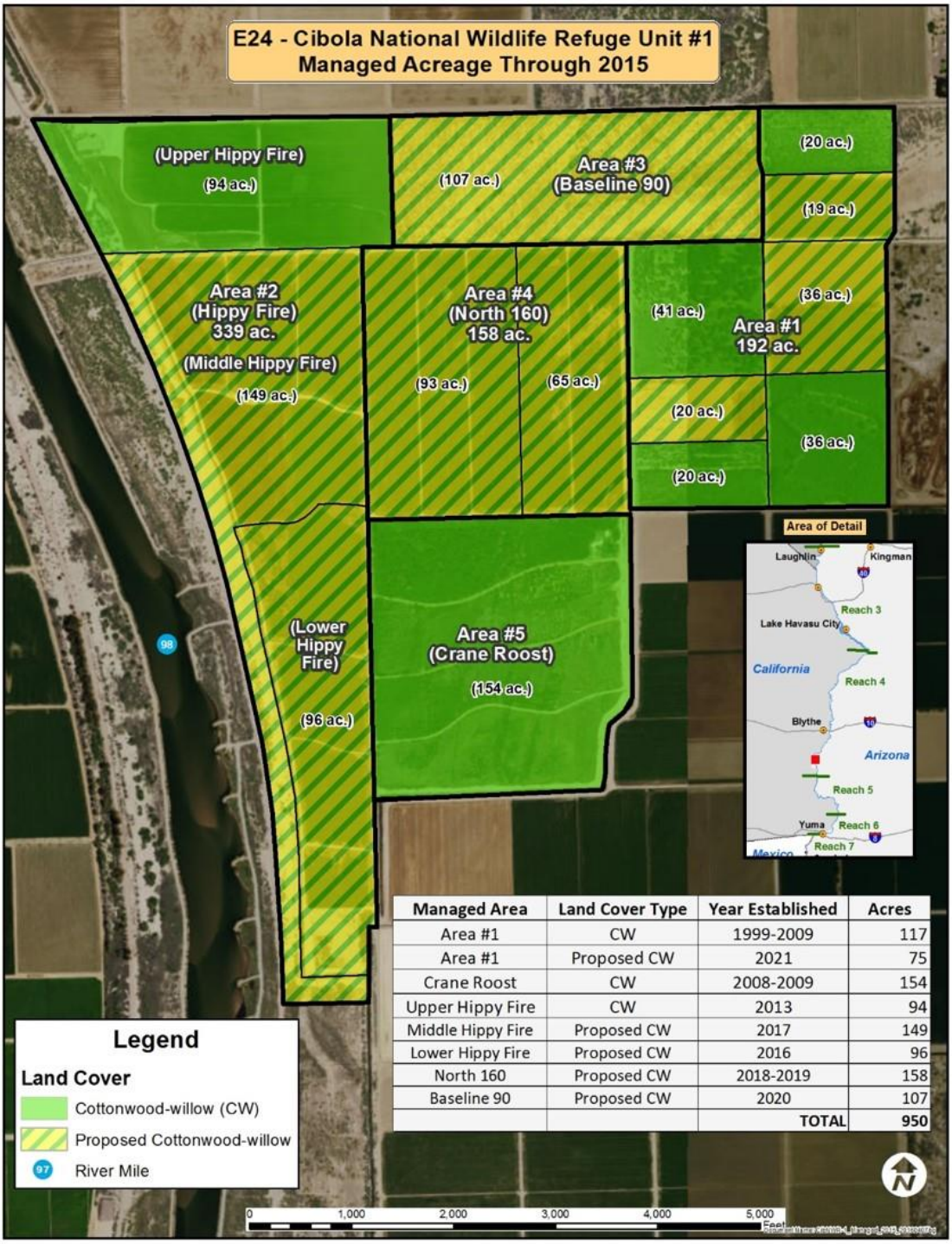


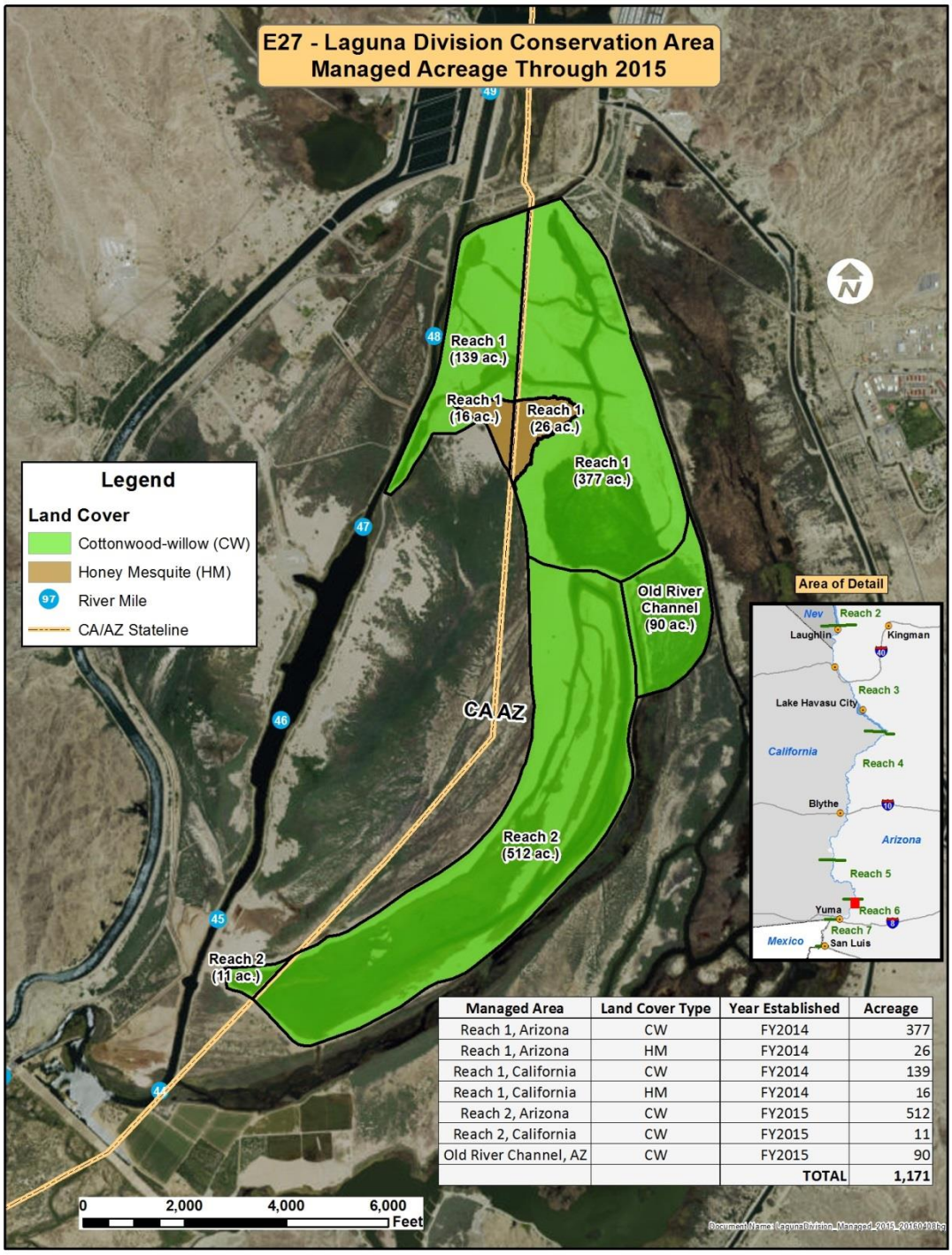
Figure 1-7.—E21 – Planet Ranch managed acreage through 2015.



Managed Area	Land Cover Type	Year Established	Acres
Area #1	CW	1999-2009	117
Area #1	Proposed CW	2021	75
Crane Roost	CW	2008-2009	154
Upper Hippy Fire	CW	2013	94
Middle Hippy Fire	Proposed CW	2017	149
Lower Hippy Fire	Proposed CW	2016	96
North 160	Proposed CW	2018-2019	158
Baseline 90	Proposed CW	2020	107
		TOTAL	950

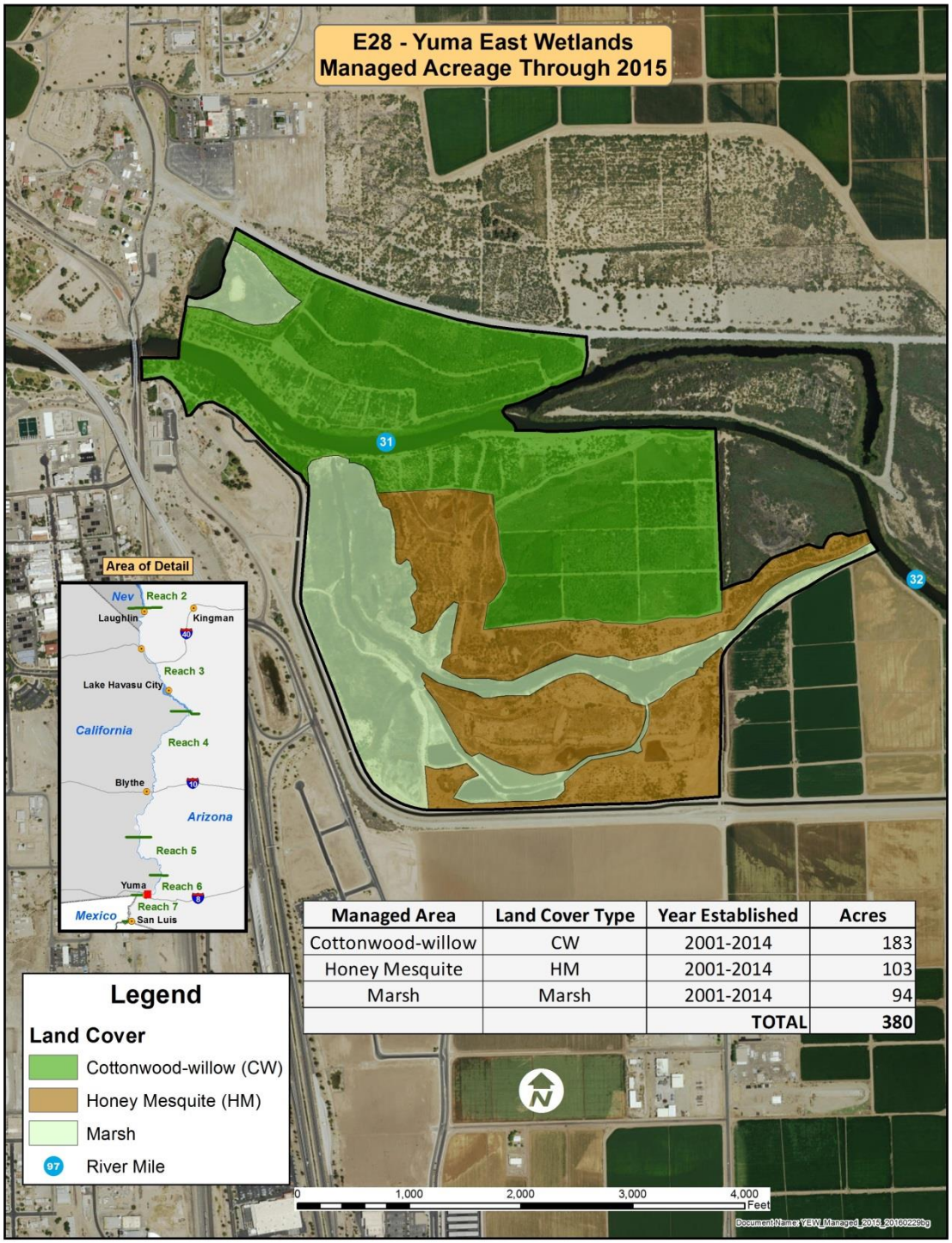
Figure 1-8.—E24 – Cibola National Wildlife Refuge Unit #1 Conservation Area managed acreage through 2015.

Figure 1-9.—E25 – Big Bend Conservation Area managed acreage through 2015.



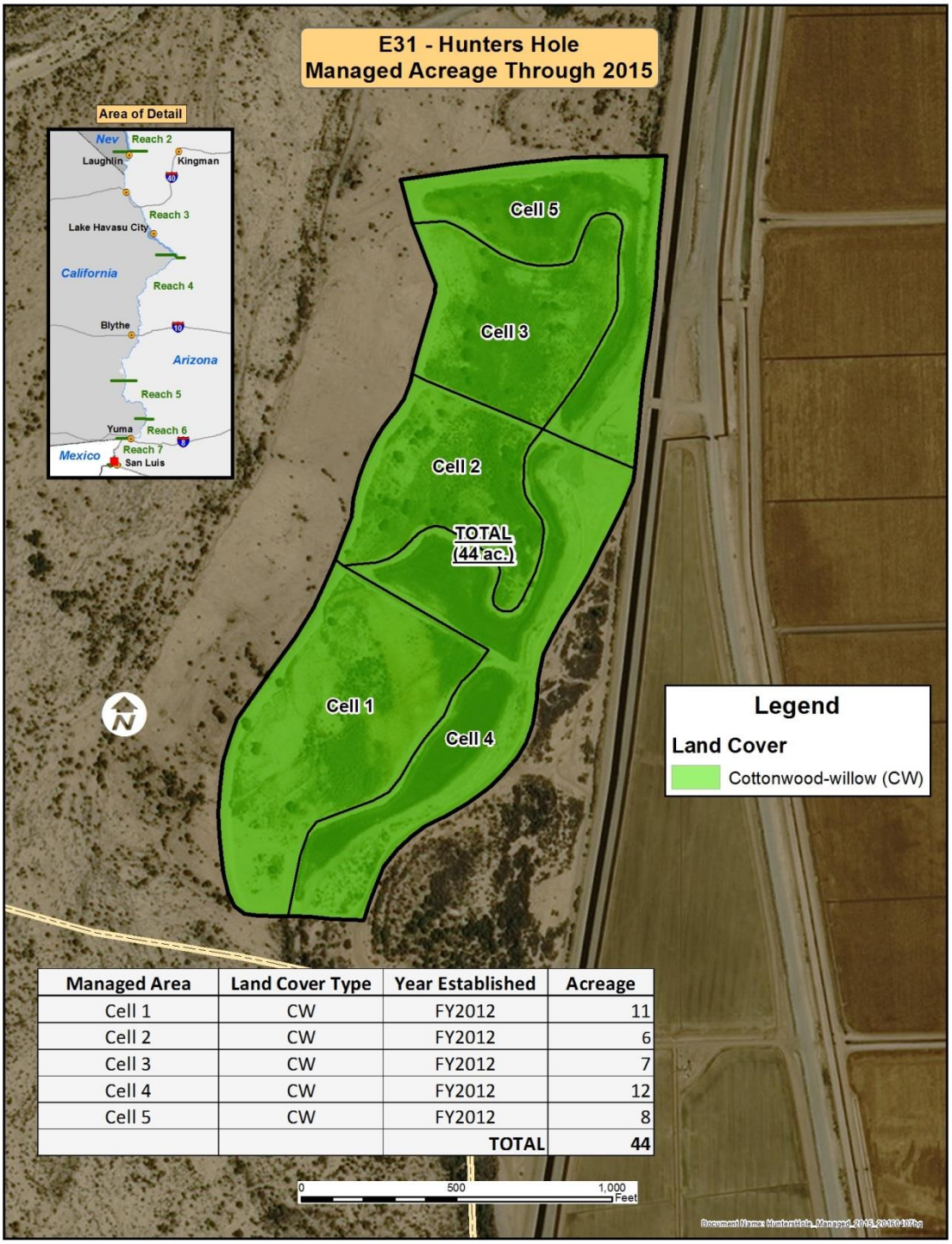
Managed Area	Land Cover Type	Year Established	Acreage
Reach 1, Arizona	CW	FY2014	377
Reach 1, Arizona	HM	FY2014	26
Reach 1, California	CW	FY2014	139
Reach 1, California	HM	FY2014	16
Reach 2, Arizona	CW	FY2015	512
Reach 2, California	CW	FY2015	11
Old River Channel, AZ	CW	FY2015	90
		TOTAL	1,171

Figure 1-10.—E27 – Laguna Division Conservation Area managed acreage through 2015.



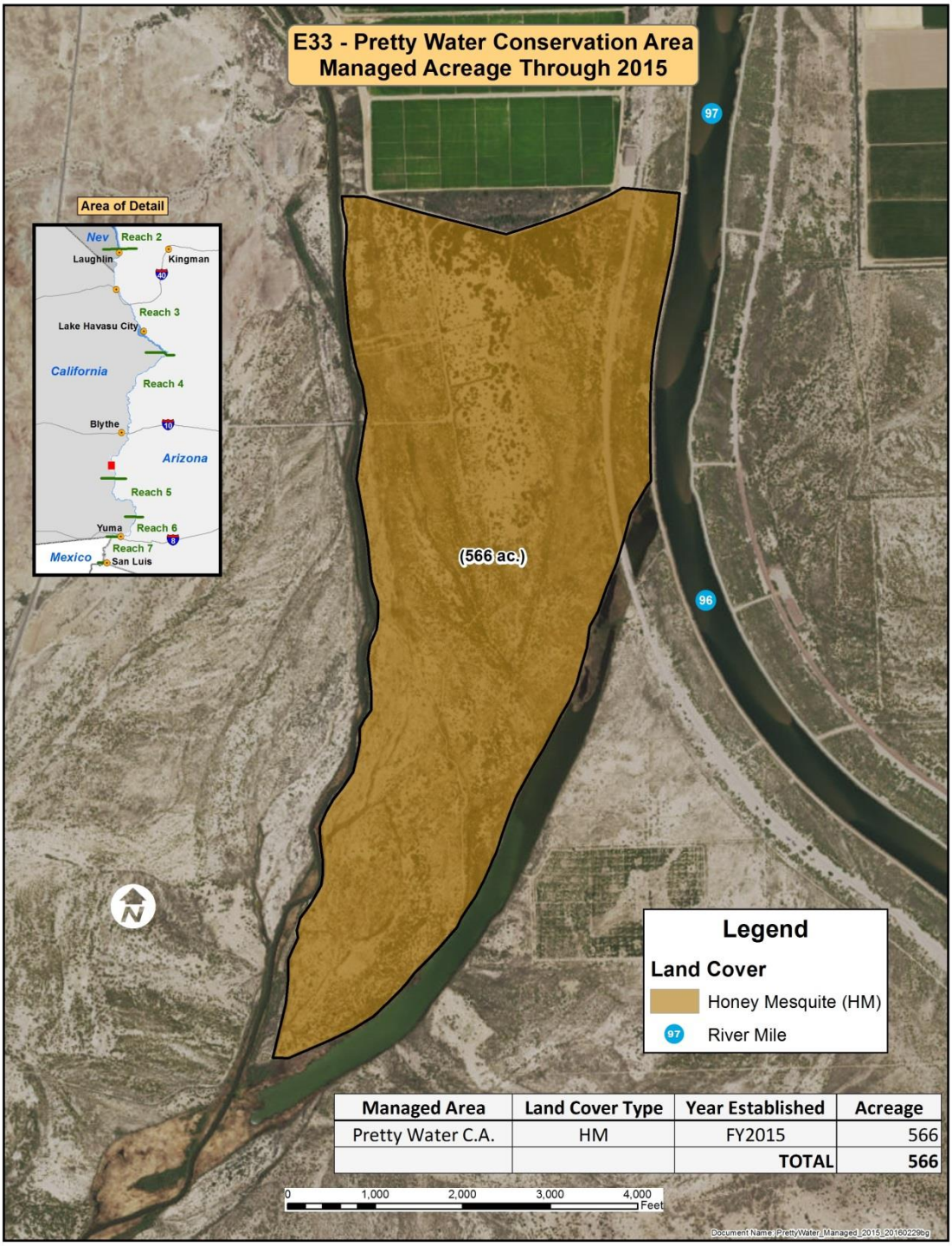
Managed Area	Land Cover Type	Year Established	Acres
Cottonwood-willow	CW	2001-2014	183
Honey Mesquite	HM	2001-2014	103
Marsh	Marsh	2001-2014	94
		TOTAL	380

Figure 1-11.—E28 – Yuma East Wetlands managed acreage through 2015.



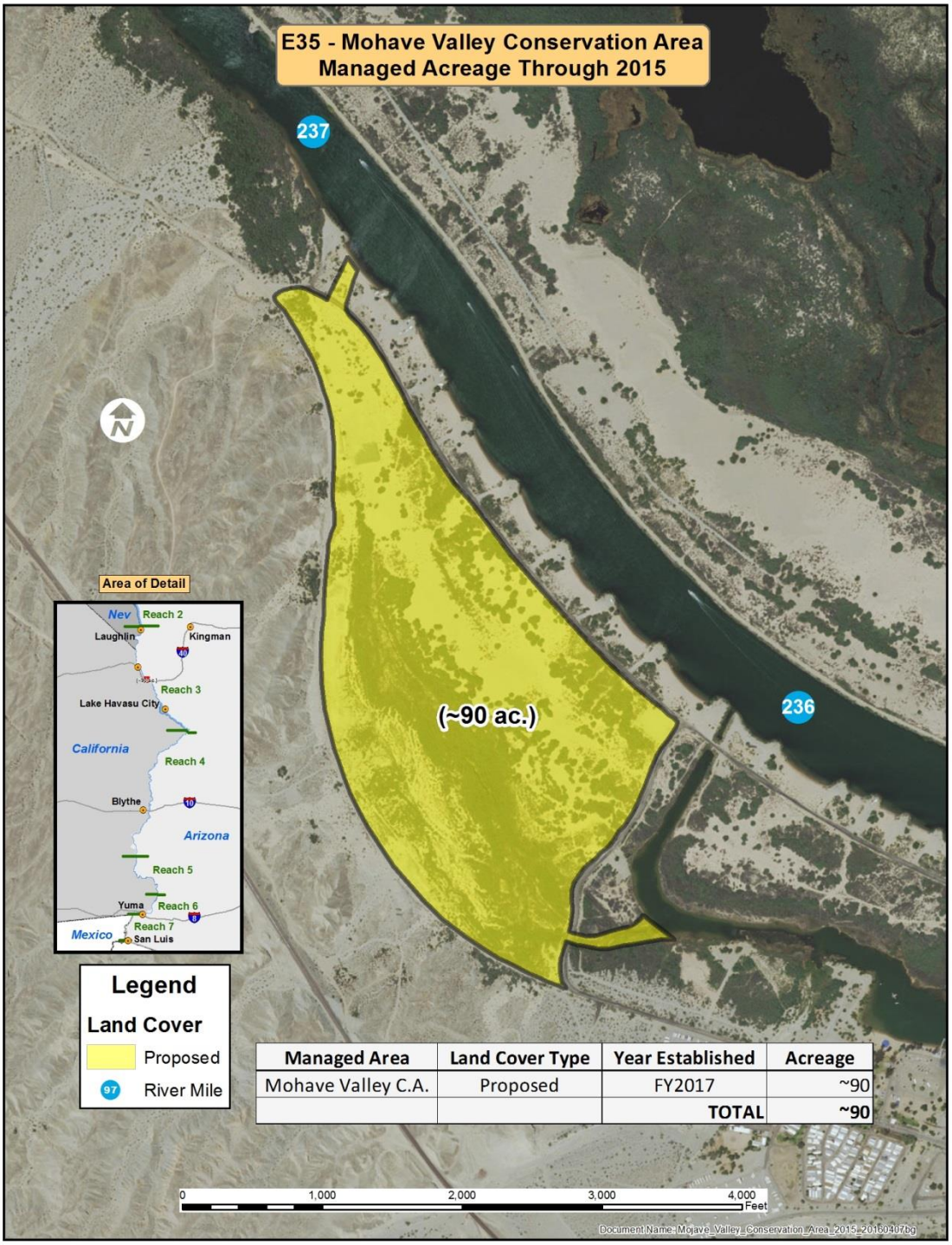
Managed Area	Land Cover Type	Year Established	Acreage
Cell 1	CW	FY2012	11
Cell 2	CW	FY2012	6
Cell 3	CW	FY2012	7
Cell 4	CW	FY2012	12
Cell 5	CW	FY2012	8
		TOTAL	44

Figure 1-12.—E31 – Hunters Hole managed acreage through 2015.



Managed Area	Land Cover Type	Year Established	Acreage
Pretty Water C.A.	HM	FY2015	566
		TOTAL	566

Figure 1-13.—E33 – Pretty Water Conservation Area managed acreage through 2015.



Managed Area	Land Cover Type	Year Established	Acreage
Mohave Valley C.A.	Proposed	FY2017	~90
		TOTAL	~90

Figure 1-14.—E35 – Mohave Valley Conservation Area managed acreage through 2015.

Each site, whether identified as marsh, backwater, honey mesquite, or cottonwood-willow cover type, will have its own set of site-specific challenges to overcome.

The HCP includes tentative schedules for development of all four land cover types, with a final end date for habitat creation of 2036. However, the funding described in the HCP reflects an end date of 2026 for habitat creation, assuming efficient habitat creation techniques are identified during the first few years of implementation. To balance available resources and ensure progress is being made to complete the habitat requirements under the LCR MSCP, habitat creation is expected to be complete in 2026 in conformance with the funding schedule. Since funding estimates are based on 5-year periods, habitat creation includes both long-term planning and a selection of projects to implement within the next 5 years, which allows time for planning, site evaluation, coordination with partners, design, permitting, and sequencing into the program.

Five-Year Projection: For 2015–20, restoration has occurred or is expected to occur at: (1) the LDCA, (2) the PWCA, (3) Cibola NWR Unit #1, (4) the CVCA, (5) the MVCA, (6) PVER-South, (7) Parker Dam Camp, and (8) Three Fingers Lake. However, the LCR MSCP is flexible enough to take advantage of other restoration opportunities and utilizes the work plan (annual report) to refine short-term restoration projections.

FY15 Accomplishments

The focus of development in FY15 was completion of planting at the LDCA, establishment of honey mesquite at the PWCA, and planting of Phase 7 at the CVCA.

Laguna Division Conservation Area

Acreage was established in both Arizona and California. In Arizona, 979 acres of cottonwood-willow and 26 acres of honey mesquite were established for a total of 1,005 acres. In California, 150 acres of cottonwood-willow and 16 acres of honey mesquite were established for a total of 166 acres. The total of land cover types created in both States on this conservation area is 1,171 acres.

Pretty Water Conservation Area

A total of 566 acres of honey mesquite were established on this conservation area in the State of California.

Cibola Valley Conservation Area

Phase 7 was planted and established 72 acres of honey mesquite. Of the available 1,282 acres, 265 acres of cottonwood-willow and 477 acres of honey mesquite have been established. Annual plantings are projected, with complete development projected of the CVCA in 2019.

The total number of acres being managed by land cover type and by reach and State on established conservation areas is shown in tables 1-13 and 1-14. The LCR MSCP, through FY15, has 5,928 acres (table 1-13) of land available for the program, of which 5,536 acres are being actively managed. Not all acreage can or will be converted into either of the four land cover types due to resource limitations or the habitat creation needs of the program.

Table 1-13.—Managed Acres by Conservation Area Through FY15

Conservation Area	Established Land Cover Types	Managed Acreage	Available Lands
Beal Lake Conservation Area (Arizona)	116	116	116
Palo Verde Ecological Reserve (California)	1,023	1,023	1,023
Cibola Valley Conservation Area (Arizona)	742	890	1,282
Hart Mine Marsh (Arizona)	255	255	255
Imperial Ponds Conservation Area (Arizona)	92	126[1]	126
Big Bend Conservation Area (Nevada)	15	15	15
Cibola National Wildlife Refuge Unit #1 Conservation Area (Arizona)	365	950	950
Laguna Division Conservation Area (Arizona and California	1,171	1,171	1,171
Yuma East Wetlands (Arizona)	380	380	380
Hunters Hole (Arizona)	44	44	44
Pretty Water Conservation Area (California)	566	566	566
Total	**4,769**	**5,536**	**5,928**

[1] Managed acres include established land cover types plus 34 acres of cover crop, which will ultimately be converted to cottonwood-willow.

Of the 5,536 acres being actively managed under the LCR MSCP, the four land cover types have been established on approximately 4,769 acres. Acreages at conservation areas still in the planning phase, or for which there were no signed Land Use Agreements in FY15, such as Planet Ranch or the MVCA, are not included in the tables 1-13 and 1-14 at this time. The MVCA acreage of approximately 90 acres will be included when construction is complete.

Table 1-14.—Land Cover Type by Reach and State Through FY15

	Cottonwood-Willow	Honey Mesquite	Marsh	Backwaters	TOTAL
Arizona					
Reaches 1 and 2	0	0	0	0	0
Reach 3	107	0	9	0	116
Reach 4	630	477	255	0	1,341
Reach 5	0	0	12	80	92
Reach 6	1,162	157	66	0	1,385
Reach 7	44	0	0	0	44
Total	**1,943**	**634**	**342**	**80**	**2,999**
California					
Reaches 1 and 2	0	0	0	0	0
Reach 3	0	0	0	0	0
Reach 4	945	644	0	0	1,589
Reach 5	0	0	0	0	0
Reach 6	150	16	0	0	166
Reach 7	N/A	N/A	N/A	N/A	N/A
Total	**1,095**	**660**	**0**	**0**	**1,755**
Nevada					
Reaches 1 and 2	0	0	0	0	0
Reach 3	0	0	0	15	15
Reaches 4–7	N/A	N/A	N/A	N/A	N/A
Total	**0**	**0**	**0**	**15**	**15**
TOTAL	**3,038**	**1,294**	**342**	**95**	**4,769**

FY16 Activities

Planting at the CVCA and Cibola NWR Unit #1 and the start of construction at the MVCA are planned. With the successful close of escrow of Planet Ranch, securing water rights and providing a permanent onsite presence to protect our investment is the first priority. Planning for stabilization and development of Planet Ranch will also begin.

Cibola Valley Conservation Area

Planting of Phase 8, honey mesquite and upland, is expected to increase the established land cover types at this conservation area by another 111 acres. Annual plantings are projected, with complete development projected of the CVCA in 2019.

Cibola National Wildlife Refuge Unit #1 Conservation Area

Planting of portions of the lower Hippy Burn area with cottonwood-willow and honey mesquite is expected to increase the established land cover types at this conservation area by 96 acres. Annual plantings are projected, with complete development projected of Cibola NWR Unit #1 in 2021.

Mohave Valley Conservation Area

Clearing and the start of excavation of approximately 1,200,000 cubic yards of material are scheduled to begin late in 2016. Completion in 2017–18 is expected to result in the establishment of approximately 90 acres of all four land cover types, with a goal of 50 acres of backwater.

Planet Ranch

To ensure the viability of water rights associated with this property, over 1,200 acres of alfalfa are being grown as pasture from December 16, 2015, through December 15, 2016. Water meters, at each groundwater well, display rate of flow in addition to total usage. Water usage, when combined with acreage being farmed, documents the beneficial use of water on the property. Water usage and crop acreage are updated monthly. A farmer is providing irrigation, site maintenance, and an onsite presence. Significant vandalism has occurred on other ranches within the watershed when no onsite presence has been maintained.

Discussions with the USFWS to maintain an onsite presence are underway. Our intent is to have a permanent Federal onsite presence by the close of the fiscal year. Procurement of heavy equipment, supplies, and vehicles would begin.

Planning would include development of a Restoration, Development, and Monitoring Plan, which would inform development of the conservation area. It will be initiated and likely include a workshop focused on isolated backwater

construction and management. The backwaters to be created would be a mix of smaller ponds, which would be helpful in raising fish while maintaining genetics of the refugia ponds, and raising native fish in the larger refugia ponds, which would require less management.

FY17 Proposed Activities

Planting of cottonwood-willow and honey mesquite will continue at the CVCA and Cibola NWR Unit #1 along with construction at the MVCA. Development of Planet Ranch will also continue.

Cibola Valley Conservation Area

Planting of Phase 9 with cottonwood-willow is expected to increase the established land cover types at this conservation area by 76 acres. Annual plantings are projected, with complete development projected of the CVCA in 2019.

Cibola National Wildlife Refuge Unit #1 Conservation Area

Planting of cottonwood-willow is expected increase the established land cover types at this conservation area by 149 acres. Annual plantings are scheduled for FY17, with complete development projected for 2021.

Mohave Valley Conservation Area

Mobilization, clearing the site of vegetation, and initial contouring of this conservation area to create a backwater for native fish within California is scheduled for FY17.

Planet Ranch

Water usage will continue to be tracked to secure the water rights. A farmer would provide irrigation, site maintenance, and an onsite presence. A permanent Federal presence is expected to be onsite in FY17.

Permitting and refinement of the Restoration, Development, and Monitoring Plan, including design work on specific areas of development, would be initiated. Minor construction or upgrading of facilities, such as the maintenance shop, to support development and long-term management are anticipated.

Reclamation participation on the Bill Williams River Corridor Steering Committee would continue. Converting lands from private ownership to a resource agency provides additional flexibility in the release of water from Alamo Dam. Lands secured within the active flood plain, as well as lands downstream on the Federal refuge, benefit from releases from both normal as well as high flow

releases from the dam and can be conducted without affecting these former privately owned lands. However, during the period of time when water rights are being trued December 2016 – December 2017, it was requested that high flow events be held to a minimum. The intent of high flows are understood and supported, and LCR MSCP staff have been coordinating with both the USFWS and the U.S. Army Corps of Engineers on potential high flow events.

Adaptive Management Program (Section G)

Restoration research and demonstration projects help supply new information to adaptively manage habitat creation projects to make them more effective in meeting species-specific habitat requirements and managing costs to meet those requirements. In general, adaptive management research projects are those that have specific research questions and are supported by a robust, replicated study design in which 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, habitat manipulation, determining habitat creation potential at identified sites based on current ecological functions, and evaluating technologies to assist in meeting specific habitat requirements.

Work tasks can address specific research questions or use demonstration projects to assess a particular technique to determine whether the technique might be feasible and effective. Demonstration projects are designed to evaluate techniques, effectiveness, and cost efficiency. These projects may have vegetation that matures into a land cover type that meets the specific 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 managers and guide future selection and implementation of habitat creation projects.

FY15 Accomplishments

Soil and Groundwater Salinity Monitoring Network

The monitoring locations established under Work Task E34 have been established for research and demonstration purposes. Once the research and demonstration phase has been completed (FY16), the future maintenance and expansion of the monitoring network will be covered under Work Task F1. Existing and future monitoring locations will be operated and maintained throughout the life of the LCR MSCP to ensure that data are available to make management decisions for the long term. In addition to providing data for the successful management of vegetation, this work task has also provided data for Work Tasks C60 and F1.

The collection of data under Work Task E34 for Work Tasks C60 and F1 reduces the duplication of data collection efforts and provides necessary data for these other work tasks to fulfill their objectives.

A preliminary soil moisture monitoring effort was initiated in FY15 as the first step in establishing the larger salinity and soil moisture network. The purpose of this effort was twofold. First was to collect data to determine the temporal and spatial distribution of surface soil moisture at a non-LCR MSCP southwestern willow flycatcher-occupied site (Rockhouse Riparian Demonstration Project near Roosevelt Lake, Arizona) and at an established LCR MSCP conservation area that has not had a resident southwestern willow flycatcher. The other purpose of the effort was to provide background information for expanding the soil moisture network across all LCR MSCP conservation areas. Specific objectives included: (1) establish the necessary standards and protocols, (2) identify equipment and instrument needs for expanding the network, (3) identify the level of effort needed for expanding the network, and (4) identify potential issues that may arise while expanding the network.

These data will be used to make habitat management decisions. Based on the results of this preliminary effort, it was concluded that additional data would assist in further identifying the range of soil moisture and site conditions at other southwestern willow flycatcher-occupied sites. In FY16, two new southwestern willow flycatcher-occupied (non-LCR MSCP) sites will be monitored in addition to the two sites monitored during FY15.

Habitat Manipulation

Several covered avian species require habitat with early- to mid-successional stages of native riparian trees. In natural systems where periodic flooding is a component of the system, portions of the habitat can be periodically disturbed and reset to earlier successional stages and associated structural diversity. The LCR MSCP riparian conservation areas are planted densely in order to reduce invasive species competition with native species and to provide habitat for covered avian species. Over time, some of the LCR MSCP riparian habitat creation sites may grow out of suitable habitat for some covered species unless management actions are taken.

Without the disturbance events that were once more common in the historic river hydrograph, direct manipulation of portions of these conservation areas may be required. Information collected will be used to perform assessments and provide protocols to inform deliberate habitat manipulations to enhance structural diversity and to produce the appropriate serial stages of habitat for covered species.

Information from the CEMs and foliage height diversity measurements were incorporated into the development of the pilot vegetation monitoring protocol. The vegetation monitoring protocol was drafted and data collection was conducted in the field targeting foliage height using aerial LiDAR sensing and terrestrial LiDAR sensing. The data were collected in a non-LCR MSCP southwestern willow flycatcher-occupied site (Rockhouse Riparian Demonstration Project near Roosevelt Lake, Arizona) and at the PVER. Development began on the foliage height diversity indices tool using LiDAR remote sensing techniques to describe structural diversity at varying scales.

The LiDAR and soil moisture data were used to assess Conservation Measure WIFL1 accomplishment at the PVER. The analyses provided the necessary information to determine if acreage established at the PVER met the criteria described in this conservation measure. This is listed in table 1-9.

FY16 Activities

Soil and Groundwater Salinity Monitoring Network

Two additional sites on the Rio Grande River in New Mexico (non LCR-MSCP) will be instrumented as part of the effort initiated in FY15. The purpose of adding these two sites is to include southwestern willow flycatcher-occupied sites that have different vegetation or hydrologic characteristics and to increase the amount of available data. With a wider range of site characteristics and a larger dataset (both spatial and temporal), it is expected that the analysis will enable more informed management decisions. The two sites monitored during FY15 will be continued for a second season.

The protocols for the salinity and soil moisture monitoring network are expected to be finalized during FY16. The protocols will synthesize input from all the studies mentioned in previous activities from the lessons learned during the FY15 preliminary effort and will lay out a schedule for expanding the salinity and soil moisture network. The schedule will be based on priority, targeting the higher priority (high soil salinity, higher southwestern willow flycatcher potential) areas first. The schedule will also lay out what parameters will be collected at which conservation areas since this will be dictated by site conditions (i.e., salinity will not be monitored if there is low risk for soil salinization).

Habitat Manipulation

Vegetation monitoring will continue in FY16, with additional conservation areas being evaluated at varying structural scales to determine monitoring priority areas at each site. Vegetation structural diversity assessments will continue in different structure types to identify study sites with low structural diversity and/or those with later successional stages of growth. An assessment of aerial and terrestrial LiDAR sensing-based methods will continue, including the development of additional tools for assessing structural diversity.

FY17 Proposed Activities

Soil and Groundwater Salinity Monitoring Network

Several conservation areas will be instrumented as part of the salinity and soil moisture monitoring network under Work Task F1. Data collected are expected to track and support the long-term health and survival of established land cover types. Over the course of 5–7 years, the monitoring network will be expanded to address the needs of all conservation areas. However, given the site-specific nature of each site, the monitoring network will not be uniform; it will reflect the actual site conditions, and higher priority (high soil salinity and higher southwestern willow flycatcher potential) areas will be targeted first.

Habitat Manipulation

The pilot vegetation monitoring project will be completed, including assessing the effectiveness of the two methods (aerial and terrestrial LiDAR sensing) for measuring vegetation structure. Potential management tools will be identified for further evaluation. Further research will be conducted on the feasibility of implementing habitat management strategies when conditions within created habitat warrant their use.

Restoration research in future years may focus on: (1) the efficient use of Colorado River water, (2) ensuring moist soil conditions are maintained when necessary and practical, (3) planting and/or seeding techniques, and (4) the protection and long-term management of conservation areas for covered species.

WORK TASKS – SECTION A

Program Administration

Work Task A1: Program Administration

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$1,382,444	$1,140,477.22	$10,995,005.59	$1,411,966	$1,418,074	$1,418,074	$1,418,074

Contact: John Swett, (702) 293-8555, jswett@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: Under this work task, senior staff and administration receive support to manage implementation of the LCR MSCP. The Program Manager directs functions and activities associated with implementation of the Habitat Conservation Plan to ensure the completion of activities in accordance with the program documents.

Previous Activities: The LCR MSCP Office was established in the Bureau of Reclamation's Lower Colorado Region in 2005. The Steering Committee was established in accordance with the Funding and Management Agreement, and the bylaws for the Steering Committee were approved.

FY15 Accomplishments: Under Work Task A1 for FY15, management of the LCR MSCP continued. Ongoing administrative activities included financial, human resources, and support for the program. The Steering Committee met in October 2014 and April 2015. A technical work group meeting was held in March 2015 to review upcoming actions of the committee. The *Final Implementation Report, Fiscal Year 2016 Work Plan and Budget, Fiscal Year 2014 Accomplishment Report* was prepared. Financial tracking of the program continued, and the annual financial work group meeting was held. A 10-year anniversary tour and dedication of the Laguna Division Conservation Area was conducted in April 2015.

FY16 Activities: Under Work Task A1 for FY16, management of the LCR MSCP will continue. Ongoing administration activities will include financial, human resources, and support for the program. Coordination with the Steering Committee continued with meetings held on October 28, 2015, and April 27, 2016. Technical work group meetings were held 1 month prior to these dates to review upcoming actions of the Steering Committee. The *Draft Implementation Report, Fiscal Year 2017 Work Plan and Budget, Fiscal Year 2015 Accomplishment Report* was prepared. Financial tracking for the program will continue, and the annual financial work group meeting will be held. An evaluation of the potential for adding the northern Mexican gartersnake to the covered species list will be initiated.

Proposed FY17 Activities: Under Work Task A1 for FY17, management of the LCR MSCP will continue. Ongoing administration activities will include financial, human resources, and support for the program. Coordination with the Steering Committee will continue with biannual Steering Committee meetings, specific work group meetings, and email announcements. The *Final Implementation Report, Fiscal Year 2018 Work Plan and Budget, Fiscal Year 2016 Accomplishment Report* will be prepared. Financial tracking of the program will continue, and the annual financial work group meeting will be held.

Pertinent Reports: The *Final Implementation Report, Fiscal Year 2016 Work Plan and Budget, Fiscal Year 2014 Accomplishment Report* is posted on the LCR MSCP Web site. The *Final Implementation Report, Fiscal Year 2017 Work Plan and Budget, Fiscal Year 2015 Accomplishment Report* will also be posted upon completion.

WORK TASKS – SECTION B

Fish Augmentation

Work Task B1: Lake Mohave Razorback Sucker Larvae Collections

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$200,000	$183,182.91	$2,158,662.37	$200,000	$215,000	$215,000	$215,000

Contact: Patricia Delrose, (702) 293-8202, pdelrose@usbr.gov

Start Date: FY04

Expected Duration: FY55

Long-Term Goal: Fish augmentation

Conservation Measures: RASU3, RASU5, and RASU8

Location: Reach 2, Lake Mohave, Arizona/Nevada

Purpose: To develop the razorback sucker broodstock in Lake Mohave, maintain the broodstock, and harvest offspring for rearing as needed for the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): Work Tasks B2, B3, B4, B5, B6, and B7 are related to this work task, as the razorback suckers to be reared under these work tasks originate from Lake Mohave. Other research related to larvae collection, handling, and genetics include Work Tasks C30 (closed), C31, and C40.

Project Description: The razorback sucker broodstock in Lake Mohave provides a level of genetic diversity found nowhere else in the world. Under this project, wild-born razorback sucker larvae from Lake Mohave are captured and delivered to the Willow Beach National Fish Hatchery (Willow Beach NFH) for initial rearing. The work involved under this work task includes surveys to locate spawning groups, nighttime larvae collection, and maintaining the boat fleet and field station at Cottonwood Cove. Larvae are captured one at a time, making this a labor-intensive program.

Work normally commences in January and extends into late April or early May. Equipment is delivered to and staged at Cottonwood Cove, where a field station is established. The lake's shoreline is surveyed, and locations of spawning aggregations of razorback suckers are recorded. Razorback sucker larvae attracted to submerged lights suspended from the boats are captured by net and

counted. The larvae are transferred to the Willow Beach NFH, by either boat or vehicle, where they are logged in by date received, number collected, and location. This work task is repeated three to four nights per week through mid-to-late April. Research under Work Task C31 has helped to define larvae collection protocols. In order to represent the high genetic diversity of razorback sucker larvae used for rearing, collection efforts will continue to be distributed both temporally across the spawning season and spatially among the known spawning areas on Lake Mohave.

Previous Activities: This work task is part of a program started by the Lake Mohave Native Fish Work Group in 1989 to rebuild the adult stock of razorback suckers in Lake Mohave so that these fish could be used as brood fish for razorback sucker conservation and recovery. A portion of the larvae collected is used to sustain the broodstock, and the remaining larvae are reared for release into Reaches 2–5 to accomplish the augmentation goals of the program. In 2007, an invasive species, quagga mussels, were found within the Lake Mead Recreational Area, which includes Lake Mohave. To avoid transferring this species into other waters where they currently do not exist, larvae are no longer transported outside the lower Colorado River to the Southwestern Native Aquatic Resources & Recovery Center at Dexter or the Bubbling Ponds Fish Hatchery. Therefore, there is no longer a connection with Work Tasks B4 or B5.

FY15 Accomplishments: A target of 17,000 larvae was established for FY15 in coordination with the Lake Mohave Native Fish Work Group. This quantity was established to provide the appropriate number of larvae for the new rearing strategy at the Willow Beach NFH. Of these larvae, 11,000 were set aside for rearing at the Willow Beach NFH, and the remaining were set aside for rearing at the Lake Mead Fish Hatchery.

A total of 17,841 wild larvae were collected from four areas on Lake Mohave. All larvae were delivered to the Willow Beach NFH for further grow-out. The hatchery had a target goal of 11,000 larvae, so once larvae were reared to fingerling size, the remaining 6,841 fingerlings were taken to the Lake Mead Fish Hatchery for additional grow-out. The contribution from each zone of Lake Mohave by month of capture is presented in table 1.

Table 1.—Larval Razorback Suckers Collected from Lake Mohave, 2015*

Location	January	February	March	April	May	Total
Nine Mile	0	2,018	1,692	69	0	3,779
Tequila	500	1,750	2,500	200	0	4,950
Yuma	1,000	1,750	3,150	87	0	5,987
Above Owl Point	90	550	170	1,516	799	3,125
Total	1,590	6,068	7,512	1,872	799	**17,841**

* Larvae collection numbers should be considered approximations. Larvae are collected by hand and counted during collection; however, exact counts of larvae are not verified.

Remote passive integrated transponder scanners were placed throughout the spawning areas to assess the population of fish spawning at each location. Telemetry tags have also been used on adult stocked fish in an attempt to find new spawning areas.

FY16 Activities: A target of 17,000 larvae was once again planned for FY16; however, at the request of the LCR MSCP, the Lake Mead Fish Hatchery began preparations to expand razorback sucker production in February of FY16. Subsequently, larvae collections will also need to be increased to achieve these goals and are expected to increase the efforts and, potentially, expenditures in FY16.

Proposed FY17 Activities: Razorback sucker larvae collections will continue. The target level for FY17 is expected to be 15,000–20,000 larvae. The projected increase in the budget estimate for FY17 is attributed to the implementation of additional safety procedures associated with collecting larvae.

Pertinent Reports: A status report titled *Five-Year Summary of Razorback Sucker (Xyrauchen texanus) Larval Collections on Lake Mohave: 2010–2014* will be posted on the LCR MSCP Web site upon completion.

Work Task B2: Willow Beach National Fish Hatchery

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$325,000	$312,306.38	$3,496,327.15	$325,000	$325,000	$325,000	$325,000

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

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Fish augmentation

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

Location: Reach 2, Willow Beach, Arizona

Purpose: To annually contribute razorback suckers and bonytail to the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): The Willow Beach National Fish Hatchery (Willow Beach NFH) receives larval razorback suckers under Work Task B1 and bonytail under Work Task B4. A portion of the fish from the hatchery is reared at the Achii Hanyo Native Fish Rearing Facility (B3). Some fishery research actions described in Species Research (Section C) have occurred at the Willow Beach NFH, including Work Tasks C10 (closed) and C30 (closed).

Project Description: The Willow Beach NFH is managed by the U.S. Fish and Wildlife Service. The hatchery receives program funding to rear razorback suckers and bonytail for the LCR MSCP Fish Augmentation Program. There are three primary tasks at this hatchery:

1. **Receive fish to be reared.** The Willow Beach NFH annually receives wild razorback sucker larvae collected from Lake Mohave and fingerling bonytail (25–75 millimeters [mm] total length [TL]) from the Southwestern Native Aquatic Resources & Recovery Center (B4).

2. **Provide fish to other hatcheries.** Initially, the Willow Beach NFH was to provide fingerling razorback suckers to the Bubbling Ponds Fish Hatchery to be further reared and ultimately stocked into Reaches 3–5, provide fingerling razorback suckers from wild-caught larvae to the Southwestern Native Aquatic Resources & Recovery Center for further

rearing and eventual repatriation into Lake Mohave, and provide juvenile bonytail to the Achii Hanyo Native Fish Rearing Facility for further rearing and ultimately for stocking into Reaches 3–5. Due to quagga mussel infestations, the Willow Beach NFH is only delivering fish to the Achii Hanyo Native Fish Rearing Facility and the Lake Mead Fish Hatchery.

3. **Annually rear razorback suckers for release into the lower Colorado River.** The Willow Beach NFH will rear 8,000 subadult razorback suckers for stocking into Reaches 2–5 and, in addition, rear up to 1,000 razorback suckers greater than 400 mm TL for repatriation into Lake Mohave. All razorback suckers stocked into Reaches 2 and 3 will be a minimum of 300 mm TL. All razorback suckers stocked into Reaches 4 and 5 will be a minimum of 305 mm TL.

Previous Activities: This cold-water hatchery began operation in 1962 to produce rainbow trout for recreational fishing. Between 1994 and 1997, the U.S. Fish and Wildlife Service and the Bureau of Reclamation cooperatively added solar heating systems to the hatchery, converting 50 percent of its rearing capacity to warm-water fish production. Each year since 1996, the hatchery has received wild razorback sucker larvae, reared juvenile razorback suckers, and repatriated fish back into Lake Mohave.

During January 2007, the exotic quagga mussel was discovered in Lake Mead and was subsequently found at the Willow Beach NFH. Larval razorback suckers that were to be transferred to the Bubbling Ponds Fish Hatchery were not collected (B1), and no razorback suckers were delivered to waters outside the lower Colorado River corridor. Quagga mussels have not severely impacted the maintenance or operation of the Willow Beach NFH; however, they continue to have an impact on the delivery of fish.

FY15 Accomplishments: The rearing strategy at the Willow Beach NFH was changed in FY15 in an attempt to produce larger (400 mm) fish for stocking into Lake Mohave. This change was made to improve post-stocking survival of razorback suckers stocked into Lake Mohave and to ultimately increase the adult population of the lake.

During 2015, 17,841 razorback sucker larvae were received from Lake Mohave, 750 razorback sucker juveniles were stocked to lake-side rearing ponds (B7), and 14,472 razorback suckers of at least 300 mm TL were repatriated into Lake Mohave (Reach 2). A total of 2,021 razorback suckers were stocked in Reach 3; 791 at Laughlin Lagoon, 687 in Jack Smith Park, and 543 in Tampas Cove. A total of 723 year class 2011 razorback suckers, 3,270 year class 2012 razorback suckers, and 15,000 year class 2014 bonytail were transferred to the Achii Hanyo Native Fish Rearing Facility (B3) for further grow-out. The majority of funds were for salary and consumable materials (fish feed,

medicines, chemicals, etc.). Installation of two new wells was completed at the Willow Beach NFH along with pumps and associated electrical parts. In addition, a new pump with associated electrical parts was installed on an existing well.

FY16 Activities: The Willow Beach NFH will receive razorback sucker larvae from Lake Mohave and will continue to rear and distribute the razorback suckers and bonytail currently at the hatchery. This includes 12,132 razorback suckers of the 2013 year class, 9,043 razorback suckers of the 2014 year class, and 10,007 razorback suckers of the 2015 year class. No bonytail were reared at the Willow Beach NFH in FY16.

One well will be extended and re-screened to improve flow rates and is expected to be completed in FY16. By adding this redundancy, well water will supply the Willow Beach NFH with a reliable source of pathogen-free water, thereby helping to eliminate quagga mussels from this facility.

Proposed FY17 Activities: The Willow Beach NFH will continue to receive razorback sucker larvae from Lake Mohave and rear and distribute razorback suckers and bonytail for the LCR MSCP Fish Augmentation Program.

In addition, genetic samples may be collected at the time of tagging in order to obtain data for inference regarding genetic trends of the Lake Mohave broodstock. This change in genetic sampling may also reduce future needs for intense netting efforts during the spawning season. Discussions are ongoing, but depending on any necessary changes in effort, budget estimates may need to be altered in subsequent years.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B3: Achii Hanyo Native Fish Rearing Facility

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$160,000	$174,637.87	$1,244,414.09	$275,000	$50,000	$170,000	$170,000

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

Start Date: FY04

Expected Duration: FY55

Long-Term Goal: Fish augmentation

Conservation Measures: RASU3, RASU4, BONY3, and BONY4

Location: Reach 4, Colorado River Indian Tribe Reservation, Parker, Arizona

Purpose: To support operation and maintenance of fish rearing facilities in order to annually contribute razorback suckers and bonytail to the LCR MSCP Fish Augmentation Program for stocking into Reaches 2–5 of the lower Colorado River (LCR)

Connections with Other Work Tasks (Past and Future): This project is related to Work Tasks B2 and B4, as fish from both the Willow Beach National Fish Hatchery (Willow Beach NFH) and the Southwestern Native Aquatic Resources & Recovery Center (SNARRC) may be transferred to the Achii Hanyo Native Fish Rearing Facility. Additionally, fish research for razorback suckers and bonytail may be accomplished at this station.

Project Description: This project supports both the development and maintenance of the Achii Hanyo Native Fish Rearing Facility as a grow-out site for razorback suckers and bonytail and the rearing of bonytail for release into Reaches 3–5 of the LCR. The station is primarily used as a grow-out facility for bonytail from the SNARRC, although razorback suckers are occasionally brought on station in response to stocking needs and space limitations at other facilities. Funds are used for staff salaries, facility operation and maintenance, fish feed and chemicals, and fish distribution.

This facility is located on the Colorado River Indian Tribe Reservation, near Parker, Arizona. There are nine earthen ponds that receive Colorado River

water from an irrigation canal. A metal building was constructed to house 4 flow-through raceways and 3 circular tanks; in addition, 12 circular tanks are housed under an outside canopy, and there is 1 large, outside research tank.

Fish rearing operations are seasonal, producing one crop per year. Bonytail are brought in from the Willow Beach NFH and/or SNARRC in winter. Fish are fed through spring and summer. In fall, the ponds are drained, and fish are harvested, tagged, and stocked. Fish under target size (less than 300 millimeters total length) are returned to a pond for continued rearing. New fish are then brought on station, and the process is repeated. The annual production goal is 4,000 bonytail for stocking into the LCR.

Previous Activities: In cooperation with the U.S. Fish and Wildlife Service, upgrades to this facility have occurred since FY04. The work completed includes: (1) the purchase and assembly of a metal building (tank house) and fiberglass fish tanks, (2) an office, (3) a feed storage room, (4) restrooms, (5) electrical upgrades, (6) a backup generator, and (7) upgraded aeration systems for fish tanks in the tank house.

FY15 Accomplishments: At the start of the year, 15,000 bonytail of the 2014 year class, 3,270 razorback suckers of the 2012 year class, and 723 razorback suckers of the 2011 year class were on station. In December 2014, fish were harvested and tagged, 477 razorback suckers were stocked into Reach 2, 3,170 bonytail were stocked into Reach 3, and 1,998 bonytail were stocked into Reach 4. Approximately 5,850 bonytail of the 2012 year class and 9,000 bonytail of the 2014 year class were held on the Achii Hanyo Native Fish Rearing Facility for additional grow-out.

FY16 Activities: In December 2015, fish were harvested and tagged, 139 razorback suckers were stocked into Reach 3, and 2,372 razorback suckers were stocked into Reach 4 of the LCR. In addition, 825 bonytail were stocked into Reach 3. Following the harvest, at the start of the year, 1,205 bonytail of the 2012 year class, and 24,460 bonytail of the 2014 year class were on station for grow-out.

Bonytail will be brought on station from the SNARRC to meet production goals. Delivery of approximately 10,000 bonytail from the SNARRC is expected in late winter. Three ponds will be dried, disked, and graded to aid harvest. Two ponds will be dried so the levee between them can be widened. All levee roads will be graded, and another layer of rock will be added.

The estimated FY16 budget incorporates costs associated with raising and stocking native fishes for FY16 and FY17. Obligating 2 years of funds reduces administrative costs and allows for flexibility at the facility. The FY17 estimated budget has been adjusted accordingly.

Proposed FY17 Activities: Bonytail left on station from FY16 will be reared to target size, and fingerling bonytail will be delivered from either the Willow Beach NFH or SNARRC.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B4: Southwestern Native Aquatic Resources & Recovery Center at Dexter

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$250,000	$224,440.99	$2,142,765.08	$260,000	$260,000	$260,000	$260,000

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

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Fish augmentation

Conservation Measures: RASU3, RASU4, BONY3, BONY4, and HUCH1

Location: Dexter, New Mexico

Purpose: To support operation and maintenance at the Southwestern Native Aquatic Resources & Recovery Center (SNARRC), support maintenance of the bonytail broodstock, and annually provide razorback suckers and bonytail for the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): This work task is related to Work Tasks B2, B3, and B5, as fish from the SNARRC will be delivered to the Willow Beach National Fish Hatchery (Willow Beach NFH), Achii Hanyo Native Fish Rearing Facility, and Bubbling Ponds Fish Hatchery. In addition, fish rearing research activities outlined in Work Tasks C10 (closed), C11 (closed), C14, and C30 (closed) may be conducted at the SNARRC. A humpback refugium has been established at the SNARRC as a safeguard in case of catastrophic events in the wild (C14).

Project Description: The SNARRC is managed and operated by the U.S. Fish and Wildlife Service. The facility maintains the only broodstock for bonytail in the world and also retains a backup broodstock of razorback suckers. Funds provided will be used to maintain extant broodstock, annually produce fingerling bonytail for distribution to other hatcheries, and to annually rear bonytail to 300 millimeters (mm) total length (TL) for distribution within Reaches 2–5.

Previous Activities: The Bureau of Reclamation and the U.S. Fish and Wildlife Service have past and ongoing Interagency Agreements to support rearing and research for razorback suckers and bonytail at the SNARRC.

Beginning in FY14, the SNARRC was not required to provide subadult razorback suckers for stocking into the lower Colorado River (LCR). The space made available by this action is being devoted to increased production of bonytail for the LCR MSCP.

FY15 Accomplishments: The SNARRC plans to target a 305 mm TL for all bonytail stocked in FY15–18; however, fish with TLs of 300 mm or larger may be stocked in Reach 3, while fish stocked in Reaches 4 and 5 will be 305 mm TL or larger. The four ponds that were constructed in FY14 have been tested and are now stocked with bonytail for grow-out to target size. The addition of these ponds is expected to bring the SNARRC to its annual production goal of 12,000–13,000 bonytail greater than 305 mm for the lower Colorado River.

Bonytail: The SNARRC maintained a 1,942 adult bonytail broodstock that comprised six year classes of Lake Mohave origin fish. Approximately 38,000 bonytail were maintained on station for future stocking into the LCR. These included 8,000 bonytail of the 2012 year class, 10,000 of the 2013 year class, and 20,000 of the 2014 year class. The SNARRC hormonally induced and hand-stripped eggs from 20 adult bonytail females, producing 328,610 eggs. Over 59,600 egg, larval, and juvenile bonytail were transferred to other stations for grow-out and research during FY15. The SNARRC harvested, passive integrated transponder tagged, hauled, and stocked a total of 2,551 subadult bonytail (300+ mm TL) into Reach 3 and 2,866 subadult bonytail (305+ mm TL) into Reach 4.

Razorback Suckers: The SNARRC maintained a broodstock of 1,090 adult razorback suckers that comprised nine year classes of Lake Mohave origin fish. The SNARRC hormonally induced and hand-stripped eggs from 16 adult razorback sucker females, producing 398,120 eggs. Approximately 65,000 razorback sucker larvae were transferred to the Bubbling Ponds Fish Hatchery and the Aquatic Research and Conservation Center at Bubbling Ponds for grow-out and future stocking into the LCR.

FY16 Activities: The bonytail broodstock will be maintained, and the hatchery will produce approximately 100,000 larvae or fingerling bonytail for distribution depending upon various agency requests (including the Willow Beach NFH, Achii Hanyo Native Fish Rearing Facility, Lake Mead Fish Hatchery, and Bubbling Ponds Native Fish Conservation Facility). The SNARRC will rear 12,000–13,000 bonytail to 305 mm TL in FY16 for distribution within the LCR.

Proposed FY17 Activities: The bonytail broodstock will be maintained. Up to 100,000 larvae or fingerling bonytail will be produced for distribution to various rearing/research facilities depending upon requests (including the Bubbling Ponds Native Fish Research Facility, Lake Mead Fish Hatchery, Willow

Beach NFH, and Achii Hanyo Native Fish Rearing Facility). Approximately 12,000–13,000 bonytail will be reared to 305 mm TL for distribution within Reaches 2–5. Budget estimate increases in FY16 and subsequent years reflect the increase in bonytail production.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B5: Bubbling Ponds Fish Hatchery

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$960,000	$686,937.96	$2,739,536.89	$315,000	$330,000	$330,000	$330,000

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

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Fish augmentation

Conservation Measures: RASU3 and RASU4

Location: Cornville, Arizona

Purpose: To operate and maintain the fish rearing facility and annually contribute razorback suckers to the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): Activities at the Bubbling Ponds Fish Hatchery are related to Work Task B4; the hatchery receives razorback suckers from the Southwestern Native Aquatic Resources & Recovery Center (SNARRC). A portion of the fish rearing and predator- conditioning research activities outlined in Work Tasks C10 (closed) and C11 (closed) are also conducted at the research center associated with this hatchery.

Project Description: The Bubbling Ponds Fish Hatchery is managed and operated by the Arizona Game and Fish Department. This is a warm-water rearing facility that is supplied by a continuous, year-round, 10-cubic-feet-per-second spring flow of 68-degree Fahrenheit water. The facility has 10 acres of production ponds, a workshop, a storage shed, a small laboratory, and sufficient fish distribution equipment to meet the delivery requirements of the LCR MSCP. Program funds provide for salaries, fish feed and supplies, facility operation and maintenance, and delivery of fish. Production goals are 12,000 razorback suckers of 305 millimeters minimum total length for release into Reaches 3–5.

Previous Activities: Prior to the LCR MSCP, 70,000 razorback suckers were successfully reared at the Bubbling Ponds Fish Hatchery and delivered to the LCR as required by two Biological Opinions (1997 and 2001).

FY15 Accomplishments: A total of 60,000 fry were received for rearing from the SNARRC in April. During FY15, a total of 9,613 razorback suckers were harvested, passive integrated transponder/wire tagged, and stocked. A total of 4,322 razorback suckers were stocked into Lake Havasu (Reach 3), and 5,291 were stocked below Parker Dam (Reach 4).

A new 5-year agreement was completed, which will continue razorback sucker production through September 2020. In order to ensure funding was available to maintain year classes of fish on station, the first year of this new agreement was pre-obligated using FY15 funds. The target for the new agreement is to produce 12,000 razorback suckers for the LCR MSCP. The new agreement represents an increase in budget expenditures necessary to cover the costs of rearing supplies, salaries, and maintenance activities at the Bubbling Ponds Fish Hatchery.

Funds were also expended in FY15 for minor repairs and maintenance and to provide support for topographic and hydraulic surveys. These surveys were conducted in preparation for major infrastructure repairs needed to meet LCR MSCP fish production requirements. Budget expenditures were less than projected because these major infrastructure repairs, specifically the water supply line from the spring, were postponed.

FY16 Activities: The Bubbling Ponds Fish Hatchery began 2016 with approximately 72,970 razorback suckers on station. This total includes 4,918 razorback suckers of the 2013 year class, 22,451 of the 2014 year class, and 45,601 of the 2015 year class. All razorback suckers were supplied by the SNARRC. Most are expected to reach target size in 2016 and 2017. A total of 2,594 razorback suckers have been passive integrated transponder tagged and stocked into Reach 3 as of January 2016.

Replacement of the water supply line that provides water from the spring to the hatchery is planned for FY 16–17. This infrastructure is currently in critical disrepair and, without replacement, may threaten the water supply to the hatchery. A cost share for these repairs will be provided under the LCR MSCP. Funds for this cost share are expected to be obligated in FY16. The FY16 approved budget estimate will be exceeded to cover these costs.

Proposed FY17 Activities: Razorback sucker larvae will continue to be received from the SNARRC. Razorback suckers from the 2015 and 2016 year classes will continue to be reared. Approximately 12,000 razorback suckers greater than 305 millimeters total length are expected to be produced at the Bubbling Ponds Fish Hatchery for the LCR MSCP in FY17. Annual administrative progress reports for FY17 activities and production numbers will also be provided by the Bubbling Ponds Fish Hatchery.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B6: Lake Mead Fish Hatchery

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$255,000	$238,485.46	$651,098.11	$240,000	$325,000	$325,000	$325,000

Contact: Jim Stolberg, (702) 293-8206, jstolberg@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Fish augmentation

Conservation Measures: BONY3, BONY4, RASU3, RASU4, RASU5, RASU7, RASU8, and FLSU2

Location: Reach 1, Lake Mead, Boulder City, Nevada

Purpose: To support Lake Mead razorback sucker studies and contribute bonytail and razorback suckers to the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): Activities at the Lake Mead Fish Hatchery contribute to other LCR MSCP Work Tasks, including B11, C13, C39 (closed), C41, C49 (closed), C53, C57, C61, and D8.

Project Description: The Lake Mead Fish Hatchery is managed and operated by the Nevada Department of Wildlife (NDOW). The Bureau of Reclamation and the NDOW are cooperatively rearing both bonytail and razorback suckers at this facility in support of the LCR MSCP Fish Augmentation Program. Bonytail for this work task are produced and supplied by the Southwestern Native Aquatic Resources & Recovery Center, and razorback suckers are wild caught individuals from Lakes Mead and Mohave. Funds from this work task are provided for the salaries, equipment, feed, and chemicals necessary to rear these fish. Fish produced through this work task will be used to support research and augmentation in Reaches 1–5.

Previous Activities: A number of infrastructure and facilities improvements were made to the Lake Mead Fish Hatchery prior to 2007 to accommodate native fish production for the LCR MSCP. Since 2007, larval and fingerling razorback suckers, from Lakes Mead and Mohave respectively, have been brought into the Lake Mead Fish Hatchery and reared in these tanks. Subsequently, these fish have been transferred to ponds at the Overton Wildlife Management Area

(Overton WMA) for additional grow-out, used for Lake Mead research and monitoring projects, and stocked into Lake Mohave. Additional rearing space was made available at the hatchery in 2012 in continued support of the LCR MSCP Fish Augmentation Program. This additional space has allowed for a greater number of native fishes to be kept on station and is currently being used to rear razorback suckers, flannelmouth suckers, and bonytail. Prior to 2014, adult bonytail had only been held on station for short durations. The Lake Mead Fish Hatchery received an estimated 35,000 bonytail from the Wahweap State Fish Hatchery in December 2013, marking the first time that this species has been reared at the facility. The additional rearing capacity now available at the Lake Mead Fish Hatchery will continue to be necessary in future years when the number of fish stocked annually into Reaches 3–5 is expected to increase.

FY15 Accomplishments: During FY15, the Lake Mead Fish Hatchery continued rearing the approximately 28,000 bonytail, 7,000 razorback suckers, and 50 flannelmouth suckers that were on station from previous years. The Lake Mead Fish Hatchery received approximately 4,000 fingerling bonytail during FY15, bringing the total number of bonytail on station to approximately 32,000. The hatchery's razorback sucker stocks were also augmented in FY15 with an additional 100 razorback sucker larvae from Lake Mead, 4,000 razorback sucker larvae from Lake Mohave, and approximately 5,800 razorback sucker fingerlings also from Lake Mohave. At the end of FY15, approximately 16,000 razorback suckers from the 2010–2015 year classes were on station.

A number of small stockings occurred during FY15 in support of ongoing LCR MSCP work task activities. These stockings have been organized by river reach and include their associated work tasks where applicable. A total of 11 razorback suckers were stocked into Reach 1 during FY15 in support of ongoing research. These fish were sonic-tagged juvenile razorback suckers released in order to investigate habitat use and seasonal movements of immature razorback suckers in Lake Mead (C57). A total of 200 razorback suckers were stocked into Reach 2 during FY15. Fifty-one were harvested from Center Pond at the Overton WMA and stocked into Reach 2 by the NDOW in November. These fish were mostly from the 2008–09 year class and had an average total length of 515 millimeters (mm) (range 343–593 mm). The Lake Mead Fish Hatchery provided an additional 149 razorback suckers stocked in cohorts of 77 and 72 fish in support of ongoing latent mortality research (C65). These fish were from the 2010 and 2011 year classes and had average total lengths of 372 mm (300–415 mm) and 439 mm (345–520 mm), respectively. The Lake Mead Fish Hatchery also provided 410 bonytail that were stocked into Davis Cove in support of research continuing under Work Task C63, and 8 sonic-tagged bonytail were stocked into Reach 3 for research under Work Task C64. The final stocking of FY15 occurred in Reach 3. A total of 42 sonic-tagged, juvenile flannelmouth suckers were stocked in support of other ongoing research (C53).

Similar to the previous year, only minimal stockings of Lake Mohave razorback suckers occurred during FY15. It was anticipated that five hundred 500-mm razorback suckers would be stocked into Reach 2 by the end of FY15, but only 84 razorback suckers of this size have been stocked. The remainder will require additional time for grow-out. Over 47,000 native fishes from multiple year classes remain on station. These fish will be stocked or made available for research purposes as needs are identified.

FY16 Activities: The NDOW will continue to operate the Lake Mead Fish Hatchery for bonytail, flannelmouth sucker, and razorback sucker production. Operations will include grow-out and stocking of native fishes from the 2011–16 year classes, capture and rearing of up to 500 wild-caught razorback sucker larvae from Lake Mead, rearing of up to 6,000 additional fingerling bonytail, rearing of 5,000 additional fingerling Lake Mohave razorback suckers, and rearing of up to 100 juvenile flannelmouth suckers from Lake Mead and Reach 3 for research. An additional 7 sonic-tagged, juvenile razorback suckers will be stocked in the first quarter of FY16 to complement the cohort of 12 that were stocked as part of ongoing research funded in FY15 (C57). Approximately 2,000 Lake Mohave razorback suckers will also be stocked toward annual fish augmentation goals in FY16.

The NDOW will also continue to make improvements to the Lake Mead Fish Hatchery, including an electrical upgrade, which will enhance the ability to flow condition native fish prior to stocking. This upgrade was originally scheduled for FY15; however, the NDOW has rescheduled for FY16. Upon completion of the electrical upgrade, the hatchery will begin pre-stocking flow conditioning of native fishes. The Lake Mead Fish Hatchery will also establish a low-density raceway for adult bonytail during FY16 to provide the LCR MSCP with larger specimens for use in future sonic telemetry studies.

In FY16, the Lake Fish Mead Hatchery will start preparations to expand razorback sucker production by 4,000 per year, for a total goal of 6,000 per year expected in FY18–19. This will likely require a number of infrastructure upgrades to the hatchery and a corresponding increase in budget expenditures in FY16 and out-years.

Proposed FY17 Activities: Rearing and stocking of native fishes from previous year classes will continue. Lake Mead Fish Hatchery stocks will be augmented with 2017 year class razorback sucker larvae from Lake Mead; the NDOW will also receive and rear up to 6,000 additional fingerling bonytail and razorback suckers from the Southwestern Native Aquatic Resources & Recovery Center and Lake Mohave, respectively. Additional razorback suckers will also be reared directly from larvae at this facility to accommodate increases in production for this species. Adult and subadult Lake Mead razorback suckers will be delivered to the Overton WMA and additional off-channel grow-out sites as

necessary. Bonytail stockings from the Lake Mead Fish Hatchery are expected to begin in FY17. Budget estimates for FY17 and later years have been increased to account for escalation of native fish production at this facility.

In FY17, hatchery production under this work task will include the use of the Overton WMA ponds (B11) and will be reported under this work task. This consolidation will also contribute to the increase in the estimated budget proposed for this work task in FY17.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B7: Lake-Side Rearing Ponds

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$200,000	$181,782.56	$2,050,370.87	$200,000	$200,000	$200,000	$200,000

Contact: Eric Loomis, (702) 293-8519, eloomis@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Maintain fish rearing capability, provide razorback suckers and bonytail to 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, Arizona/Nevada

Purpose: To operate and maintain fish grow-out areas along the Lake Mohave shoreline to contribute to razorback sucker broodstock development

Connections with Other Work Tasks (Past and Future): Activities are related to Work Tasks B2 and B4, as fish for grow-out ponds come from the Willow Beach National Fish Hatchery and Southwestern Native Aquatic Resources & Recovery Center. In addition, some of the fish rearing research activities outlined in Work Tasks C34 (closed), C40, C44 (closed), and C63 may be conducted at these ponds.

Project Description: Lake Mohave is operated by the Bureau of Reclamation (Reclamation) as a re-regulation reservoir. It fluctuates annually within a 15-foot vertical range, filling by mid-May and lowering to an annual minimum in October. Wave actions redistribute sediment deposits from desert washes and shape these deposits into sandbars or natural berms. In some areas, these sandbars isolate the lower portions of the desert washes from the lake proper, and when the lake is at full pool, lake-side ponds form at many of these washes. Reclamation and its partners in the Lake Mohave Native Fish Work Group have been using these lake-side ponds since 1992 as rearing and grow-out areas for razorback suckers and bonytail. The ponds are stocked with juvenile fishes as the reservoir fills (typically stocked in late January). LCR MSCP staff members monitor the fish and manage the ponds throughout the growing season. This work

includes periodic monitoring of plankton production, removal of weeds and debris, installing and maintaining solar well pumps to mix the water and provide sufficient oxygen levels, population monitoring through the use of remote sensing technologies, and routine monitoring of physical, chemical, and biological parameters. The ponds are normally harvested in fall as the lake elevation declines. The fish from these ponds are then released back into Lake Mohave. Reclamation anticipates the need for these ponds to support razorback sucker and bonytail conservation through FY55.

Previous Activities: These ponds have been in use since 1992, and more than 32,000 razorback suckers have been reared and repatriated into Lake Mohave. In an effort to expedite development of razorback sucker broodstock, the target size for repatriation was increased to 500 millimeters (mm) total length (TL) during 2007. Since this new target size went into effect, the ponds have been managed to rear larger-sized fish for the LCR MSCP. Typically, razorback suckers in excess of 300 mm TL are stocked into the ponds and then harvested in spring and fall. Beginning in 2012, surplus in situ spawned fish were harvested and fin clipped and/or passive integrated transponder (PIT) tagged and transferred to Reach 3 below Davis Dam.

FY15 Accomplishments: Five backwaters were stocked at the beginning of the year with juvenile razorback suckers that were originally collected from Lake Mohave as larvae and then reared at the Willow Beach National Fish Hatchery. All fish were stocked at a size of at least 300 mm TL to be consistent with the minimum release target length. While all stockings of the Lake Mohave backwaters supported work under Work Task B7, several of the backwaters were also used to conduct concurrent species research work tasks. Specifically, the North Chemehueve and Willow backwaters were stocked solely in support of Work Task B7. The Arizona Juvenile (AJ), Dandy, and Yuma Cove backwaters were stocked as part of Work Task C40. These backwaters received 200, 50, 200, 200, and 100 razorback suckers, respectively, for a total of 750 razorback suckers stocked into Lake Mohave backwaters in FY15.

The total number of fish harvested from the backwaters from stocking in FY15 and repatriated into Lake Mohave in FY15 was 243. The mean TL for all backwater fish during this harvest was 430 mm, with a range of 325–520 mm. These fish were all from the 2011 year class. All fish were PIT tagged prior to initial stocking into the backwaters; however, harvested fish were re-scanned at the time of harvest, and a new tag was inserted if the original PIT tag was not detected. A breakdown of backwater harvested fish for FY15 is as follows: 20 stocked adult razorback suckers (mean TL = 507) were netted from the Yuma Cove backwater in May 2015, and an additional 124 razorback sucker recruits from prior stockings were also harvested from the Yuma Cove backwater (mean TL = 422). All captured recruits received a new PIT tag, and genetic (tissue) samples were collected as part of Work Task C40. All fish were returned to the Yuma Cove backwater. A total of 102 in situ-produced fish (recruits

from reproduction) greater than 300 mm captured from the Dandy and North Chemehueve backwaters were PIT tagged and transferred to Reach 3 to supplement LCR MSCP augmentation initiatives. An additional lot of more than 470 spawned razorback suckers captured from the ponds that measured less than 300 mm TL were also PIT tagged and released into Reach 3. Table 1 lists the numbers of fish repatriated into Lake Mohave from the 2015 harvest, excluding the Yuma Cove and Davis backwaters.

Table 1.—2015 Stocked Adult Razorback Suckers Repatriated into Lake Mohave from Lake-Side Rearing Ponds

Backwater		Number Stocked		Mean TL at Stocking (mm)		Number Harvested		Mean TL at Harvest (mm)		Percent Harvested from 2015 Stocking
Yuma Cove*		100		368		0		0		0.0
Willow		50		359		40		441		80.0
Dandy		200		362		85		412		42.5
Arizona Juvenile		200		364		53		415		26.5
North Chemehueve		200		360		65		457		32.5
Davis Cove		0		0		0		0		0.0
Total or Overall Mean Value	**Total**	**750**	**Mean**	**363**	**Total**	**243**	**Mean**	**431**	**Mean**	**32.4**

* Backwater sampled with no repatriates released into Lake Mohave. The Yuma Cove backwater was excluded from the totals due to project goals related to Work Task C40.

A total of 399 year class 2012 adult bonytail provided by the Southwestern Native Aquatic Resources & Recovery Center were stocked in equal proportions in the North Nine Mile and Nevada Egg backwaters in 2015 as part of Work Task C40. A total of 53 adults previously stocked in Nevada Egg and 10 previously stocked in North Nine Mile were harvested in 2015 and repatriated into Lake Mohave. The mean TL for all backwater adult bonytail at harvest was 297 mm, with a range of 255–355 mm. None of the bonytail repatriated into Lake Mohave were used to fulfill LCR MSCP augmentation goals.

FY16 Activities: Lake-side ponds are again being used for razorback sucker broodstock maintenance and development. Genetic and demographic data related to Work Task C40 in the AJ, Yuma, and Dandy backwaters will continue to be gathered, and in situ voluntarily spawned fish will continue to be harvested and released into downstream locations in Reach 3 below Davis Dam.

The North Nine Mile and Nevada Egg backwaters will again be stocked with bonytail to quantify genetic and demographic parameters. This work is related to investigations into reproductive success of razorback suckers in the AJ, Yuma, and Dandy ponds (C40).

Remote sensing technology will be expanded to all backwaters in the form of continuous PIT tag scanning from the time of initial stocking until the final harvest. Data collected from continuous population monitoring through remote sensing will be used to address variability in survival rates both spatially and temporally.

Stocking densities will be reduced in all backwaters to100 individuals per location to assess the impact of reduced density on growth and survival. The Willow backwater will continue to be stocked with 50 individuals. Sex ratios in the Willow backwater will be manipulated to evaluate the role reproductive behavior has on growth in these closed system environments. The Yuma Cove backwater will not be augmented in FY16 based on monitoring activities associated with Work Task C40. The Davis backwater will be stocked with 100 individuals to supplement Work Task C63 objectives.

Proposed FY17 Activities: Lake-side ponds along the shoreline of Lake Mohave will be operated and maintained for native fish. Stocking densities will continue at approximately 100 individuals per location. Sex ratio dynamics will continue to be explored in the current non-research North Chemehueve and Willow backwaters. All ponds will be monitored regularly to make sure survivorship is maximized during the grow-out phase prior to repatriation. Continuous proactive measures will need to be implemented to ensure backwater habitats are free of surface algal mats and dense submerged vegetation that has likely impacted water quality over various ponds in past years. Voluntarily spawned fish from backwaters will continue to be transported downstream from Davis Dam.

Pertinent Reports: N/A

Work Task B8: Fish Tagging Equipment

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$125,000	$115,059.95	$878,805.06	$135,000	$135,000	$135,000	$135,000

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

Start Date: FY04

Expected Duration: FY55

Long-Term Goal: Acquire and maintain a 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: To mark fish released into the lower Colorado River (LCR) for identification purposes to assess survival and distribution

Connections with Other Work Tasks (Past and Future): Activities are related to all work tasks that result in fish stocking for augmentation, fish research, and fish monitoring.

Project Description: Under the LCR MSCP, more than 1.2 million native fishes will be reared and stocked into the LCR. Fish will be marked to assess distribution and survival and for effective research and decisionmaking. Funds provide for both tagging materials and detection equipment needed during monitoring and research. The Bureau of Reclamation anticipates the need for fish tags and tagging equipment throughout the life of the program.

Previous Activities: Fish released into the LCR have been tagged with 400-kilohertz (kHz) passive integrated transponder (PIT) tags (Lakes Mead and 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 fishes used for research on Lakes Mead, Mohave, and Havasu. Fin clipping and floy tags have been used for short-term survival studies in some rearing and grow-out ponds.

In 2006, we began using new 134.2-kHz frequency PIT tags. These new tags have a greater detection range than the previously used tags (12 versus 2 inches away from fish) and will allow for testing and deployment of remote listening stations within spawning areas and other locations along the LCR. Purchase of the new PIT tags, tag readers, and antennae began in 2006. A total of 72,651 razorback suckers and 17,454 bonytail were PIT tagged and/or wire tagged and released into the LCR between 2006 and 2008. More recent stockings have included 24,299 razorback suckers and 6,579 bonytail in 2009, 22,476 razorback suckers and 4,993 bonytail in 2010, and 25,598 razorback suckers and 7,122 bonytail in 2011. In 2012, 27,105 razorback suckers and 7,821 bonytail were tagged and released into the LCR. These reported numbers of tagged fish represent the total number of fish implanted with tags and not the number of fish repatriated and credited under the LCR MSCP Fish Augmentation Program. They include fish used for research, smaller volunteer spawned fish that have been translocated into other areas, and fish that have been retagged due to tag loss or replacement of older frequency tags.

FY15 Accomplishments: PIT tags, tagging equipment, and tag readers were purchased as needed to mark fish for monitoring and research. A total of 33,292 razorback suckers and 7,032 bonytail were PIT tagged and released into the LCR during 2015.

FY16 Activities: PIT tags, tagging equipment, and tag readers will be purchased as needed to mark fish for monitoring and research. As augmentation goals and numbers of tagged fish increase, fiscal year budget estimates will also increase to meet these needs.

Proposed FY17 Activities: PIT tags, tagging equipment, and tag readers will continue to be purchased as needed to mark fish for monitoring and research. Budget estimates reflect increased fish number goals and needs for additional supplies and equipment to support ongoing tagging and remote sensing research and monitoring efforts.

Pertinent Reports: N/A

Work Task B11: Overton Wildlife Management Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$50,000	$0	$428,954.45	$50,000	$0	$0	$0

Contact: Jim Stolberg, (702) 293-8206, jstolberg@usbr.gov

Start Date: FY06

Expected Duration: FY16

Long-Term Goal: Develop and maintain offsite rearing capability to augment production at State and Federal hatcheries

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

Location: Reach 1, Overton, Nevada

Purpose: To provide additional rearing capacity for razorback suckers

Connections with Other Work Tasks (Past and Future): This work task is closely related to the Work Tasks B6, C13, and D8. Ponds at the Overton Wildlife Management Area (Overton WMA) also receive fish from the Willow Beach National Fish Hatchery (B2) for grow-out and future repatriation.

Project Description: The Overton WMA is located in Clark County, Nevada, at the upper end of Lake Mead at the confluence of the Muddy and Virgin Rivers, 65 miles northeast of Las Vegas. 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 receiving Lake Mead and Lake Mohave razorback suckers for grow-out to target size (300+ millimeters [mm]) for future program needs. The Overton WMA may also provide opportunities to conduct species research under the LCR MSCP Adaptive Management Program.

Previous Activities: Prior to 2008, a number of site modifications, including repairs and improvements to the water delivery infrastructure, were completed. These were specific to Honeybee and Center Ponds and were implemented to facilitate managing for native fish culture under the LCR MSCP. Pond

improvements, maintenance, and repairs have also been performed since 2008 and have included the purchase of a chemical spray unit to curtail aquatic vegetation and maintain sufficient open water areas, installation of a new boat ramp in the northeast corner of Center Pond, purchase of a new outlet structure and valves, and renovation of Honeybee Pond. Between 2009 and 2011, a total of 4,615 razorback suckers were stocked into Center Pond. From this time through the present, stocked fish and pond water quality have been monitored on a biannual and monthly basis, respectively. In FY14, the LCR MSCP and Nevada Department of Wildlife consolidated native fish production and monitoring by combining operations at the Lake Mead Fish Hatchery and Overton WMA ponds under a single agreement; this agreement is being funded through Work Task B6.

FY15 Accomplishments: FY15 is the first year that the use of Overton WMA as part of fish production at the Lake Mead Fish Hatchery was tracked under Work Task B6. No funds were expended under Work Task B11 in FY15: no major capital expenditures were required at Overton WMA, and labor costs associated with regular pond maintenance and harvests were captured under Work Task B6.

Field work associated with the Overton WMA ponds was conducted throughout the year and included quarterly monitoring of pond water quality as well as a fall sampling event to assess razorback sucker pond stocks in both Honeybee and Center Ponds. A total of 1,158 fish were captured from Honeybee Pond, including 53 razorback suckers, 1,091 common carp, 8 largemouth bass, and 6 bullhead catfish. Razorback suckers accounted for 12.2% of the biomass, and 4.6% of all fish captured. Razorback suckers averaged 370 mm total length and 648 grams (g) in weight and were returned to the pond for additional grow-out. A total of 95 fish were captured from Center Pond, including 52 razorback suckers, 37 largemouth bass, 3 bluegill, and 3 channel catfish. Razorback suckers accounted for 82.3% of the biomass and 54.7% of all fish captured. Of the 52 razorback suckers captured, 51 were removed from the pond and stocked into Reach 2 for augmentation purposes. These fish averaged 515 mm total length (range 343–593 mm) and 1,634 g in weight (370–2640 g). The remaining fish was returned to the pond for additional grow-out. No additional razorback suckers were stocked into the Overton WMA ponds during FY15 due to the abundance of common carp in Honeybee Pond and the estimated size of the current razorback sucker population in Center Pond. Sampling and stocking efforts in Honeybee Pond have been put on hold until a strategy is developed to manage the abundance of common carp.

FY16 Activities: Center Pond will be augmented in FY16 with additional stockings of Lake Mohave razorback suckers. Razorback suckers in both ponds will be monitored as needed using standards methods such as hoop nets, trammel nets, remote passive integrated transponder tag scanners, and/or electrofishing. Water quality information will be collected quarterly, as well as in association with all fish monitoring activities, using standardized methods consistent with

water quality data collection from previous project activities. Management of aquatic vegetation and routine maintenance on the existing water delivery infrastructure will be performed as necessary. Budget expenditures under Work Task B11 are expected to be minimal in FY16.

The Nevada Department of Wildlife will continue to manage the Overton WMA ponds in support of LCR MSCP needs into the future: fish populations and water quality will also continue to be monitored through routine sampling efforts. Site and infrastructure improvements will also continue, but these actions are expected to occur at a reduced level. Native fish rearing and hatchery production activities will be consolidated under the Lake Mead Fish Hatchery (B6) and Work Task B11 is expected to close.

Proposed FY17 Activities: This work task will be closed in FY16.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B12: Maintenance of Alternate Bonytail Broodstock

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$0	$0	$0	$50,000	$65,000	$65,000	$65,000

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

Start Date: FY16

Expected Duration: FY55

Long-Term Goal: Fish augmentation

Conservation Measures: BONY3 and BONY4

Location: Mora National Fish Hatchery (Mora NFH), Mora, New Mexico

Purpose: To support maintenance of the alternate bonytail broodstock and potentially provide bonytail for the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): N/A

Project Description: Bonytail are federally listed as "endangered" under the Endangered Species Act and are often referred to as critically endangered; they are considered functionally extirpated from their historical range, and their persistence in the Colorado River basin now relies entirely on stocking. The Southwestern Native Aquatic Resources & Recovery Center (SNARRC) maintains the only bonytail broodstock in the world and has developed a second broodstock. To guard against a catastrophic event, the second broodstock will be moved to another facility to secure the species' genetics. Having redundancy to safeguard this species is not only critical for its conservation, but it has benefits for the LCR MSCP. The maintenance of the current broodstock has provided the source of all the bonytail for the LCR MSCP Fish Augmentation Program. The LCR MSCP will again benefit greatly by having a redundant location to safeguard this species against future events that may limit the ability to meet program augmentation goals.

This work task will partially support the relocation and maintenance of the second bonytail broodstock developed by the SNARRC. Depending on the selected location, its capacity, and degree of development, this new broodstock may also produce bonytail for the LCR MSCP Fish Augmentation Program. Budget

estimates will reflect the LCR MSCP cost share in the relocation and maintenance of the new broodstock as well as the amount of fish received for repatriation into the lower Colorado River as part of the augmentation program.

A review team was formed in FY15 to select the location of the alternate broodstock based on criteria developed by the U.S. Fish and Wildlife Service (USFWS)/SNARRC. A recommendation was made in FY15 to relocate the alternate bonytail broodstock to another USFWS facility. The USFWS has indicated that this new broodstock is not intended to provide additional production fish to any conservation/recovery programs in the near future and would function as a "refuge population" to provide redundancy for securing and conserving the genetics of this species.

Previous Activities: This is a new start in FY16.

FY15 Accomplishments: This is a new start in FY16.

FY16 Activities: The alternate bonytail broodstock is expected to be relocated to Mora NFH, Mora, New Mexico, in FY16. Funds will be supplied to the hatchery to help cover the costs of relocating and maintaining this alternate broodstock. Costs in FY16 are expected to be greater than the approved budget based on the USFWS's updated proposed costs for these efforts.

Proposed FY17 Activities: Funding will be provided to help support the maintenance of the alternate bonytail broodstock at Mora NFH. The increase in the proposed budget for FY17 is more representative of the true cost of this broodstock maintenance. This cost may vary depending on contributions made through other recovery and conservation programs.

Pertinent Reports: N/A

WORK TASKS – SECTION C

Species Research

Work Task C2: Sticky Buckwheat and Threecorner Milkvetch Conservation

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$11,000	$10,673.49	$115,851.18	$11,000	$11,000	$11,000	$11,000

Contact: Carrie Ronning, (702) 293-8106, cronning@usbr.gov

Start Date: FY06

Expected Duration: FY30

Long-Term Goal: Support existing conservation programs for covered plant species

Conservation Measures: STBU1 and THMI1

Location: Reach 1, Nevada

Purpose: To 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 as described in the LCR MSCP Habitat Conservation Plan.

Project Description: Sticky buckwheat and threecorner milkvetch are covered species within the LCR MSCP. Funding in the amount of $10,000 per year will be provided to an ongoing conservation program or other entity approved by the U.S. Fish and Wildlife Service (USFWS) to implement conservation activities for these two plant species. Funding may be advanced for up to 5 years, depending on availability, to keep administrative costs at a minimum.

Previous Activities: From 2008 to 2014, the National Park Service (NPS) monitored select populations of sticky buckwheat and threecorner milkvetch within the Lake Mead National Conservation Area. Monitoring included presence/absence surveys from 2008 to 2014 and invasive weed removal in 2013 and 2014 at select sites.

A minor modification to the conservation measures for both plants was written and approved by the USFWS on January 4, 2011, following approval by the Steering Committee. The language was changed to state that funding would go

"to an ongoing Conservation Program or other entity approved by the USFWS to implement conservation activities for the threecorner milkvetch and sticky buckwheat."

FY15 Accomplishments: Conservation activities for these two plant species was supported under the LCR MSCP in accordance with the NPS' *Lake Mead National Recreation Area Resource Stewardship Strategy, November 2014*. Threecorner milkvetch populations at Sandy Cove were monitored. A total of 291 of the 506 plots surveyed contained threecorner milkvetch, with 19,961 plants recorded overall. Sticky buckwheat populations located between Lime Cove and Glory Hole were monitored. A total of 117 sticky buckwheat plants were documented; Lime Cove had 100 plants, and Glory Hole had 17 plants. Invasive Sahara mustard (*Brassica tournefortii*) weeds were removed from 3 acres of the dunes/sandy areas and surrounding beaches at Sandy Cove and Lime Cove. An annual report was provided to the Bureau of Reclamation (Reclamation) that summarized the achievements toward conservation goals for sticky buckwheat and threecorner milkvetch.

FY16 Activities: Funds in the amount of $10,000 will be transferred to the NPS per the above-described agreement to implement conservation activities for these two plant species. An annual report will be provided to Reclamation that summarizes the achievements made toward the conservation goals for sticky buckwheat and threecorner milkvetch.

Proposed FY17 Activities: Funds in the amount of $10,000 will be transferred to the NPS per the above-described agreement to implement conservation activities for these two plant species. An annual report will be provided to Reclamation that summarizes the achievements made toward the conservation goals for sticky buckwheat and threecorner milkvetch.

Pertinent Reports: Reports titled *Surveys of Threecorner Milkvetch (Astragalus geyeri* var. *triquetrus) and Sticky Buckwheat (Eriogonum viscidulum) in Fiscal Year 2014 – Lake Mead National Recreation Area* and *Surveys of Threecorner Milkvetch (Astragalus geyeri var. triquetrus) and Sticky Buckwheat (Eriogonum viscidulum) in Fiscal Year 2015 – Lake Mead National Recreation Area* are posted on the LCR MSCP Web site.

Work Task C3: Lower Colorado River Multi-Species Conservation Program Covered Species Profile Development

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$10,000	$466.27	$278,663.86	$0	$0	$0	$0

Contact: John Swett, (702) 293-8555, jswett@usbr.gov

Start Date: FY05

Expected Duration: Closed in FY15

Long-Term Goal: Species research

Conservation Measures: 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, Arizona, California, and Nevada

Purpose: To assess existing knowledge on 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 Work Task E16. Information from this work task was used to develop conceptual ecological models under Work Tasks G4 and G6.

Project Description: To successfully create habitat for LCR MSCP covered species, species accounts have been developed based on extensive literature searches. These accounts include current information about each species' legal status, life history, distribution, habitat requirements, behavior, and LCR MSCP conservation measures as they relate to the creation and management of the species' habitats, enabling the successful completion of conservation measures.

Species accounts were written for both covered and evaluation species, including known habitat requirements and management concerns. Data gaps were identified to set covered species research priorities. LCR MSCP research and monitoring data needs have been identified for each covered and evaluation species where appropriate. These needs have been 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, which are outside of the scope and purpose of the LCR MSCP, have also been listed in the plan.

Previous Activities: Species accounts for 25 covered and 5 evaluation species listed in the Habitat Conservation Plan that use terrestrial, marsh, and riparian habitats were completed in 2008. In FY14, new information was incorporated and updated internally into the species accounts. Literature searches, literature acquisition, and data compilation were conducted to update the species accounts.

FY15 Accomplishments: The updated species accounts completed in FY14 for the following species were edited and prepared for publication: Arizona Bell's vireo, California black rail, Colorado River cotton rat, Colorado River toad, desert pocket mouse, desert tortoise, elf owl, flat-tailed horned lizard, Gila woodpecker, humpback chub, lowland leopard frog, relict leopard frog, sticky buckwheat, three-corner milkvetch, western least bittern, western yellow bat, yellow warbler, Yuma clapper rail, and Yuma hispid cotton rat. Future development of species accounts will be completed in coordination with the conceptual ecological models that are prepared under Work Task G6.

FY16 Activities: This work task was closed in FY15.

Proposed FY17 Activities: This work task was closed in FY15.

Pertinent Reports: The 2015 report titled *Species Accounts for the Lower Colorado River Multi-Species Conservation Program Covered Species* will be posted on the LCR MSCP Web site upon completion.

Work Task C4: Relict Leopard Frog

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$11,000	$10,843.67	$114,832.84	$0	$0	$0	$0

Contact: Allen Calvert, (702) 293-8311, acalvert@usbr.gov

Start Date: FY06

Expected Duration: Closed in FY15

Long-Term Goal: Support existing relict leopard frog conservation programs

Conservation Measures: RLFR1

Location: Reach 1, Nevada and Arizona

Purpose: To 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 Habitat Conservation Plan.

Project Description: Assistance with and contributions toward existing relict leopard frog research and conservation efforts initiated by the Relict Leopard Frog Conservation Team will be provided under the LCR MSCP. A total of $10,000 per year, for a period of 10 years, will be contributed to the team in order to implement planned, but unfunded, conservation measures.

Previous Activities: Funds in the amount of $10,000 annually, totaling $90,000, were transferred to the National Park Service to support their relict leopard frog conservation activities.

FY15 Accomplishments: Funds in the amount of $10,000 were transferred to the National Park Service for the final year of the agreement. Relict leopard frog conservation activities supported by these funds were conducted at 19 sites within southern Nevada and northwestern Arizona. The conservation activities included:

- Releasing tadpoles and juvenile frogs at six experimental sites, including Corn Creek, a new experimental release site. Excess individuals were released back to the site from which they were collected.

- Conducting diurnal and nocturnal population surveys year round at 20 natural and experimental sites.

On May 16, 2016, the Bureau of Reclamation received a letter from the U.S. Fish and Wildlife Service concurring that the requirements under RLFR1 have been met. Conservation Measure RLFR1 is now complete.

FY16 Activities: This work task was closed in FY15.

Proposed FY17 Activities: This work task was closed in FY15.

Pertinent Reports: The *Relict Leopard Frog Monitoring and Management, 2014 Activity Report* is posted on the LCR MSCP Web site. The *Relict Leopard Frog Monitoring and Management, 2015 Activity Report* will also be posted upon completion.

Work Task C13: Lake Mead Razorback Sucker Study

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$135,000	$135,241.40	$1,695,608.41	$0	$0	$0	$0

Contact: Jim Stolberg, (702) 293-8206, jstolberg@usbr.gov

Start Date: FY05

Expected Duration: Closed in FY15

Long-Term Goal: Investigate conditions that allow for natural recruitment of razorback suckers in Lake Mead

Conservation Measures: RASU7

Location: Reach 1, Lake Mead, Nevada/Arizona

Purpose: To assess the razorback sucker 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 Work Task D7. The long-term monitoring portion of this work has now been moved to Work Task D8, and larvae collected through that effort are being reared at the Lake Mead Fish Hatchery (B6) and Overton Wildlife Management Area (B11).

Project Description: The focus areas of this study are to:

- Locate populations of razorback suckers in Lake Mead
- Document use and availability of spawning areas at various water elevations
- Monitor potential nursery areas
- Continue aging of captured razorback suckers
- Confirm recruitment events that may be tied to physical conditions in the lake

Previous Activities: In 1995, the Southern Nevada Water Authority, Nevada Department of Wildlife, and the Bureau of Reclamation began a monitoring program for razorback suckers in Lake Mead. Between 1995 and 2004, some 200 adult and 30 juvenile razorback suckers were captured. Aging data showed that a low level of recruitment had occurred in at least 22 of the past 30 years. This recruitment has happened in the face of extensive non-native fish populations and declining lake elevations. A summary report of the first 10 years of the study was completed and posted on the LCR MSCP Web site. The general sites identified in that report are now part of the long-term monitoring for razorback suckers in Lake Mead (D8). Research under this work task began focusing on an additional area of Lake Mead, the Colorado River inflow, in FY10, and was further expanded to include the lower Grand Canyon in FY13 as part of a multi-agency cooperative effort. Similar to past research efforts on Lake Mead, this work utilizes hatchery-reared and wild, sonic-tagged razorback suckers to assist researchers in locating spawning aggregates. Through FY13, 27 hatchery-reared and wild razorback suckers have been sonic or radio tagged as part of this effort. These fish have provided information that assisted in the capture of 82 razorback sucker larvae, 12 flannelmouth sucker larvae, 42 wild adult razorback suckers, and approximately 500 flannelmouth suckers from the Colorado River inflow. All captured adult and subadult native fish were passive integrated transponder tagged for individual identification before being released back into Lake Mead, and all captured razorback suckers have been aged between 2 and 11 years old. In FY14, habitat use and information pertaining to movement patterns of razorback suckers were obtained from 25 sonic-tagged fish that were contacted during the year. These 25 fish included the 11 released in 2014 as well as an additional 14 fish that were released during prior study years. Some sonic-tagged fish were observed to use both the Colorado River inflow and lower Grand Canyon regardless of where they were released, which may indicate that both areas provide important habitat for this species.

FY15 Accomplishments: Sonic-tagged razorback suckers were used in FY15 to locate potential spawning sites in the Colorado River inflow area of Lake Mead. Contacts with sonic-tagged fish were used to direct sampling efforts within the study area, and larval sampling and trammel netting were conducted where concentrations of razorback suckers were suspected. During the 2015 spawning period (February – May), a total of 45 larval razorback suckers were captured from two primary locations deemed to be spawning areas. Trammel netting (1,658 net-hours) conducted in similar areas resulted in the capture of 17 razorback suckers, 3 razorback-flannelmouth sucker hybrids, and 129 flannelmouth suckers. Of the 17 razorback suckers captured, 11 were wild, and 6 were pond-reared fish stocked in previous years. Three of the 11 wild fish were successfully implanted with sonic tags during the study year. These fish will help maintain an effective presence of sonic-tagged fish in the lake, and will be beneficial to the continuing work in the Colorado River inflow and lower Grand Canyon as well as ongoing monitoring occurring throughout the lake.

The expansion of sonic telemetry efforts into the lower Grand Canyon in 2013, and the continued use of sonic telemetry through 2015, has helped to document the connectivity and movement of razorback suckers between the Colorado River inflow and lower Grand Canyon. Movement of sonic-tagged razorback suckers from the Colorado River inflow to other areas of Lake Mead, and vice versa, has also been documented. Considering the size, dynamic nature, and the previously unknown status of razorback suckers using the study area, sonic-tagged fish were crucial in providing new information regarding razorback sucker general habitat use. The documentation of movement between the Colorado River inflow, lower Grand Canyon, and the greater Lake Mead study area may also indicate that all of these areas provide important habitat for this species.

All monitoring actions, including larval sampling, trammel netting, tracking of sonic-tagged fish, evaluating growth rates of recaptured fish, and fin ray sectioning for aging adult and subadult razorback suckers are expected to continue. Data obtained through these continuing actions will help further identify the size, age structure, habitat use, spawning areas, and recruitment patterns of razorback suckers located in the Colorado River inflow and lower Grand Canyon. All remaining FY15-initiated research activities will be completed in FY16 using FY15 funding that was obligated for this work but has yet to be expended. Parts of this specific research may also transition into long-term monitoring and be continued at a reduced effort under Work Task D8 in subsequent years.

FY16 Activities: This work task was closed in FY15.

Proposed FY17 Activities: This work task was closed in FY15.

Pertinent Reports: The 2015 final annual report titled *Razorback Sucker Research and Monitoring in the Colorado River Inflow Area of Lake Mead and the Lower Grand Canyon, Arizona and Nevada* will be posted on the LCR MSCP Web site upon completion.

Work Task C14: Humpback Chub Program Support

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$57,000	$87.21	$287,987.11	$57,000	$57,000	$57,000	$57,000

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

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Support humpback chub conservation

Conservation Measures: HUCH1

Location: Grand Canyon, Arizona; Willow Beach, Arizona; Dexter, New Mexico

Purpose: To provide support for the Glen Canyon Dam Adaptive Management Program (Glen Canyon Dam AMP) to conserve the humpback chub

Connections with Other Work Tasks (Past and Future): This work task is connected to Work Tasks B2 and B4, as money will be transferred to the U.S. Fish and Wildlife Service (USFWS) through an agreement for activities at the Willow Beach National Fish Hatchery and the Southwestern Native Aquatic Resources & Recovery Center (SNARRC).

Project Description: A total of $500,000 over the life of the LCR MSCP (50 years) will be provided for the Glen Canyon Dam AMP, or other programs approved by the USFWS, to support implementation of planned, but unfunded, humpback chub conservation measures.

Previous Activities: In support of the Glen Canyon Dam AMP, funds were provided to the USFWS for the care of humpback chubs from the Little Colorado River housed at the Willow Beach National Fish Hatchery in FY06. In an effort to reduce administrative costs and optimize planning, the USFWS requested funding of $10,000 per year for 3 years (FY06–08).

During calendar year 2008, additional funds were provided under the LCR MSCP for the development of a refugia broodstock for the humpback chub. The agreement for broodstock development was in place for FY09–11.

A refuge population/captive broodstock of Grand Canyon humpback chub has been established at the SNARRC. In 2014, the SNARRC successfully maintained 1,024 humpback chub from the Little Colorado River, Grand Canyon. This included 274 of the 2008 year class, 202 of the 2009 year class, 174 of the 2010 year class, 200 of the 2011 year class, and 174 of the 2012 year class. The overall survival for the year was 99.2 percent.

Approximately one-half of the overall $500,000 commitment has been spent funding broodstock development in addition to the previous support of humpback chub initiatives of the Glen Canyon Dam AMP. The remaining funds will be allocated when the Glen Canyon Dam Adaptive Management Program, in coordination with the USFWS, identifies appropriate maintenance activities or research needs for the funds.

FY15 Accomplishments: The humpback chub refuge stock was inventoried and found to have 100-percent survival. No research or support needs were identified for FY15. Expenditures in FY15 were limited to administrative charges.

FY16 Activities: Support will continue for humpback chub conservation in coordination with the USFWS and the Glen Canyon Dam AMP. Remaining funds will be spent according to research needs as agreed to among all cooperating agencies.

Proposed FY17 Activities: Support will continue for humpback chub conservation in coordination with the USFWS and the Glen Canyon Dam AMP. Remaining funds will be spent according to research needs as agreed to among all cooperating agencies.

Pertinent Reports: Progress reports are available upon request.

Work Task C24: Avian Species Habitat Requirements

FY15 Estimates	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$310,000	$161,927.64	$1,707,382.89	$270,000	$340,000	$150,000	$0

Contact: Beth Sabin, (702) 293-8435, lsabin@usbr.gov

Start Date: FY08

Expected Duration: FY18

Long-Term Goal: Identify covered bird species' habitat characteristics to inform conservation area management

Conservation Measures: MRM1 and MRM2 (CLRA, LEBI, BLRA, SWFL, YBCU, ELOW, GIFL, GIWO, VEFL, BEVI, YWAR, and SUTA)

Location: Reaches 1–7 from Lake Mead to the Southerly International Boundary with Mexico, Bill Williams River, and other river systems in Arizona

Purpose: The purpose of this work task is to evaluate the habitat requirements of covered marsh and riparian bird species, including Arizona Bell's vireo, California black rail, elf owl, Gila woodpecker, gilded flicker, western least bittern, Sonoran yellow warbler, southwestern willow flycatcher, summer tanager, vermilion flycatcher, yellow-billed cuckoo, and Yuma clapper rail. Conservation measures within the Habitat Conservation Plan call for research to better identify habitat requirements (Monitoring and Research Measure 1[MRM1]) and to manage habitat of covered bird species (MRM2). The research under this work task fulfills those goals. Research questions will be focused on habitat elements that can be managed at the habitat conservation areas. Conservation measures to create habitat exist for each of the above species; knowledge of their habitat requirements will assist in habitat creation.

Connections with Other Work Tasks (Past and Future): Information gained from this work task will be used to conduct pre- and post-monitoring at conservation areas in Conservation Area Development and Management (Section E) that target covered bird species and system-wide monitoring of avian species (D2, D3 [closed], D5, D6, D7, and F2). Information gained from this work task will be incorporated into Conservation Area Development and Management (Section E) work tasks and adaptive management (G5 [closed]).

Project Description: A requirement under the LCR MSCP is the creation of a minimum of 512 acres of marsh habitat for three covered marsh bird species. All 512 marsh acres should provide habitat for the Yuma clapper rail and western least bittern, while 130 acres will provide habitat for the California black rail. The Habitat Conservation Plan requires the creation of a minimum of 5,940 acres of cottonwood-willow habitat and 1,320 acres of honey mesquite habitat for nine covered riparian obligate bird species. Studies will be conducted to evaluate the habitat elements of covered bird species that can be managed at habitat conservation areas: Arizona Bell's vireo, California black rail, elf owl, Gila woodpecker, gilded flicker, Sonoran yellow warbler, summer tanager, vermilion flycatcher, western least bittern, and Yuma clapper rail. Habitat characteristics for the southwestern willow flycatcher (D2), yellow-billed cuckoo (D7) and the gilded flicker (C52) are covered under separate work tasks.

Previous Activities:

Yellow-billed cuckoo: A Geographic Information System-based model of yellow-billed cuckoo breeding habitat was developed.

Arizona Bell's vireo, Gila woodpecker, Sonoran yellow warbler, and summer tanager: From FY08 to FY10, habitat data were collected and summarized. More detailed habitat characterizations addressing microclimate for the Arizona Bell's vireo, Gila woodpecker, Sonoran yellow warbler, and the summer tanager were conducted from FY11 to FY14. Forty bird territories and 40 sites without territories were monitored for each species to detect vegetation differences where they choose to nest to inform habitat management. The characteristics measured included overstory trees, the shrub and intermediate layer, canopy closure and gaps, total vegetation volume, the herbaceous layer, and microclimate.

Restoration of managed marsh units to benefit black rail and other marsh birds: In 2009, vegetation surveys were conducted, water depth data were monitored at wells, and biweekly marsh bird surveys were conducted throughout the breeding season at the Imperial National Wildlife Refuge in Fields 16 and 18. The locations of all black rails, clapper rails, and western least bitterns were mapped in both fields. Black rails were first detected in Fields 16 and 18 in April and July 2009. Yuma clapper rails were consistently detected in Field 16 throughout summer, with a high of 21 birds. In Field 18, clapper rails were also detected in 2009. In 2011, a final report was prepared, giving recommendations on the creation of marshes for both clapper and black rails. Further research on marsh bird habitat requirements will be conducted under Work Tasks C60 and C66.

Elf owl: A study was initiated to refine the survey methods for elf owls in dense habitat and estimate the general habitat characteristics of occupied riparian habitat to inform nest box placement and management of habitat conservation areas. A study plan was developed and reviewed.

FY15 Accomplishments:

Arizona Bell's vireo, Gila woodpecker, Sonoran yellow warbler, and summer tanager: The FY13 report was published, and the FY14 report was reviewed. An audit of the data from FY11 to FY14 was conducted to verify its completeness and quality.

Elf owl: Surveys were conducted to locate elf owls in order to confirm that they use riparian habitat; identify birds that could be used to test the accuracy of the call-playback survey method in dense riparian conditions; and identify nesting territories to inform where we should install nest boxes on conservation areas. No elf owls were located along the lower Colorado River, so surveys were conducted throughout their range in Arizona. In FY15, approximately 550 elf owls were detected, including 113 elf owls detected in riparian areas. A preliminary analysis suggests that elf owls in western Arizona are more likely to be found in riparian areas with greater canopy cover, tree height, and riparian width than in eastern Arizona. Elf owls are also more likely to be found in native riparian habitat than non-native riparian habitat and in riparian habitat adjacent to desert scrub with saguaros than in riparian habitat adjacent to other vegetation types. Mobile electronic field form (MEFF) and database development were initiated, and MEFFs were used during discovery surveys.

The FY15 obligations were less than the approved budget, as intensive radio tracking of elf owls was delayed until FY16 in order to focus efforts on locating owls for the study.

FY16 Activities:

Elf owl: Surveys will be conducted at four to six study sites in Arizona where elf owls were documented in riparian habitat during the FY15 breeding season, such as along the Bill Williams, Santa Maria, and Big Sandy Rivers. Fifteen elf owl nests will be located, and rapid habitat assessments will be conducted at the nest and surrounding territory to describe the vegetation community and structure. The data will be used to inform where to install nest boxes on conservation areas. The accuracy of the call-playback survey method will be tested to evaluate how vegetation density affects the accuracy of the survey protocol. The MEFFs and database will be completed, including queries and reports.

The budget increases in FY16 due to the intensity of the field work required to capture and radio track owls.

Proposed FY17 Activities:

Elf owl: Surveys will be conducted at four to six study sites in Arizona where elf owls were documented in riparian habitat during the FY15 breeding season, such as along the Bill Williams, Santa Maria, and Big Sandy Rivers. An additional 15 elf owl nests will be located, and rapid habitat assessments will be conducted

at the nest and surrounding territory to describe the vegetation community and structure. The data will be used to inform where to install nest boxes on conservation areas. The survey protocol evaluation will continue.

The budget increases in FY17, as data analysis will begin in addition to field work to capture and radio track owls.

Pertinent Reports: The report titled *Lower Colorado River Riparian Bird Surveys 2013 Annual Report* is posted on the LCR MSCP Web site.

Work Task C25: Imperial Ponds Native Fish Research

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$200,000	$184,143.25	$1,644,441.56	$200,000	$200,000	$200,000	$0

Contact: Jeff Lantow, (702) 293-8557, Jlantow@usbr.gov

Start Date: FY08

Expected Duration: FY18

Long-Term Goal: Inform management and provide ways to improve created backwaters through species research

Conservation Measures: RASU2 and BONY2

Location: Reach 5, Imperial National Wildlife Refuge (Imperial NWR), Arizona

Purpose: To evaluate six ponds created as backwater habitats at the Imperial NWR to assess the efficacy of the ponds for native fish species, specifically bonytail and razorback suckers

Connections with Other Work Tasks (Past and Future): Bonytail and razorback suckers to be stocked into the ponds are provided through Work Tasks B1–B5. Ponds were developed under Work Task E14, and additional monitoring support will be provided through Work Task F5. Data are maintained under Work Task G1.

Project Description: The development of native fish refugia in six constructed ponds on the Imperial NWR will be monitored and evaluated. Incorporated into pond construction were design features such as riprap, spawning gravels, hummocks, and increased depth, which were thought to provide suitable habitat for life cycle completion by bonytail and razorback suckers. The role and importance of each of these features toward developing self-sustaining native fish populations will be evaluated.

Previous Activities: Habitat use was evaluated for razorback suckers in Ponds 2, 4, and 6. Habitat use by razorback suckers shifted across seasons, but habitat selection in any given season was different for razorback sucker populations in each pond. There were consistently more contacts for both species at night than during the day. During summer, deep open water areas were selected by both species, and little activity was detected. Few bonytail were

contacted so habitat associations were unclear. Razorback suckers were associated with gravel beds during the nominal spawning season that peaked in late winter/spring.

Bonytail and razorback suckers were implanted with acoustic transmitters to assess distribution. Bonytail were distributed in deep waters along the north, south, and northeast corner during the day and in open water across the length of the pond, avoiding shallow areas during the night. Razorback suckers used deep waters west of the hummocks during the day. Nighttime monitoring results indicated that razorback suckers concentrated on the boat ramps and on or around the spawning beds. Spatial overlap was minimal between the two species.

A water management study was completed in May 2013 in order to evaluate and compare water quality in Pond 1 (where regular water management was continued) with Ponds 2 through 6 (without a managed water supply). A trend analysis from the physicochemical profiles indicated that temperature had increased over time in all six of the ponds; however, it appeared to be increasing at a slightly higher rate in Pond 1. Specific conductivity levels suggested a gradual increase in all ponds over time as well. The pH levels also indicated a trend of increasing values over time, with variation among all ponds. The pH commonly exceeded the management guideline of 9.0 in Ponds 2 through 6 in the summers of 2011 and 2012. The pH levels were lowest in Pond 1. Dissolved oxygen varied in all ponds, and recorded levels did not appear to be a cause for concern in the absence of water management. The results of this study indicate that the ponds can be managed with much less water than previously thought. Because of these lower demands and the desire for a non-native free water source, the water supply was switched from surface water to a groundwater (well) source.

FY15 Accomplishments: Native fish removal efforts from Pond 1 were completed in preparation for the renovation of all six ponds. Eighty-six razorback suckers were captured: 46 had previously been passive integrated transponder (PIT) tagged, and 40 had no tag data. All razorback suckers were stocked into the A-10 backwater near Ehrenberg, Arizona. Any razorback sucker that did not have a tag received one prior to stocking. One-hundred and forty-five bonytail were captured from Pond 1; none were PIT tagged. Bonytail were transported to the Lake Mead Fish Hatchery for later stocking.

The ponds were treated with rotenone to remove all fish species. The ponds were treated at about 4.0 parts per million. Post-renovation sampling has occurred in all ponds. No fish were encountered during sampling of any of the ponds; however, mosquitofish (*Gambusia affinis*) were observed along the shorelines in Pond 5 during the September 2015 sampling.

No water was added to the ponds following the renovation in FY15. Temperature, dissolved oxygen, and pH had similar trends. Specific conductivity decreased when the pond elevations were being raised to 185 feet

for the renovations. Once the water was turned off to the ponds, the specific conductivity increased in all ponds.

A water management schedule has been established. Each pond will receive approximately 2.5 million gallons of water from January through June and October through December. They will receive about 5.5 million gallons from July through September. Water additions to the ponds are intended to mitigate pH and specific conductivity. These are the only management recommendations that will be employed until the effectiveness of these actions has been evaluated.

FY16 Activities: In FY16, post-renovation fish monitoring will be reduced to quarterly sampling as indicated in the post-renovation monitoring plan. Water chemistry and water quality data, as well as zooplankton and phytoplankton samples, will be collected on a quarterly basis. Continuous sampling units will be deployed to record water quality parameters at 6-hour intervals, including temperature, pH, dissolved oxygen, and specific conductivity. Downloads of these units will occur monthly. Permanent submersible PIT tag detection antennas will be purchased and installed to support fish stockings.

A draft report will be developed that outlines the successes and lessons learned from the renovation effort at the Imperial ponds. A native fish stocking plan will be drafted in FY16, and it will include a stocking timeline and potential research questions to be addressed for the Imperial ponds.

Mosquitofish were observed in Pond 1 and Pond 5 early in FY16. The presence of mosquitofish was confirmed (fish were captured) in Pond 5. The presence of mosquitofish was not confirmed in Pond 1, and no other observations of mosquitofish have been made in this pond. No other fish species have been detected in any of the Imperial ponds since the renovation.

Proposed FY17 Activities: The native fish stocking plan will be implemented. Native fish research will be implemented and may include investigations such as stocking density and survivorship, avian bioenergetics, and genetic contributions of spawning adults.

Pertinent Reports: The scopes of work are available upon request. Annual reports are posted on the LCR MSCP Web site.

Work Task C27: Small Mammal Population Studies

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$50,000	$39,005.31	$438,705.18	$40,000	$0	$0	$0

Contact: Allen Calvert, (702) 293-8311, acalvert@usbr.gov

Start Date: FY08

Expected Duration: FY16

Long-Term Goal: Identify distribution, genetics, and habitat requirements as well as establish monitoring protocols for covered small mammal species

Conservation Measures: CRCR1, YHCR1, DEPO1, MRM1, and MRM2

Location: Reaches 3, 4, 6, and 7

Purpose: The purpose of this work task is to implement distribution, genetic, and habitat studies for monitoring LCR MSCP covered and evaluation small mammal species. These studies are being conducted to clarify the geographic range of the Yuma hispid cotton rat and the Colorado River cotton rat along the lower Colorado River (LCR), identify ways to differentiate subspecies of desert pocket mouse, and to describe habitat characteristics of these species.

Connections with Other Work Tasks (Past and Future): Data collected as part of Work Task F3 will be analyzed as part of the effort to determine the distribution of the two cotton rat species found along the LCR. Previous presence/absence surveys on small mammal populations were conducted under Work Task D10. This research will inform improvements to the monitoring protocol for small mammals.

Project Description: Studies will be designed to identify the distributional range, genetic differentiation, and habitat use of the covered and evaluation small mammal species. Small mammals will be trapped in various habitat types along the LCR to collect genetic samples, and the samples will be sent to a genetics laboratory for deoxyribonucleic acid (DNA) analyses. Genetic differentiation data for animals captured along the LCR will also be compared with data from animals of different subspecies located within Arizona, east of the LCR MSCP planning area, to obtain genetic markers. The data will be used to clarify the distributional range of each species of cotton rat and identify genetic markers that can differentiate subspecies of the desert pocket mouse within the LCR

watershed. Habitat use and population demographics will be estimated with mark-recapture analyses. A population demography study will be implemented to identify habitat at cotton rat capture locations and establish a protocol for monitoring cotton rat presence at conservation areas.

Previous Activities: Cotton rats were captured at seven localities along the LCR, including sites near Yuma, Arizona; Imperial National Wildlife Refuge; Cibola National Wildlife Refuge; Palo Verde Ecological Reserve; and Pintail Slough on the Havasu National Wildlife Refuge. A study was initiated at the end of FY07 to determine the distributional range for each species, the genetic differentiation between the covered cotton rat species, and their habitat use along the LCR (D10 and F3). In FY08, the study was moved under Work Task C27 in which additional efforts were made to identify cotton rat populations, including sampling known populations along the LCR. Distribution and population genetic analyses have been conducted for these covered species.

Population and habitat monitoring began in FY10. From FY11 to FY13, field work for a combined mark-recapture and habitat study was conducted using trapping grids that had different population densities of Colorado River cotton rats at Pintail Slough, the Cibola National Wildlife Refuge Unit #1 Conservation Area Nature Trail, and the Palo Verde Ecological Reserve. Data suggest that cotton rats need dense herbaceous vegetation at least 0.5 meter in height, as it provides an important cover for their activities and protects them from predators. Areas with this habitat structure often had better trapping success as well. These results and methods were reviewed, and protocol improvements were identified in vegetation measurements and data analyses. These improvements will be incorporated into future monitoring efforts.

FY15 Accomplishments: The final report was revised. Genetic samples of both cotton rats and the desert pocket mouse were sequenced using Next-Gen to identify genetic markers that can be used to differentiate the cotton rat species and the subspecies of the desert pocket mouse. The Next-Gen data are now available for researchers interested in pursuing studies that are outside the scope of the LCR MSCP, such as analyzing the species' ranges and population connectivity.

FY15 obligations were under budget, as no field work was required that fiscal year.

FY16 Activities: The data will be incorporated into the LCR MSCP database, and the work task will be closed in FY16.

Proposed FY17 Activities: This work task will be closed in FY16.

Pertinent Reports: The report titled *Habitat and Population Demographics of the Colorado River Cotton Rat (Sigmodon arizonae plenus) Along the Lower Colorado River* will be posted on the LCR MSCP Web site upon completion.

Work Task C31: Razorback Sucker Genetic Diversity Assessment

FY15 Estimate	FY15 Actual Obligations	Cumulative Accomplishment Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$140,000	$141,928.74	$650,031.33	$160,000	$160,000	$160,000	$0

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

Start Date: FY09

Expected Duration: FY18

Long-Term Goal: Maintain the genetic quality of razorback suckers utilized under the LCR MSCP

Conservation Measures: RASU2, RASU3, RASU5, and RASU6

Location: Wayne State University, Detroit, Michigan

Purpose: To maintain a sound genetic management program for razorback suckers utilized under the LCR MSCP

Connections with Other Work Tasks (Past and Future): This work task is related to larval razorback sucker collections (B1) and management of fish habitat restoration sites (e.g., C40, E14, and F5). Larval and adult tissue samples are collected from each reach of the LCR MSCP planning area wherever razorback suckers are captured, and this includes work accomplished under Work Tasks C13, C33 (closed), C45 (closed), C49 (closed), C64, and D8.

Project Description: The genetic structure of razorback sucker communities in reservoirs, river reaches, and off-channel habitats within the LCR will be monitored, and the various razorback sucker stocks relative to the founder population from Lake Mohave will be characterized. Under the LCR MSCP Fish Augmentation Program, production of large numbers of fish annually will continue; these large pulses of fish have the potential to change the genetic diversity of a population in a short period of time. It is important to monitor the genetic structure of the various razorback sucker communities over many years in order to detect changes in the genetic diversity as these populations mature.

Larval fish and adult fin clips will be collected and preserved from each stock during numerous annual surveys and the continuing Lake Mohave larvae collections. These samples will be delivered to a genetics research laboratory

for analyses. The results will be used to determine the genetic health of these communities, assess the effectiveness of the LCR MSCP Fish Augmentation Program, assess the effectiveness of the Lake Mohave repatriation effort, and provide guidance on management of razorback sucker populations developing in newly constructed flood plain habitats within the LCR MSCP area.

Previous Activities: Samples of larvae and adult fin clips were obtained on an annual basis from multiple time periods and from various spawning areas, reservoirs, river reaches, and off-channel habitats within the LCR MSCP area. Deoxyribonucleic acid (DNA) was extracted, and samples characterized for mitochondrial deoxyribonucleic acid (mtDNA) and microsatellite variation. Analyses of microsatellite data collected over the past 19 years are consistent with those from mtDNA, indicating that the razorback sucker conservation strategy employed in Lake Mohave is maintaining genetic diversity in the nuclear genome as well. Interpretation of the data in the context of effective numbers of breeders and size identifies the importance of increasing the population size in Lake Mohave.

FY15 Accomplishments: Within Lake Mohave, 173 fin clips and 404 larval samples were collected from the main basin and analyzed for levels of molecular variation. The findings were consistent with previous years and indicated that, in Lake Mohave, levels of molecular variation (as measured by mtDNA and microsatellites) continue to be maintained by the current management program. An additional 20 fin clips and 117 larvae were obtained from above the Willow Beach National Fish Hatchery, and these individuals are not significantly different from those in the main basin.

The efficacy of fin clipping all razorback suckers for genetic samples during tagging was explored in FY15. Currently available off-the-shelf systems did not contain preservatives compatible with long-term storage for genetic samples; therefore, this process was not implemented in FY15. Additional discussions and strategies are being explored to evaluate the cost-benefit of this effort. Long-term benefits may be important in terms of genetic information and reduced handling of adult razorbacks in the field.

From Lake Mead, 29 adult fin clips and 91 larvae were collected. Samples have been extracted, sequenced, genotyped, and analyzed using genetic software.

From Reach 3, 148 adult fin clips and 338 larvae were collected. Samples have been extracted, sequenced, genotyped, and analyzed using genetic software.

FY16 Activities: Razorback sucker genetics will continue to be assessed for the LCR through analyses of razorback sucker fin clips and larvae collected from spawning areas, reservoirs, river reaches, and off-channel habitats within the LCR MSCP area.

Reach 3 razorback sucker augmentation will include fish from the Lake Mohave gene pool. Due to this shift, genetic monitoring efforts of larvae and adults for Reach 3 will increase to provide contrast with razorback sucker genetics of Lake Mohave. These additional samples will provide a genetic baseline for this population from which changes can be monitored as more Lake Mohave fish are stocked into this reach.

Proposed FY17 Activities: Collection of larval razorback suckers and fin clips from spawning areas within the LCR MSCP area will continue. DNA will be extracted and samples characterized for mtDNA and microsatellite variation. Due to the small population sizes, future work will continue in order to evaluate potential problems related to the effective number of breeders.

Pertinent Reports: Annual reports for 2013–15 titled *Razorback Sucker Genetic Diversity Assessment* have been completed and will be posted on the LCR MSCP Web site upon completion.

Work Task C32: Determination of Salinity, Temperature, pH, and Oxygen Limits for Bonytail and Razorback Suckers

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$115,000	$96,353.36	$690,956.97	$110,000	$110,000	$0	$0

Contact: Jim Stolberg, (702) 293-8206, jstolberg@usbr.gov

Start Date: FY09

Expected Duration: FY17

Long-Term Goal: To develop and maintain high quality backwater habitats for native fishes

Conservation Measures: RASU2, RASU3, RASU5, RASU6, BONY2, BONY3, and BONY5

Location: LCR MSCP Native Fish Laboratory, Boulder City, Nevada

Purpose: To evaluate razorback sucker and bonytail early life stage thresholds of survival at varying levels of salinity, temperature, pH, and dissolved oxygen

Connections with Other Work Tasks (Past and Future): This work task began under Work Task G3 and is related to management of fish habitat restoration sites.

Project Description: Through laboratory testing, the threshold levels of various water quality parameters needed to sustain early life stages of bonytail and razorback suckers in backwater habitats developed under the LCR MSCP will be evaluated.

Previous Activities: Salinity concentrations evaluated during FY07 and FY08 indicated that upper salinity tolerances ranged from 11,000 to 12,000 microsiemens per centimeter (µS/cm) for razorback sucker eggs and from 23,000 to 27,750 µS/cm for razorback sucker larvae. Observations during larval trials also documented that long-term survival may be possible at salinities as high 23,000 µS/cm when larval razorback suckers are properly acclimated.

During FY09, the results from razorback sucker egg trials indicated that the lower dissolved oxygen limit for this early life stage is in the 2.5 to 3 milligrams per liter (mg/L) range. The limit observed for larvae was slightly lower, with increased mortality occurring at DO concentrations near 2 mg/L.

Research during the FY10 study year was focused on evaluating the threshold levels of pH for early life stage razorback suckers. The results from egg trials indicated that the threshold levels for successful embryo development are between pH 9 and 10. The pH threshold observed for razorback sucker larvae was slightly higher; 98% survival was observed with short-term exposure (20 days) to pH 10.

Research during FY11 focused on evaluating the threshold levels of pH for fingerling bonytail and razorback sucker survival. Results from both bonytail and razorback sucker trials indicated that the upper lethal limit for these species is near pH 10 at both 20 and 30 degrees Celsius (°C). While low levels of mortality were observed at both temperatures during the first 72 hours, mortality increased to 87–93% after 20 days of exposure at 20 °C and to 83–97% after 15 days of exposure at 30 °C. Increased survival was observed in lower pH treatments; bonytail exposed to pH 9 at 20 °C displayed zero mortality over 20 days and only 8% mortality after a 15-day exposure at 30 °C. Survival was also higher for razorback suckers exposed to pH 9.5 and below.

DO concentrations evaluated in FY12 indicated that the lower lethal limit for fingerling bonytail was below 2 mg/L during short-term exposure at 20 °C. Only 17% mortality was recorded for bonytail exposed to the 2 mg/L treatment for 15 days. Trials at 30 °C indicated that the lower lethal DO limit is very near 2 mg/L. Sixty-seven percent mortality was observed at 72 hours, and 100% mortality was observed at 18 days. Mortality for the remaining 30 °C treatments decreased incrementally as DO concentrations increased.

Research during FY13 focused on evaluating threshold DO concentrations for successful bonytail egg development and larval survival. While all DO treatments (2 to approximately 8 mg/L at 20 °C) produced swim-up larvae in egg trials, percent hatch was lowest at 2 mg/L (12%), highest at 8 mg/L (57%), and fairly uniform for the remaining treatments (39–46%). Larvae exposed to DO concentrations of 2 to approximately 7.25 mg/L for 20 days resulted in survival ranging from 93–100% and from 46–85% at 20 and 25 °C, respectively. Results from this study year indicate that bonytail egg success will increase with increased DO concentrations, little to no egg development should be expected at 2 mg/L, and at least short-term survival of larvae can be expected at DO concentrations as low as 2 mg/L at moderate temperatures.

Research during FY14 focused on suggesting threshold salinity concentrations for successful bonytail egg development and larval survival. Eggs were exposed to salinity concentrations of 1,000 to 12,500 μS/cm in triplicate at 20 °C. All treatments produced swim-up larvae, and percent hatch was similar among treatments (20–31%). Larvae were exposed to salinity concentrations of

12,500 to 20,000 μS/cm in triplicate in two separate trials run at 20 and 25 °C for 15 days. Salinity concentrations of 12,500 and 15,000 μS/cm resulted in larval mortality ranging from 4–14% at 20 °C, while observed mortality at higher salinity concentrations (17,500 and 20,000 μS/cm) ranged from 52–99%. For the 25 °C trial, mortality increased for all treatments. Larval mortality ranged from 13–70% at 12,500 μS/cm, 29–88% at 15,000 μS/cm, and from 98–100% for the remaining treatments. Larval mortality for control groups (1,000 μS/cm) was observed to be lower during both trials, ranging from 2–6% at 20 °C and 8–13% at 25 °C.

FY15 Accomplishments: Research during FY15 focused on threshold pH levels for successful bonytail egg development and larval survival. Results have been provided as a range of values to show the variability within treatments. Fertilized eggs were exposed to pH ranging from 7 to 10.5 in three replicate treatments at 20 °C until hatch was completed. Successful egg development, reported as percent hatch, was measured as the number of larvae surviving to swim-up stage. Greater success was observed at lower pH levels, with percent hatch ranging from 51–58% at pH 7, 8, and 9. Percent hatch was reduced at higher pH levels and ranged from 35–51% at pH 9.5, 6–12% at pH 10, and 0% at pH 10.5. Larvae were exposed to pH ranging from 8 to 10.5 in three replicate treatments through two separate trials run at 20 and 25 °C for up to 20 days. Mortality at 20 °C ranged from 7–15% at pH 8 to 10 and from 92–100% at pH 10.5. Mortality was slightly higher at 25 °C, ranging from 7–22% at pH 8 to 9.5, 39–53% at pH 10, and 100% at pH 10.5. Results from the FY15 study year indicate that successful development of bonytail eggs may be expected at pH levels as high as 9.5, little to no egg development should be expected at pH levels of 10 and above, and short-term survival of mesolarvae may be expected at pH levels as high as 10 at moderate temperatures.

FY16 Activities: Evaluation of threshold salinity concentrations for bonytail and razorback sucker fingerlings was originally planned for FY16; however, this work has been rescheduled for FY17 when bonytail fingerlings will become available. Research during this study year will instead focus on determining the lower DO limit of razorback sucker fingerlings. Two multiple replicate trials, one at 25 °C and one at 30 °C, will be conducted to evaluate the combined effects of DO and temperature on survival of this life stage. A comprehensive review of available, published literature will continue so that data gaps may be identified.

Proposed FY17 Activities: Research during the FY17 study year will focus on suggesting threshold salinity concentrations for bonytail and razorback sucker fingerlings. It is anticipated that two trials will be conducted for each species to evaluate the combined effects salinity and temperature have on survival.

Pertinent Reports: Annual reports will be posted on the LCR MSCP Web site upon completion.

Work Task C40: Genetic and Demographic Studies to Guide Conservation Management of Razorback Suckers and Bonytail in Off-Channel Habitats

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$190,000	$186,066.42	$760,448.36	$275,000	$300,000	$300,000	$0

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

Start Date: FY10

Expected Duration: FY18

Long-Term Goal: Effective fishery management of backwater habitats developed under the LCR MSCP

Conservation Measures: RASU2, RASU6, BONY2, and BONY5

Location: Backwater habitats (Reaches 2–5)

Purpose: To quantify genetic and demographic parameters that are necessary for informed, long-term management of razorback suckers and bonytail in off-channel habitats

Connections with Other Work Tasks (Past and Future): This work task is related to Work Tasks B7, C25, C31, C56 (closed), F5, and G3.

Project Description: In Lake Mohave and elsewhere, razorback suckers and bonytail demonstrate a group spawning behavior whereby a female will spawn with multiple partners many times over a period of a few weeks. These observations led biologists to believe that all possible genetic crosses were being made during the spawn. However, analyses of adult razorback suckers placed into the Yuma Cove backwater in 1991 and 1992, along with analyses of the larval razorback suckers produced each year, showed that not all of the adults contributed genetic material to the next generation. It is possible that individual adults do not spawn every year, or that even if they do, they do not always contribute genetic material to the next generation. This information needs to be verified in order to model a population structure within these isolated habitats over subsequent generations and to predict at what frequency genetic material needs to be exchanged between habitats to maintain the diversity of the overall razorback sucker and bonytail populations within the LCR MSCP area.

Demographic and genetic information will be collected that will lead to recommendations to optimize long-term management of off-channel habitats for these two critically endangered fishes. Genetic data will be captured from larval, juvenile, and adult razorback suckers and bonytail from at least two replicate groups from off-channel habitats. Characterization of DNA variation will be used to assign the parentage of individual larvae to specific adults. The data can then be compared and contrasted to: (1) determine the actual number of individuals that participate in annual spawning activities, (2) census the populations, and (3) quantify patterns of survivorship.

There are three phases to the study: field observations, laboratory analyses of genetic materials, and modeling of population dynamics. The study will require multiple years of data collection and analyses and stable populations for both razorback suckers and bonytail to allow for multiple years of censusing. Final recommendations will be provided at the end of this work task and included in the future management of LCR MSCP backwaters.

Previous Activities: Adults, larvae, and juveniles razorback suckers have been genotyped, and multiple iterations of in situ spawning have been completed in the AJ, Dandy, and Yuma Cove backwaters along Lake Mohave. Collections from FY10 to FY14 were analyzed, identifying considerable variability in individual reproductive success within and especially among different lake-side ponds.

In FY14, three Lake Mohave backwater ponds were no longer being used for razorback sucker production, so they were dedicated to bonytail genetic experiments. The North Nine Mile, Nevada Egg, and Nevada Larvae backwaters were all stocked with 80 male and female adult bonytail. The Nevada Larvae backwater experienced a fishkill shortly after stocking, and it was removed from the study. However, spawning was successful in the North Nine Mile and Nevada Egg backwaters. From these backwaters, 397 and 593 genetic samples of larvae and age-0 fish samples were collected from the North Nine Mile and Nevada Egg backwaters, respectively. Parentage was determined for almost all larvae and age-0 fish samples produced within these two backwaters. Variance in reproductive success differed dramatically among backwaters. Specifically, in Nevada Egg, certain males and females contributed disproportionate numbers of progeny. High variance in reproductive success acts to reduce the genetic effective size of the population, which in turn can increase the rate at which genetic diversity is lost from the population. Allelic diversity declined between the parental and progeny collections, although this decline was not statistically significant.

FY15 Accomplishments: The AJ backwater has typically produced razorback sucker offspring that remained viable into autumn, with generally consistent levels of individual contribution to larval production across years. This year was similar to FY13 and previous years, all of which have had greater individuals contributing than FY14. The Dandy backwater produced a few larvae and

juveniles in FY15, but they have yet to be analyzed. This was the third year of sampling from the Yuma Cove backwater; larvae were readily captured as in the previous two years, and parental contributions to larvae were comparable to the first year and AJ annual samples. Despite continued high survivorship of remaining resident adults, most individuals stocked into the Yuma Cove backwater this year again died shortly after stocking. This pattern was unexpected, as individuals from the same lot stocked into the AJ and Dandy backwaters at the same time did not exhibit similar patterns of mortality. Despite the high level of contribution of different stocked individuals to the larval pool, a small proportion of individuals seemed to be contributing a relatively large percentage of the total larvae in any given year in all ponds. This variation needs to be quantified in order to effectively generate a management strategy for backwater ponds.

FY15 represented the second year for bonytail backwater research. Two backwaters (North Nine Mile and Nevada Egg) were each stocked with 100 males and females. Genetic data were collected from these individuals as well as from 744 and 798 larvae and juveniles from North Nine Mile and Nevada Egg backwaters, respectively. Genetic diversity was preserved between parental and progeny generations, and reproductive success was similar between the two backwaters but slightly lower than in the previous year.

FY16 Activities: In the Yuma Cove backwater, the relative survival of the newly stocked razorback suckers verses the surviving razorback suckers from previous years will be monitored. Additional manipulations of this population may be required to maintain a genetically stable population. The number of individuals stocked in the AJ and Dandy backwaters will be reduced to examine the impacts of density on reproductive success.

FY16 will represent the third iteration of genetic monitoring of bonytail in the North Nine Mile and Nevada Egg backwaters. Both backwaters will be stocked and sampled similar to previous years, and the 3 years of research will be summarized in a report.

The addition of the two bonytail backwaters has resulted in an increased effort for backwater genetics work, and this increased effort is expected to impact budgets in subsequent years. Razorback suckers and bonytail spawn at different times of the year, and this limits the amount of cost sharing while collecting larvae. Sample collections and analyses similar to previous years will continue for both razorback suckers and bonytail dedicated backwaters.

Proposed FY17 Activities: Efforts will be expanded in FY17 to evaluate additional genetic research questions related to razorback suckers and bonytail in isolated backwater environments and to address challenges encountered in

previous study years. These efforts will include evaluating effects of stocking densities, use of additional genetic tools, and expansion/transition of the study area.

FY17 will mark the first year that this work will begin to transition to created disconnected backwaters, beginning with the Imperial ponds. Experiences from the first 7 years of this work will provide input for the initial stockings at these ponds. Fin clips will be collected from all stocked fishes, and genetic material from their offspring will be collected once they begin to reproduce. The projected work plan budget in FY17 has been adjusted to account for this expansion of effort. Stocking densities of razorback suckers will continue to be reduced in the AJ and Dandy backwaters (100 individuals per location) to replicate the assessment of the impact of reduced density on life history parameters. Additional genetic tools will be used to assess the differences in parental contributions among backwaters and attempt to identify the factors contributing to these differences. The adult razorback sucker population at the Yuma Cove backwater may also need to be manipulated again to re-establish the population there; reproduction and survivorship will also continue to be monitored. Additional years of sampling and analyses will be required to be able to draw inferences regarding the long-term genetic management of these backwaters.

For bonytail, work will continue for another year in the two Lake Mohave backwaters (North Nine Mile and Nevada Egg) and then transition to the Imperial ponds. Protocols for collections and analyses will continue similar to previous years; however, the number of stocked fishes, both for bonytail and razorback suckers, will likely be higher for the Imperial ponds not only due to their larger sizes but also due to increased initial genotyping efforts.

Pertinent Reports: A report titled *Development and Characterization of Microsatellite PCR Primers for Bonytail Chub for Use in Assessing Relatedness of Fishes Produced in Off-Channel Habitats* was completed under Work Task G3, and it will be posted on the LCR MSCP Web site.

Work Task C43: Population Demographics and Habitat Use of the California Leaf-Nosed Bat, a Genetic Evaluation

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$25,000	$24,984.19	$110,099.63	$40,000	$0	$0	$0

Contact: Allen Calvert, (702) 293 8311, acalvert@usbr.gov

Start Date: FY11

Expected Duration: FY16

Long-Term Goal: Assess the population demographics and habitat use of the California leaf-nosed bat

Conservation Measures: CLNB1 and CLNB2

Location: Reaches 3–5

Purpose: The purpose of this work task is to investigate the genetic variation in California leaf-nosed bats at roost sites along the lower Colorado River (LCR) to inform program managers about the connectivity of the species' populations and level of rarity. This will include an analysis of the genetic history of California leaf-nosed bats along the LCR watershed and adjacent areas, including geographic structuring, evolutionary history, and other population demographic parameters.

Connections with Other Work Tasks (Past and Future): A portion of the roost site data and tissue samples analyzed were collected under Work Tasks D9 and F4.

Project Description: The genetics of California leaf-nosed bats along the LCR will be described. Genetic samples from each of the known roost sites near the LCR and from individuals captured during system-wide monitoring will be collected, and DNA sequencing and microsatellite analyses will be performed. This will document the genetic structuring of bats at roost sites and allow for various population analyses, including the connectivity of the species' populations and level of rarity, as well as demographic parameters to be estimated such as population size, previous population expansion or contraction, and dispersal among roosts, which may suggest which roost sites or areas along the river the bats netted at LCR MSCP conservation areas are coming from.

Previous Activities: Genetic samples and mitochondrial sequencing for samples collected prior to FY12 were conducted under Work Task G3. Additional samples were collected at roosts. A total of 917 base pairs of the mitochondrial cytochrome B gene have been sequenced, and these sequences were used to create haplotype networks and neighbor joining trees to explore diversity and relatedness among roosts.

FY15 Accomplishments: Microsatellite-enriched whole genome data for six individuals were received from the genome sequencing laboratory. The data were combined across the six individuals to allow for filtering and selection of an informative microsatellite dataset that will be used to identify possible population genetic patterns in the genetic samples from 91 individuals.

FY16 Activities: Next-Gen genetic data will be filtered down to an informative microsatellite dataset, and the analysis of population demographics of California leaf-nosed bats based on the genetic results will be completed. The final report will be written, which can be used to guide future management actions for California leaf-nosed bats along the LCR.

Proposed FY17 Activities: The work task will be closed FY16.

Pertinent Reports: A report titled *Genetic Characterization of Macrotus californicus Populations along the Lower Colorado River – 2010 Annual Report* is posted on the LCR MSCP Web site. The annual reports will also be posted upon completion.

Work Task C52: Gilded Flicker Riparian Habitat Use and Seasonal Movement Research

FY15 Estimates	FY15 Actual Obligations	Cumulative Expenditures Through FY14	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$160,000	$107,103.99	$513,269.60	$300,000	$300,000	$0	$0

Contact: Mary Ellen Chavez, (702) 293-8475, mchavez@usbr.gov

Start Date: FY12

Expected Duration: FY17

Long-Term Goal: Evaluate the current distribution and abundance of gilded flickers on the lower Colorado River (LCR) by conducting species-specific, non-random surveys

Conservation Measures: GIFL1 and MRM1

Location: The LCR MSCP planning area and other areas in Arizona where gilded flickers are located

Purpose: The purposes of this work task are to: (1) evaluate year-round habitat use, seasonal movements, and size of the breeding home range of the gilded flicker, (2) observe how often gilded flickers are using riparian habitat as nesting or roosting cavities, and (3) identify approximate dates of pair formation, incubation, nestling, and fledgling stages.

Connections with Other Work Tasks (Past and Future): Information obtained through this work task will be used during post-development monitoring of habitat conservation areas (F2) and system-wide surveys (D6).

Project Description: Surveys conducted under the LCR MSCP have not resulted in the detection of gilded flickers breeding in riparian habitats within the LCR MSCP planning area. However, there have been incidental observations of gilded flickers using the riparian habitat in this area as family groups during the fall and winter months and occasionally during the summer months.

Additional research and monitoring is needed to understand how and when the gilded flicker is most likely to use riparian habitats within its range. This study will: (1) estimate time periods of breeding and post-breeding stages and document breeding season behaviors to help interpret results of sightings, (2) document gilded flicker travel distances during and after nesting season to

document if it is possible that birds nesting in saguaro habitats may also use disconnected riparian habitats, and (3) help define habitat use by the gilded flicker during the breeding and non-breeding seasons.

Previous Activities: The species profile and annotated bibliography were updated; and historical and recent records were examined for detections within the LCR MSCP planning area and along the Bill Williams River. In FY12, preliminary surveys were conducted to locate breeding gilded flickers within the LCR MSCP planning area and adjacent areas. Areas where gilded flickers were observed include a family group in mesquite habitat along the Bill Williams River north of Mineral Wash Road, a pair of gilded flickers at McIntyre Park in Blythe, California; an incidental sighting of a gilded flicker at Yuma East Wetlands; and numerous gilded flickers readily detected in the saguaro habitat adjacent to the LCR MSCP planning area in Arizona.

In FY13 and FY14, a study was conducted to document the breeding chronology, seasonal movement and breeding home range size, and year-round habitat use of the gilded flicker and test existing methods to document species movements. Capture and radio telemetry tracking methods were tested, and information on the breeding chronology of the gilded flicker was collected at an upland ephemeral wash study area that was selected south of Quartzite, Arizona. Different year-round tracking techniques were employed to compare effectiveness and cost, including backpack and retrix-mounted radio telemetry and Global Positioning System (GPS) locators. Techniques and equipment were studied for effectiveness on adult males and females and juveniles. To document the timing of the different breeding stages, eight active nest cavities were monitored on a regular basis until nestlings fledged. The types of vocalizations made during different activities and time periods were also documented. Juvenile habitat use, average home range size, and behavior while in family group formation were also studied.

FY15 Accomplishments: In FY15, the study continued at the study site south of Quartzite. A seasonal chronology of behaviors and vocalizations during pair formation, nesting, and family group formations continued in order to refine and test protocols and methodologies developed in FY13 and FY14. The GPS locator tracking method was least successful; one male fitted with a GPS locator in FY14 was recaptured, but due to equipment malfunction, tracking data were not retrieved for analyses, and the other two males with GPS units were not located. Three adult gilded flickers with backpack transmitters were tracked until their equipment came off naturally. These birds, as well as other gilded flickers in the study area (both color banded and unbanded), were observed monthly to gain additional insights to site fidelity, movements, habitat use, and behaviors throughout the year. Solo and paired gilded flickers, as well as active nest cavities and family groups, were monitored, and vocalizations during different activities and time periods throughout the year were documented.

Reduced field efforts in FY15 required fewer funds than budgeted.

FY16 Activities: Surveys will be conducted in the Quartzsite study area in an attempt to locate the two males with GPS transmitters. The equipment will be removed, data retrieved, and followup surveys conducted on banded flickers from FY13 and FY14, as necessary, to complete the protocols. Exploratory surveys will be conducted along the LCR MSCP planning area and western Arizona where gilded flickers have been recently documented to locate gilded flickers in riparian areas, look for nest and roost cavities in riparian woodlands, and test survey methods.

Proposed FY17 Activities: Additional surveys for gilded flickers will be conducted to test the survey methods and detect nest and roost cavities in riparian woodlands. If gilded flickers are not easily detected using the double sampling survey method or sufficiently responsive using the call-playback method, up to 10 gilded flicker pairs utilizing riparian habitats will be captured and fitted with tracking equipment in order to determine how detectable they are in dense riparian vegetation and how intensively plots need to be surveyed to get an accurate measure of gilded flickers if they are present. Presence survey methods will be finalized, and the work task will be closed.

Pertinent Reports: The report titled *Development of Appropriate Radio Telemetry Techniques for Gilded Flickers (Colaptes chrysoides) in Western Arizona, 2013* is posted on the LCR MSCP Web site. The 2014 and 2015 annual reports will also be posted upon completion.

Work Task C53: Sonic Telemetry of Juvenile Flannelmouth Suckers in Reach 3

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$120,000	$117,133.38	$410,889.16	$120,000	$100,000	$100,000	$0

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

Start Date: FY12

Expected Duration: FY18

Long-Term Goal: Support flannelmouth sucker conservation

Conservation Measures: FLSU1 and FLSU3

Location: Reach 3, Arizona/Nevada/California

Purpose: To evaluate habitat selection and use of juvenile flannelmouth suckers in Reach 3 and provide recommendations to enhance juvenile flannelmouth sucker habitats as a requirement of LCR MSCP habitat creation goals

Connections with Other Work Tasks (Past and Future): Work conducted under this task is related to Work Tasks C15 (closed) and C45 (closed).

Project Description: Flannelmouth suckers were reintroduced into the Colorado River below Davis Dam by the Arizona Game and Fish Department 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 from Davis Dam.

Five years of research on this population of flannelmouth suckers was completed under the LCR MSCP. All life stages of this species were contacted, and telemetry of adults provided insight on the movements and habitat use of adult flannelmouth suckers. Inference may be limited, as only nine juvenile flannelmouth suckers > 100 millimeters (mm) and < 350 mm total length were contacted during this study. Similar difficulties contacting juveniles were encountered during studies undertaken by the U.S. Geological Survey in the 20 river miles above Lake Havasu, but it was found that, while flannelmouth

sucker contacts were rare, the majority (85 percent) of flannelmouth suckers captured consisted of these smaller size classes. The habitats used by these younger fish will be better defined and will add to the current knowledge base for this species in Reach 3.

Previous Activities: A surrogate population of flannelmouth suckers from the Colorado River at the Lake Mead inflow was used to initiate telemetry work in FY13. In March 2013, 20 subadult fish were surgically implanted with a 90-day sonic transmitter, held at the Lake Mead Fish Hatchery and observed until determined healthy, then released downstream from Laughlin, Nevada. Active tracking using boats and manually controlled receivers was initiated immediately following release accompanied by submersible ultrasonic receivers (SURs) to help determine fish locations. Fish were tracked and habitat data were recorded until mid-June. Fish proved difficult to track with manual equipment, and the majority of detections were from SURs. Seven fish were either mortalities or never detected, and the majority of active tags (10 of 13) were only detected by SURs. Fish were detected in a mix of backwater and riverine habitats.

Work in FY14 was similar to that of FY13 but included the tagging of a total of 30 subadult flannelmouth suckers with sonic transmitters and an additional 8 with 100-day radio transmitters. The increased number of tagged fish, more SURs, and the use of radio tags resulted in an increase in manual tracking detections of fish during the field season. Sonic and radio tags were both effective, and habitat data were collected on 5 radio- and 13 sonic-tagged fish. In lower turbidity environments (i.e., main channel and select backwaters), fish were associated with stands of bulrush. Fish remained concealed during daylight hours and moved out during the evenings and night, presumably to forage, and then returned to similar locations each day. This association with emergent vegetation was not seen in habitats with higher turbidity; fish in these environments remained stationary in the open water of the backwater. Over the past 2 years, multiple fish have been detected for extended periods within the backwater at the Big Bend Conservation Area.

FY15 Accomplishments: Subadult flannelmouth sucker surrogates were collected from the Lake Mead inflow. Thirty of these were surgically implanted with 90-day sonic tags, and 12 were implanted with 100-day low-frequency radio transmitters. All tagged fish (sonic and radio) were released into Laughlin Lagoon in late April 2015. Manual tracking and deployment of SURs was initiated immediately following release of the SURs to help determine fish locations. Tracking and habitat data collections continued until late July. Sonic and radio tags were both effective, and habitat data were collected on 5 radio- and 18 sonic-tagged fish. Detections indicated that habitat use in turbid and low turbidity environments was similar to data from previous years. In addition, active tracking indicated that fish were moving around in open water in backwaters at night and were tracked up to a mile upstream and downstream from the Laughlin Lagoon entrance in the river channel. Fish would return to similar

locations of bulrush stands by daybreak. Three fish moved from Laughlin Lagoon to the Big Bend Conservation Area and spent from 1–3 weeks in the backwater.

FY16 Activities: Activities will be similar to those from FY15; however, the release locations will differ greatly. The study site will be shifted, and fish will be released into the large backwater/marsh habitats found in the 20 river miles immediately upstream of Lake Havasu in Topock Gorge. Age-0 flannelmouth suckers have been detected in seine hauls within this area, and subadults have sporadically been captured during other research and monitoring. Based on recent telemetry research and available habitats, this section of river presumably serves as nursery habitat for the Reach 3 flannelmouth sucker population.

Additional effort will be dedicated to investigating individual fish movements throughout the day and night.

Proposed FY17 Activities: Activities will be similar to those from FY16; specifics may vary depending on FY16 results.

We expect that this will be a multi-year effort and have estimated budgets through FY18. Budgets after FY16 have been reduced to reflect anticipated increases in efficiency resulting from combining these efforts with other ongoing monitoring in the area (Work Tasks C64 and D8).

Pertinent Reports: A summary report will be posted on the LCR MSCP Web site upon completion.

Work Task C57: Sonic Telemetry of Lake Mead Juvenile Razorback Suckers

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$250,000	$226,958.99	$541,878.93	$0	$0	$0	$0

Contact: Jim Stolberg, (702) 293-8206, jstolberg@usbr.gov

Start Date: FY13

Expected Duration: Closed in FY15

Long-Term Goal: Support razorback sucker conservation

Conservation Measures: RASU 6

Location: Reach 1, Lake Mead, Arizona/Nevada

Purpose: To investigate habitat use of immature razorback suckers and evaluate conditions that allow for natural recruitment of Lake Mead razorback suckers

Connections with Other Work Tasks (Past and Future): This work task is related to Work Tasks C13 and D8.

Project Description: From 1996 to 2011, 95 sonic-tagged adult razorback suckers have aided researchers in locating spawning populations of this species in Lake Mead and in understanding the habitat use and spawning preferences of the adult population. Trammel netting efforts during this time also provided valuable information on Lake Mead razorback sucker demographics and included the capture of over 100 juvenile/subadults. Limited effort has been expended trying to capture this young life stage, which is an important element in understanding why razorback sucker recruitment is occurring in Lake Mead. The habitat use of immature razorback suckers will be investigated through the use of sonic telemetry, and an attempt will be made to capture additional wild, immature razorback suckers through traditional fisheries techniques. A portion of the sonic-tagged fish will be released at different times during each study year to target and evaluate seasonal habitat use.

Previous Activities: This study builds upon work conducted on the Lake Mead adult razorback sucker population (Work Tasks C13 and D8).

Sonic telemetry of juvenile, Lake Mead razorback suckers was initiated in FY13 and continued in FY14. Eighteen juvenile razorback suckers were surgically implanted with sonic transmitters in May 2013 and released as three groups of six into Las Vegas Bay, Echo Bay, and the Muddy River/Virgin River inflow area. Six of these fish (233–246 millimeters [mm] total length [TL]) received 3-month transmitters, and 12 fish (270–295 mm TL) received 12-month transmitters. An additional 18 juvenile fish were surgically implanted with sonic transmitters in FY14 and released in the same locations as the previous year. Twelve fish (280–300 mm TL) received 12-month transmitters and were released as groups of four in March. The remaining six fish (237–255 mm TL) received 3-month transmitters and were released as three pairs in September. Active and passive sonic surveillance were used throughout both years to characterize the movements and habitats occupied by these juvenile fish as well as to provide locations for sampling efforts. Three months of intensive sonic surveillance and fish community sampling were conducted each year following the release of fish with 3-month transmitters in an effort to use these fish to capture additional wild, immature razorback suckers of this smaller size class. Contacts resulting from active sonic surveillance have allowed for quantification and assessment of over 350 habitat replicates. Individual fish were observed to use similar habitat throughout the lake regardless of location or season, associating with shallow, densely vegetated habitat in spring, deeper habitats with no apparent cover other than turbidity in summer and early fall, and a shift back to shallower habitats with cover during the fall months. While no additional wild, juvenile fish have been contacted through this effort, 11 adult razorback suckers were captured in direct association with sonic-tagged juvenile fish in Echo and Las Vegas Bays during FY14. Nine of these fish were new, wild captures, and although these individuals were relatively large in comparison to their sonic-tagged counterparts, similarities in behavior and habitat selection were observed. This discovery also highlighted the continued success in using sonic-tagged razorback suckers to locate additional wild individuals.

FY15 Accomplishments: An additional 18 juvenile razorback suckers were obtained from the Lake Mead Fish Hatchery (B6) and surgically implanted with sonic transmitters. Fish were again selected from two separate size classes of juveniles and received sonic tags with either a 3- or 12-month battery life. Eleven fish (281–299 mm TL) received 12-month sonic tags and were released into three study sites in Lake Mead (Las Vegas Bay, Echo Bay, and the Muddy River/ Virgin River inflow area) in May. This group allowed for sonic surveillance, characterization of movements, and habitat use assessments to be conducted throughout the year. Results from active sampling near sonic-tagged juveniles resulted in the capture of two new, wild razorback suckers. These fish measured 435 and 550 mm TL.

The remaining seven fish (210–245 mm TL) received 3-month sonic tags and were released at the same three study sites in December 2015 (FY16). Fish were released during this period to specifically target and evaluate habitat use during

the winter months. The intensive sonic surveillance and community sampling effort began with the stocking of these fish and will continue through February 2016. Intensive sampling will be conducted in areas where sonic-tagged fish are located and will include the use of electrofishing, minnow traps, hoop nets, trammel nets, fyke nets, and seines. Intensive sampling has not resulted in the capture of any additional razorback suckers to date; however, a suite of non-native fishes has been captured in association with sonic-tagged juveniles, including a 450-mm smallmouth bass with a juvenile razorback sucker sonic tag in its stomach. This juvenile was 230 mm TL at the time of its release.

Intensive sonic surveillance, habitat assessment, fish community sampling, and collection of physicochemical data associated with juvenile razorback suckers will continue through March 2016. A final annual report will be prepared following completion of the 2015–16 study period. Funds obligated in FY15 will be used to complete this effort; therefore, no additional costs will be incurred under this work task in FY16. Any assistance needed to support these field efforts in FY16 will be provided through efforts conducted under Work Task D8. A portion of these regular monitoring efforts will also be supported through system-wide monitoring (D8) into the future.

FY16 Activities: This work task was closed in FY15.

Proposed FY17 Activities: This work task was closed in FY15.

Pertinent Reports: Annual reports for the 2014–15 field seasons have been posted on the LCR MSCP Web site. The *Sonic Telemetry and Habitat Use of Juvenile Razorback Suckers in Lake Mead: 2015–2016 Annual Report* will be posted upon completion.

Work Task C59: Selenium Monitoring in Created Backwater and Marsh Habitats

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$250,000	$65,217.24	$110,385.45	$200,000	$160,000	$160,000	$160,000

Contact: Jim Stolberg, (702) 293-8206, jstolberg@usbr.gov

Start Date: FY13

Expected Duration: FY25

Long-Term Goal: To develop a long-term selenium monitoring plan for the LCR MSCP

Conservation Measures: MRM2 and MRM5 (BONY, RASU, CLRA, and BLRA)

Location: Big Bend Conservation Area (BBCA), Hart Mine Marsh, and the Imperial Ponds Conservation Area

Purpose: To evaluate the selenium levels within created backwater and marsh habitats and establish a selenium monitoring plan as required by the Habitat Conservation Plan

Connections with Other Work Tasks (Past and Future): Monitoring for selenium will be conducted for habitat created through Conservation Area Development and Management (Section E) work tasks (E1, E9, E14, E15 [closed], E16, E25, E27, and E28) and will be incorporated into Post-Development Monitoring (Section F) work tasks (F1, F3, F5, and F7).

Project Description: As described in the Habitat Conservation Plan conservation measures, 512 acres of marsh and 360 acres of backwaters are being developed under the LCR MSCP as part of its habitat creation goals. These created habitats will be monitored over the term of the program to ensure that they maintain their function for all associated covered species. Sampling efforts will be implemented or continued at designated project sites for the purpose of determining the baseline or changes in selenium concentrations. The initial sampling phase is expected to provide a representative baseline sample and assessment of variability across each site. Once this information is known, a long-term selenium monitoring plan can be recommended for each specific conservation area to be carried out under the appropriate Post-Development

Monitoring (Section F) work task. This baseline sampling phase may be established through a 1- or 2-year approach. If initial levels of detected selenium are well below thresholds of concern, followup sampling may not need to be conducted for a longer period and will be established as part of the long-term selenium monitoring plan for the site. If there is some concern regarding the initial levels of selenium, a second year followup sampling may be conducted to ascertain the relative rate of accumulation of selenium so that a more appropriate long-term monitoring plan can be established. Multi-year sampling can then be used to develop a larger dataset on which management decisions can be based through the adaptive management process. Subsequent years' sampling may be reduced as appropriate, and the frequency and levels of sampling intensity are expected to vary from site to site. Accordingly, annual expenditures are also expected to vary based on these levels of effort. As new conservation areas are developed, this exploratory sampling phase will continue to be accomplished under this work task.

Previous Activities: Sampling sites were identified in FY14 and included the BBCA, Hart Mine Marsh, and Imperial National Wildlife Refuge (Imperial NWR).

FY15 Accomplishments: Selenium monitoring was initiated in FY15. Water and substrate samples were collected from the BBCA, Hart Mine Marsh, and the Imperial NWR. Analyses of water samples from the Imperial NWR determined that current levels of dissolved selenium are below threshold water quality standards for fish and wildlife. Selenium concentrations were elevated in individual samples from the BBCA and Hart Mine Marsh, but the remaining samples contained concentrations below detection limits. Analyses of sediment samples from all three sites reported total selenium concentrations below detectable levels. In light of additional findings at an adjacent site, however, additional sampling will be conducted.

In addition to the three sites currently identified under this work task, a fourth site was also sampled during FY15 to collect baseline data for the reopening of Work Task E13. Water, substrate, plankton, and whole body fish samples were collected from McAllister Lake during FY15. Analyses of water and periphyton samples determined selenium concentrations to be well below threshold standards for fish and wildlife. Selenium concentrations were highest in sediment, plankton, and particularly in fish tissue samples, indicating a potential concern for accumulation. Selenium levels in McAllister Lake will need to be monitored into the future.

Original FY15 budget projections were based on a wide range of estimated costs associated with a relatively high degree of sampling intensity and analyses. The FY15 actual obligations represent the actual costs incurred by implementing the revised initial baseline collection scenario at a limited number of sites.

FY16 Activities: Water and substrate samples will again be collected at the BBCA, Hart Mine Marsh, and the Imperial NWR for comparison with baseline samples collected in FY15. Baseline sampling may also be expanded to the Laguna Division Conservation Area and Yuma East Wetlands. Laboratory analyses of water and substrate samples will be compared to selenium thresholds suggested by the U.S. Fish and Wildlife Service for aquatic species, and data will be summarized as they become available.

Proposed FY17 Activities: Selenium monitoring will continue at identified LCR MSCP conservation areas. Specific work proposed will be similar to the previous year and will include collecting water and sediment samples from each site, analyzing collected samples, comparing extant selenium levels to known thresholds, and summarizing data. Additional sites may also be included for pre- and/or post-development sampling as they are identified. Individual site evaluations will be conducted for each new site in order to determine sampling locations, number of samples, and expected level of effort.

Pertinent Reports: N/A

Work Task C60: Habitat Manipulation

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$100,000	$74,319.36	$120,067.55	$225,000	$175,000	$175,000	$175,000

Contact: John Swett, (702) 293-8555, jswett@usbr.gov

Start Date: FY13

Expected Duration: FY20

Long-Term Goal: Develop cost-effective management techniques and determine the timing and extent of management actions necessary for maintaining structural diversity in riparian habitats

Conservation Measures: MRM2, WIFL, YBCU, CLRA1, BLRA1, and LEBI1

Location: All current and future riparian LCR MSCP conservation areas

Purpose: The purposes of this work task are to identify riparian habitat areas in need of structural diversity enhancement and develop protocols to manage portions of LCR MSCP habitat creation sites. The intent is to use the results of this research to appropriately manage these successional stages of riparian habitat that are required by several covered riparian avian species and thereby meet established management guidelines.

Connections with Other Work Tasks (Past and Future): Research and monitoring data obtained from Work Tasks D1, D2, D3 (closed), E34, F1, F2, F7, G3, and G4 are used.

Project Description: The LCR MSCP riparian habitat creation sites are planted densely in order to reduce invasive species competition with native species and provide habitat for covered avian species. In natural systems where periodic flooding is a component of the system, portions of the habitat can be periodically disturbed and "reset" to earlier successional stages and increased structural diversity. Several covered avian species require as habitat early to mid-successional stages of native riparian trees. Over time, some of the LCR MSCP riparian habitat creation sites may grow beyond suitable habitat for some covered species unless management actions are taken.

Without the disturbance events that were once more common in the historic river hydrograph, direct manipulation of portions of these conservation areas may be required. Information will be provided to not only perform assessments but to provide protocols, which will guide the deliberate manipulation of these habitats to enhance structural diversity and produce the appropriate seral stages for covered species.

The objectives of the riparian study are to:

1. Provide a protocol for assessing areas for structural diversity and target areas that may require enhancement to meet management objectives. This will typically result in identifying areas that have at least 8 years of growth and that comprise more monotypic stands of riparian trees; however, the protocols that are developed may indicate longer or shorter durations based on measures of structural diversity.

2. Provide a protocol to guide cost-effective and appropriate manipulations of identified riparian habitats in order to reset portions of these areas to the earlier successional stages. Protocols that may be established could include, but are not limited to locations within stands for thinning, numbers or percent of trees per stand to be removed, height at which trees should be cut to encourage stump sprouting, and potential for in-planting in thinned areas to encourage species diversity as well as longer-term structural diversity.

3. Evaluate the timing and extent of manipulation necessary for maintaining multi-successional riparian habitat at the appropriate scale. Based on the collected data from this research, potential areas and the extent of manipulation for future areas may be predicted so that proper timing and budgeting for management can be more controlled and proactive. The funds for actual management action of conservation areas will be provided through each specific conservation area's work plan.

Changes in the hydrologic regime along the lower Colorado River have reduced the likelihood of marsh habitat being refreshed though active periods of flooding and removal of the vegetation structure. The covered marsh bird species thrive in marshes that function with ephemeral flooding and resetting of the habitat. Without flooding, active restoration and management of these marsh habitats is expected throughout the life of the LCR MSCP. The current literature suggests that burning of the marshes' decadent dry material allows for new habitat to emerge.

The objectives of the marsh study are to:

1. Provide a protocol for assessing areas at various spatial scales that are no longer providing habitat for the covered marsh birds

2. Provide a protocol to guide cost-effective and appropriate manipulations of marsh in order to reset portions of these areas to the earlier successional stages

3. Evaluate the timing and extent of the manipulation necessary for maintaining a mosaic of a functioning marsh

Previous Activities: In FY13, a literature review was completed on riparian stand thinning/manipulations to determine the best approaches for achieving the desired habitat structure and to determine the measured parameters needed to indicate success. The best approaches for assessing habitat diversity in different structure types were tested to identify study sites with low structural diversity and/or those with later successional stages of growth. A supplemental literature review was conducted on the habitat requirements and limitations of the southwestern willow flycatcher and yellow-billed cuckoo. The addition of species habitat parameters was needed to assist in defining what vegetation parameters could be manipulated.

Following the literature review, two strategies were investigated to assess structural diversity: (1) field-based methods (laser and terrestrial light detection and ranging sensing [TLS]) and (2) the analyses of remote sensing (airborne light detection and ranging sensing [ALS]) data. Both methods were used to identify vegetation strata and their relative heights at a site within the plot. Additionally, statistical tools were developed to assess the diversity of this vegetation data at multiple spatial scales (e.g., plot, patch, restoration area, etc.).

FY15 Accomplishments: Field method testing using TLS and ALS continued. The collected data continued to be used to investigate the power of the indices to describe structural diversity. Statistical geographic tools continued to be developed to assess the diversity at multiple spatial scales (e.g., plot, patch, restoration area, etc.) of these vegetation data.

A literature review was initiated to gather information to better manage marsh habitats.

FY16 Activities: Field method testing will continue, and following testing, the ALS and TLS data collected will be used to investigate the power of the indices to describe structural diversity. An evaluation of the ALS and TLS methods will be conducted to assess what level of data collection is needed based on specific

management questions. Statistical geographic tools will continue to be developed to assess the diversity at multiple spatial scales (e.g., plot, patch, restoration area, etc.) of these vegetation data.

The literature review will continue in order to gather information to better manage marsh habitats.

Proposed FY17 Activities: A monitoring protocol will continue to be tested following assessment of the ALS and TLS methods. The evaluation of these methods will continue in order to assess the level of data collection needed based on specific management questions. Potential management tools will be identified for further evaluation. Additional research will be conducted on the feasibility of implementing habitat management strategies when conditions within created habitat warrant their use.

Development of a marsh habitat manipulation protocol will begin with recommended methods for manipulation and the timing of needed manipulation.

Pertinent Reports: N/A

Work Task C61: Evaluation of Alternative Stocking Methods for Fish Augmentation

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$425,000	$188,348.83	$209,893.35	$200,000	$300,000	$300,000	$0

Contact: Jim Stolberg, (702) 293-8206, jstolberg@usbr.gov

Start Date: FY14

Expected Duration: FY18

Long-Term Goal: Maintain the effectiveness of the LCR MSCP Fish Augmentation Program

Conservation Measures: RASU3, RASU5, RASU6, BONY3, and BONY5

Location: The lower Colorado River within the LCR MSCP planning area, including reservoirs and connected channels from Lake Mead downstream to Imperial Dam

Purpose: To evaluate the effects alternative stocking methods have on survival of razorback suckers and bonytail stocked within the LCR MSCP planning area

Connections with Other Work Tasks (Past and Future): Related work tasks include B2, B3, B4, B5, B6, C10 (closed), C11 (closed), C26 (closed), C31, C33 (closed), C39 (closed), C46 (closed), C63, C64, D8, and G3. In FY15, Work Tasks C10 and C11 were incorporated into this work task due to similarities in purpose, scope, and out-year implementation. Specific activities will be detailed in this work task, and the proposed fiscal year budgets will reflect the work that is to be undertaken.

Project Description: Extensive monitoring of Colorado River native fishes is a commitment under the LCR MSCP, and in accordance with the Habitat Conservation Plan, several monitoring and research elements have been included as part of the LCR MSCP Fish Augmentation Program. Two of these research elements will be addressed, including: (1) understanding and minimizing adverse effects of stocking and (2) understanding post-stocking distribution and survival. Alternative stocking methods will be evaluated for razorback suckers and bonytail within the LCR MSCP Fish Augmentation Program boundaries and may include stocking during different seasons, stocking at night, stocking cohorts of various quantities, and stocking at specific locations. These alternative methods will

generally be evaluated through multiple iterations of paired stockings, with one group representing the more traditional stocking and one representing the alternative method being investigated.

In addition to these alternative stocking methods, fish reared by alternative means may also be evaluated through these efforts. These treatments will then be used to test whether different types of conditioning will translate to improved survival of stocked fish. To test the effectiveness of these alternate rearing treatments, stockings would be completed in paired groups and may include fish that have been either flow conditioned or trained to recognize predators. Information regarding post-stocking distribution and survival will be obtained through ongoing research and monitoring work tasks (C64 and D8). As information on these stockings becomes available, different combinations of these alternative stocking methods and treatments may also be evaluated.

Previous Activities: Previous research related to this work task was conducted under Work Task C26 in FY09–11. Feeding rates, efficiency of food conversion, growth, swimming performance, and physical condition of razorback suckers reared in flowing raceways at the Lake Mead Fish Hatchery were evaluated. The results from multiple iterations of this research showed that razorback suckers reared at the highest velocity flows evaluated, 38 and 39 centimeters per second, exhibited the most growth, highest food conversion efficiency, and best swimming performance. Additional rearing of native fish under flowing conditions will be conducted as part of the current work task, and future monitoring efforts will be used to evaluate how the benefits of this rearing strategy relate to post-stocking survival of native fishes.

A total of 23,251 razorback suckers were repatriated into Lake Mohave during FY13 and FY14 as 11 paired cohorts released in day and night stocking events. All efforts associated with these stocking events were captured under Work Task B2. Approximately 2% of FY13 releases had been captured or contacted through monitoring efforts at the end of FY14, with little difference observed between day or night releases. Additional capture and contact data for FY13 and FY14 cohorts will be obtained through future year monitoring efforts and evaluated under this work task to determine the effectiveness or benefit of night stockings as compared to traditional day stocking events.

A portion of FY14 funding was also obligated to upgrade the electrical capabilities at the Lake Mead Fish Hatchery in preparation of future flow conditioning efforts. This upgrade will support the operation of submersible propeller pumps, which will allow for controlled flow in ten 40-foot raceways. Monitoring data from flow-conditioned and static-reared cohorts will be analyzed under this work task to evaluate differential survival.

FY15 Accomplishments: Razorback sucker capture and contact data collected through ongoing monitoring efforts were analyzed during FY15 to evaluate the results from previous year day/night paired releases. Through FY15, approximately 2.2% of FY13 and < 1% of FY14 releases had been captured or contacted through monitoring efforts. These figures represent similar contact rates as those observed for traditional stockings; however, while little difference has been observed between fish contacted from FY13 day or night releases, approximately 67% of contacts from FY14 releases represent fish stocked at night. Lake Mohave monitoring data collected through Work Task D8 have demonstrated that stocked fish are often not contacted for up to 3 years post-release. For this reason, these cohorts will continue to be tracked in future years, as it may require multiple years of data to evaluate this alternative stocking method.

During FY15, the Willow Beach National Fish Hatchery repatriated 14,472 razorback suckers into Lake Mohave as 7 paired cohorts released in day and night stocking events. Cohort size, time of year, and locations of stockings were all similar to those of previous years. Capture and contact data for these cohorts will be obtained through ongoing monitoring efforts and evaluated under this work task in future years to determine the effectiveness or benefit of this alternative stocking method.

Six mesocosm research ponds were constructed and lined at the Valle Vista Country Club, Kingman, Arizona, for predator avoidance trials. Electrical service was run to the ponds for the installation of 12 (2 per pond) permanent submersible passive integrated transponder tag detection antennas. The Arizona Game and Fish Department has been rearing razorback suckers and bonytail to the desired size for these experiments.

FY16 Activities: FY16 will be the first of three study years in which survival of razorback suckers stocked into Lake Mohave will be compared using cohorts of different quantities. Approximately 7,000 razorback suckers will be stocked at four locations over a 3-week period, with each location receiving a different-sized cohort (250, 500, or 1,000 fish) each week. The total number of razorback suckers stocked at each location will be the same; however, cohort stockings will be staggered so that no more than two locations receive the same number of fish during any one week. Capture and contact data for these cohorts will be collected under this and other work tasks, and data will be analyzed as they become available.

Paired stockings of flow-conditioned and static-reared razorback suckers will occur in FY16 pending completion of the Lake Mead Fish Hatchery electrical upgrade. Cohort sizes may be small during the initial study year due to availability of suitably sized fish; however, they are expected to increase in

future years as additional fish are brought on station. Fish reared at the Lake Mead Fish Hatchery will be released in Reach 2 or 3, and data will be collected through ongoing monitoring.

Mesocosm-based post-conditioning survival trials for bonytail in the presence of largemouth bass and channel catfish simultaneously will be completed in FY16. Repeated conditioning may increase the likelihood of "learning" a behavior as compared to fish conditioned for only a single time.

Proposed FY17 Activities: The potential benefits of alternative stocking methods will be analyzed. An evaluation of cohort size and stocking of flow-conditioned and static-reared native fishes will continue. Mesocosm-based post-conditioning survival trials will also continue for bonytail and will be expanded to razorback suckers in FY17. Predator presence and conditioning frequency will be used as factors with both largemouth bass and channel catfish simultaneously. Separate groups of razorback suckers and bonytail will be exposed to three treatments: no conditioning events, a single predator conditioning event, or three predator conditioning events. Survivorship will be assessed over a 30-day trial period. Other alternatives to traditional stocking will be evaluated during the year, and potential opportunities to implement these alternatives will be assessed as fish become available. The increased budget projections for FY17 are to compensate for the expansion of these research efforts and for the preparation of treatment batches of these fish for paired-release stocking and long-term monitoring.

Pertinent Reports: N/A

Work Task C62: Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$180,000	$175,622.04	$251,387.83	$150,000	$25,000	$0	$0

Contact: Allen Calvert, (702) 293-8311, acalvert@usbr.gov

Start Date: FY14

Expected Duration: FY17

Long-Term Goal: To gather data on the ecology and habitat of the lowland leopard frog and Colorado River toad to evaluate the feasibility of implementing a pilot introduction into unoccupied habitat

Conservation Measures: LLFR1, LLFR2, LLFR3, CRTO1, CRTO2, and CRTO3

Location: LCR MSCP planning area and the Bill Williams River, Agua Fria River, and Verde River watersheds

Purpose: The purpose of this work task is to document lowland leopard frog and Colorado River toad habitat characteristics and measurable ecological factors that may limit each species' distribution. This will inform future decisions on the feasibility of establishing lowland leopard frogs and Colorado River toads in an unoccupied habitat.

Connections with Other Work Tasks (Past and Future): Preliminary data collected under Work Task D12 will be expanded upon in this study.

Project Description: Surveys for lowland leopard frogs and Colorado River toads in the past have located very few populations in the LCR MSCP implementation area, and habitat requirements are not well documented. Surveys for both species will be conducted to find breeding areas and document egg mass locations and measurable habitat parameters at breeding sites. Habitat parameters may include presence of non-native predators, minimum and maximum water depth and temperature, substrate type (e.g., gravel and sand), water temperature, pH, turbidity, stream discharge, and vegetation composition. As the Bill Williams River is the only known occupied area for either species within the LCR MSCP implementation area, other similar river systems may be surveyed so the sample size will be statistically robust to support research findings.

Previous Activities: Field work began in July 2014 to locate occupied breeding habitat for the Colorado River toad within the Bill Williams River, Agua Fria River, and Verde River watersheds. Breeding was confirmed in all three watersheds, with the majority occurring at Adobe Dam in the Agua Fria River watershed.

FY15 Accomplishments: Lowland leopard frog breeding sites were found, and over 60 lowland leopard frog egg masses were documented. Habitat data were collected, including location, associated vegetation, water depth, water temperature, egg mass dimensions, pH, air temperature, and distance to cover and land. Sufficient lowland leopard frog egg and breeding habitat data were collected in FY15 for analyses, so additional egg mass searches will not be needed. Surveys were conducted for Colorado River toad breeding sites, but no egg masses were found in FY15.

FY16 Activities: Monitoring for the Colorado River toad was completed in the fall of 2015, and no egg masses were found. Colorado River toad habitat will be characterized with available data (19 egg masses detected in FY14). If egg masses for either species are found during work conducted under Work Task D12, habitat data may be collected opportunistically.

Proposed FY17 Activities: Data analyses and the final report will be completed.

Pertinent Reports: The *Ecology and Breeding Habitat of Colorado River Toads – 2015 Annual Report* will be posted on the LCR MSCP Web site upon completion.

\

Work Task C63: Evaluation of Habitat Features that May Influence Success of Razorback Suckers and Bonytail in Backwater Environments

FY15 Estimate	FY15 Actual Obligations	Cumulative Accomplishment Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$125,000	$102,751.51	$102,751.51	$135,000	$150,000	$150,000	$0

Contact: Jeff Anderson, (702) 293-8216, jranderson@usbr.gov

Start Date: FY15

Expected Duration: FY18

Long-Term Goal: To inform future design and management of created backwater habitats

Conservation Measures: BONY3, BONY5, RASU3, RASU5, and RASU6

Location: Reaches 2–5

Purpose: To provide information on how natural and artificial habitat features are used by razorback suckers and bonytail and their relative importance for influencing survival and long-term success

Connections with Other Work Tasks (Past and Future): This work task represents the merger of two previously funded work tasks: C41 and C58. This work task is related to all work tasks in Fish Augmentation (Section B) that provide razorback suckers and bonytail for augmentation stocking, specifically Work Tasks B7, C23 (closed), and F5. The results of investigations that occur under this work task may indicate that future stocking treatments will need to be tested (C61) or modified (Section B work tasks).

Project Description: The activities covered under this work task both consolidate and build on the work that has been undertaken and accomplished under Work Tasks C41 (closed) and C58 (closed). The combination of these work tasks represented a logical merger because of their similarities in scope and intent and potential overlap in ongoing experimental investigations.

Habitat features are important to success (growth, survival, and reproduction) of fishes in aquatic environments. In particular, structural features such as submerged woody debris, reefs, rock cavities, and submerged vegetation can provide cover for multiple life stages of fish. Cover allows fish to hide and rest

and can be vital to survival by allowing fish to avoid predation through both concealment and direct protection. The types of features (both artificially constructed and those that are existing/natural) that may be used by native fishes will be investigated. The use of other forms of cover, such as aquatic vegetation and turbidity, may also be investigated to determine which of these types of features plays a more important role as cover for razorback suckers and bonytail. These features may be important, especially in created backwater environments where they may not be present or may not be in sufficient quantities, to promote the success of these species. By including these features in created backwaters, both immediate and long-term survival and success may improve. This work task was created to:

- Inform managers of habitat structures to include when designing and creating backwaters

- Help improve existing created backwaters by providing options for adding structural elements (both "natural" and artificial) to afford adequate cover

- Potentially assist in improving post-stocking survival by suggesting stocking sites with adequate cover or adding features to stocking locations to provide cover from predatory fish and/or piscivorous birds

Previous Activities: Detailed accounts of work and accomplishments covered under Work Tasks C41 (closed) and C58 (closed) have been reported under these tasks and in their associated technical reports. This work includes monitoring the use of artificial habitat features in Davis Cove (on Lake Mohave) by both razorback suckers and bonytail. Investigations have also been ongoing to characterize the existing riprap shoreline at High Levee Pond because of documented frequent use of its cavities by bonytail. Preliminary investigations suggested that bonytail regularly used both artificial (constructed and installed) and more "natural" existing structures (riprap) as cover. No difference has been detected in the use of these features by razorback suckers, and this suggested that this species may use other forms of cover; aquatic vegetation and/or turbidity have been speculated as potential cover used by razorback suckers.

FY15 Accomplishments: Cavity selection trials were completed at the Lake Mead Fish Hatchery. These investigations were conducted to help refine the types of artificial cover that may be used by bonytail by providing different-sized openings in constructed artificial habitat structures. Bonytail of similar size classes were provided with cover that had three different entrance sizes and monitored to see which cavities were selected in greater frequency. Data will be analyzed in FY16.

On March 20, 2015, 400 passive integrated transponder (PIT)-tagged bonytail were stocked into Davis Cove. Mean total length and weight of bonytail were 176 millimeters and 59 grams, respectively. Artificial habitat with integrated PIT

tag scanning antennas and control antenna pairings used were the same as those described in FY15 Work Task C41 (closed). These were deployed in four sites within Davis Cove to increase replication of the study. A total of 11 scanning weeks/intervals were completed between April 6 and September 14, 2015. A total of 17 successful pairings between a habitat and its associated control antenna were completed despite several issues with the deployed scanning units. Of these 17 pairings, bonytail selected habitat over the control 15 percent of the time.

Water quality parameter profiles were taken near the center of Davis Cove once at the beginning of each scanning interval. On September 4, 2015, multiple year classes of razorback suckers and bonytail were seen along the western shoreline of Davis Cove in less than 1 foot of water. These fish were exhibiting signs of oxygen-seeking behavior, which was a response to a drop in dissolved oxygen caused by an unknown reason. A water quality profile on September 4 revealed that dissolved oxygen in Davis Cove was below 0.11 milligrams per liter throughout the water column. It is possible that any habitat associations recorded just prior to or immediately following this observed event could have been cofounded by this water quality change due to obvious changes in behavior. These pairings, therefore, may be removed from the analysis.

FY16 Activities: Dissolved oxygen in Davis Cove returned to normally observed levels on October 19. Water quality will be more closely monitored in FY16 to account for potential confounding factors in this study with respect to normal behavior. PIT tag scanning with smaller submersible units was performed in October, November, and December 2015 with the intent to track the fishes that survived the low dissolved oxygen levels in Davis Cove.

Investigations of the selection and use of artificial structures in Davis Cove will continue, with an emphasis on habitat use by bonytail. These investigations will be similar to previous years, with the intention of providing a comparable dataset for analyses and to incorporate any refinements from previous years' lessons learned.

Cavity selection trials will continue at the Lake Mead Fish Hatchery. The proposed budget estimate for FY16 includes the purchase of additional scanners and the construction of additional habitat structures for testing and deployment.

Proposed FY17 Activities: Depending on the results and analyses of FY16 habitat selection trials at Davis Cove, the artificial habitat selection study may be expanded to include tests in environments occupied by non-native predatory fish species. Investigations will expand to identify other types of cover habitats that may benefit razorback suckers, including vertical structures and turbidity, if deemed practical. Budget estimates for FY17 reflect this study expansion.

Pertinent Reports: All findings and statistical analyses will be presented in a report titled *Evaluation of Habitat Features that may Influence Success of Razorback Sucker and Bonytail in Backwater Environments: 2015*, and it will be posted on the LCR MSCP Web site upon completion.

Work Task C64: Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail

FY15 Estimate	FY15 Actual Obligations	Cumulative Accomplishment Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$700,000	$686,445.37	$502,874.59	$700,000	$750,000	$750,000	$750,000

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

Start Date: FY15

Expected Duration: FY27

Long-Term Goal: To maintain an effective LCR MSCP Fish Augmentation Program

Conservation Measures: BONY3, BONY 4, BONY5, RASU3, RASU4, and RASU6

Location: Reaches 2–5

Purpose: To provide information on movement, distribution, and habitat use of stocked razorback suckers and bonytail and to use this information to set up an appropriate monitoring network to suggest potential stocking locations and track post-stocking survival

Connections with Other Work Tasks (Past and Future): This work task represents the merger of three previously funded work tasks: C39, C45, and C49. The intent of this combination was to capture these activities with similar purposes and scope into a consolidated, multi-reach effort for both razorback suckers and bonytail. This work task is related to Work Tasks B2, B3, B4, and B6, all of which provide razorback suckers and bonytail for augmentation stocking and may also build on information gained in Reach 1 through Work Tasks C13 and C57. Information collected under this work task will be added to the database used to complete Work Task D8. This work task also has a past relationship with Work Task C8 (closed) and is expected to have future interactions with Work Task C61 or other work tasks that can benefit from the information and/or the monitoring network created under Work Task C64. Funds from Work Task G3 were provided in FY14 to accomplish preliminary work in Reach 2 that will be covered by this work task in FY15.

Project Description: The activities covered under this work task both consolidate and build on the work that has been undertaken and accomplished under closed Work Tasks C39, C45, and C49. The approaches used to identify appropriate stocking locations throughout Reaches 2–5 will be formalized, which will be accomplished through pilot releases of tagged fish to identify dispersal and movement of individuals or groups of fish. Information on preliminary post-stocking habitat selection and use and survival will be provided and can then be used to: (1) establish a more appropriate monitoring network in terms of where to locate remote sensing equipment or other sampling gear with higher probabilities for contacts, (2) indicate locations that may be better suited for stocking fish, and (3) possibly identify additional aggregations of native fishes.

The networks that are established under this work task will also provide monitoring information on the effectiveness of different stocking treatments (conducted under Work Task C61) as well as longer-term information on survival, habitat use, and movement of native fishes in these reaches. Eventually, these established long-term monitoring networks may be used for system-wide monitoring and would be covered under Work Task D8.

Previous Activities: Detailed accounts of work and accomplishments covered under closed Work Tasks C39, C45, and C49 have been reported under these tasks and in their associated technical reports. They include the tracking and monitoring of stocked razorback suckers and bonytail in specific areas in Reaches 3 and 4. Post-stocking movement and habitat use have been documented, and post-stocking survival estimates have been developed for razorback suckers and/or bonytail in these reaches.

FY15 Accomplishments:

Reach 2: Nineteen adult razorback suckers were captured from Lake Mohave in February 2015, implanted with 3-year sonic tags, and released back into the lake in March. These fish were released as two groups, with 9 released at Willow Beach (River Mile 52) and 10 released at Katherine Landing (River Mile 2). The fish were monitored monthly through passive and active tracking, which allowed for identification of large-scale movements and use of specific habitats, respectively. Based on passive contacts, fish were observed to disperse throughout the lake within approximately 3 months of release, often traveling more than 40 miles from their release location. Active contacts provided information regarding seasonal habitat use, with fish using deeper, mid-channel habitat in late spring and summer and shallow inshore habitat in late fall. Approximately 50% of sonic-tagged razorback suckers were observed to return to their point of capture within 11 months following release.

Reach 3: FY15 was the last year of a 5-year project to look at the habitat use of razorback suckers in eight backwaters and the lower Colorado River from Park Moabi downstream to the Lake Havasu delta. During FY15, two trammel

netting efforts (November and February) and monthly passive integrated transponder (PIT) scanning efforts were completed. During the 5 years of trammel netting (2011–15), 556 unique razorback suckers were contacted, and 3,770 unique razorback suckers were contacted during the 3 years of PIT scanning (2013–015). Backwater monitoring with both trammel nets and PIT scanners had a similar pattern of contacting recently released fish (< 3 years), and 42% of fish contacted by both trammel net and PIT scanner were released within 1 year.

Razorback catch per unit effort for trammel nets and PIT scanners was much higher in Park Moabi when compared to the seven other backwaters: 78 razorback suckers per 1,000-square-meter trammel net were contacted in Park Moabi compared to less than 10 razorback suckers per same-sized trammel net in the other seven backwaters. Scanning catch per unit effort was similar to trammel netting: the contact rate at Park Moabi was estimated to be 35 razorback suckers per 1,440 minutes of scanning compared to < 4 razorback suckers per 1,440 minutes of scanning in the other seven backwaters. Water quality is distinctly different in Park Moabi (primarily lower in temperature). It is suggested that the composition of aquatic vegetation is a likely result of these different limnological characteristics. Razorback suckers have been more frequently associated with the vegetation that predominates in Park Moabi as opposed to different vegetation types that typify the other backwaters that were sampled. The greater razorback sucker contact rates in Park Moabi suggest selection for these specific habitat features. These features may also be contributing to improved long-term survival; Reach 3 monitoring accomplished under Work Task D8 has shown that Park Moabi stocking cohorts have relatively higher re-contact rates, which may be an indication of increased survival.

Bonytail survival, distribution and habitat use was assessed at two different locations in FY15: Bill Williams River in the fall of 2014 and Park Moabi in the spring of 2015. Information was obtained through the use of sonic telemetry and remote PIT scanning. The Bill Williams River release site continues to result in low re-contacts for bonytail; 17 of 19 telemetered fish were confirmed mortalities within 1 month of tracking. Of the remaining two fish, only one fish was active, and another left the study area. Four of 14 study fish released in Park Moabi were confirmed mortalities, 1 left the study area, and 9 were lost (not recorded as leaving the study area – potential bird depredation) within the study area. Active contacts for telemetered fish within Park Moabi occurred in bulrush 20% of the time, and there were several other direct observations of non-telemetered bonytail also in bulrush.

Remote PIT scanning for these two locations shows that initial contact rates are high within the first weeks post-release and then drop rapidly in subsequent weeks. The Bill Williams River study resulted in the contact of 84% of the released fish within the first 2 weeks and less than 5% by week three. Similarly, the Park Moabi study resulted in the contact of 73% of the released fish within the

first 2 weeks and approximately 8% by week three. Apparent daily survival for Park Moabi fishes is approximately 93%, which is considerably higher than the previous estimate of 71% at Blankenship Bend.

Reach 4: A total of 1,797 razorback suckers and 4,864 bonytail were stocked within Reach 4, downstream of Palo Verde Diversion Dam, during the calendar year. Per the study plan for Reaches 4 and 5, monthly PIT tag scanning surveys below Palo Verde Diversion Dam began in November 2014 (FY15). Efforts involved deploying 12–14 PIT tag scanners within the main stem river as well as the backwaters from River Mile 94 to River Mile 120. Scanners were set overnight and then retrieved, data downloaded, and the scanners then redeployed in another location on the following day. Over the 11 months of scanning in FY15, 236 razorback suckers and 258 unique bonytail were contacted. Of these 258 bonytail, 222 were scanned within 4 days after their release into the A-10 backwater on September 23, 2015.

One netting survey in February 2015 resulted in the capture of three bonytail in the A-7 backwater. These fish were stocked on December 10, 2014, at the A-10 backwater, which is about 5 miles downstream from the A-7 backwater. In February 2015, 18 razorback sucker larvae were also collected from five different backwaters that were connected to the main stem river.

Reach 5: No fish were stocked into Reach 5; however, there is no physical barrier to prevent fish movement between Reach 4 below Palo Verde Diversion Dam and the upper section of Reach 5. Per the study plan for Reaches 4 and 5, monthly PIT tag scanning surveys below Palo Verde Diversion Dam began in November 2014.

Efforts involved deploying 12–14 PIT tag scanners within the main stem river as well as the backwaters from River Mile 54 to River Mile 60, within Reach 5. Scanners were set to operate overnight and then retrieved, data downloaded, and the scanner then redeployed in another location the following day. One razorback sucker was contacted in FY15 in a side channel on the California bank, about 0.80 river mile downstream of Ferguson Lake in Reach 5. One night of netting was conducted in Martinez Lake in February 2015; no native fishes were captured during this event. Later in February 2015, three razorback sucker larvae were collected from two different backwaters, Fisher's Landing and Martinez Lake, which were connected to the main stem river in Reach 5.

FY16 Activities: The budget estimates reflect the projected costs for FY16 from combined closed Work Tasks C39, C45, and C49 plus the additional work described below for Reaches 2, 4, and 5.

Reach 2: Nineteen bonytail were obtained from the Lake Mead Fish Hatchery (B6), implanted with 9-month sonic tags, and released into Lake Mohave with a cohort of approximately 400 bonytail in early FY16. These fish were released at

Arrowhead Cove, a site where bonytail were historically captured. Active tracking was conducted intensively for 6 weeks after release to maintain contact with these fish. Less intensive active tracking and continuous passive tracking will continue throughout FY16.

Sonic tags from the FY15 study year are near the end of their battery life, so an additional 20 bonytail will be implanted with sonic tags and released at locations in the lake where they were historically found. Following release, fish will be intensively tracked to evaluate dispersal, movement patterns, habitat selection, and survival rates. Data gathered from this effort will be used to inform managers of future stocking of bonytail in Lake Mohave to meet LCR MSCP commitments.

Sonic-tagged razorback suckers released in FY15 will also continue to be tracked as part of this effort, as this work can be performed concurrently and will help to maximize resources and the use of acquired equipment. Tracking of razorback suckers will be used to evaluate movement patterns, seasonal habitat use or preference, and spawning site fidelity. Contacts with sonic-tagged razorback suckers will also be used to inform sampling locations for ongoing monitoring efforts.

Reach 3: Due to promising flannelmouth and razorback sucker observations in Laughlin Lagoon, an additional iteration of bonytail telemetry and PIT scanning was initiated. This release also included radio-tagged fish to help determine the fate of fish lost within the study area. As with previous iterations, relative survival and habitat usage will be evaluated.

Reaches 4 and 5: Razorback sucker and bonytail stockings, as well as survey and monitoring efforts below Palo Verde Diversion Dam, will continue in FY16. Monthly PIT tag scanning surveys for FY16 began in October 2015 and will continue through September 2016. One netting survey in November 2016 resulted in the capture of two razorback suckers and seven bonytail. One electrofishing survey in the main stem river and two backwaters (A-7 and C-7) in December 2016 resulted in 14 razorback suckers and 1 bonytail captured. The razorback suckers were released 1 week prior to the survey.

Sonic telemetry of razorback suckers and bonytail will begin in the spring of 2016. Surveys and monitoring efforts below Palo Verde Diversion Dam will be used to inform managers of potential release locations in this portion of Reach 4.

Proposed FY17 Activities: Proposed activities for this work task have been summarized by river reach. Paired experimental releases of razorback suckers and bonytail exposed to predator avoidance conditioning and non-conditioned fish will be initiated. The location for the experiment is undecided, but one will be selected based on conditions suited for the experiment. Increases in the budget estimates for FY17 and out-years are in preparation for potential experimental stocking efforts and associated monitoring in Reaches 4 and 5.

More intensive monitoring is expected to commence along with the increased yearly experimental stocking numbers of razorback suckers and bonytail in these reaches. In order to offset some of the costs of this work task, monitoring efforts under Work Task C64 will be reduced in Reach 3 until hatchery rearing capacity is sufficient to allow the increased experimental stocking rates to commence in Reach 3. Overall increases in expenditures are still expected, however, due to the size, complexity, and accessibility issues involved in conducting work in Reaches 4 and 5.

Reach 2: Sonic-tagged razorback sucker monitoring will continue. Continued releases of sonic-tagged bonytail will also occur in Lake Mohave and will build upon the results from previous years.

Reach 3: No work is scheduled from this work task for this reach.

Reach 4: Surveys and monitoring efforts will continue in FY17. Collected data will be used to inform managers of potential release locations in Reach 4.

Reach 5: Pilot releases of pit-tagged and sonic-tagged razorback suckers and bonytail will occur in a number of locations in Reach 5.

Pertinent Reports: A report summarizing the Reach 3 bonytail work for the past several years will be posted on the LCR MSCP Web site upon completion.

Work Task C65: Evaluation of Immediate Post-Stocking Survival of Razorback Suckers and Bonytail

FY15 Estimate	FY15 Actual Obligations	Cumulative Accomplishment Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$60,000	$20,738.26	$20,738.26	$120,000	$120,000	$120,000	$0

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

Start Date: FY15

Expected Duration: FY18

Long-Term Goal: To maintain an effective LCR MSCP Fish Augmentation Program

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

Location: Reaches 2–5

Purpose: To identify the most important sources of immediate post-stocking mortality and to inform managers of how to best target and prioritize solutions

Connections with Other Work Tasks (Past and Future): This work task is related to Work Tasks B2, B3, B4, C10 (closed), C11 (closed), C46 (closed), and C61. Preliminary planning, acquisition of materials, and study design development will occur in FY14 with funds from Work Task G3.

Project Description: Observations from past stocking events have indicated relatively high and immediate post-stocking mortality of razorback suckers and bonytail. This pattern appears more commonly in backwater situations and occurs even in instances where no or low numbers of predatory fishes are present and where water quality parameters should not be a source of mortality. Transport and handling stress and predation by piscivorous birds have been suspected as causes of this low survival. Only anecdotal evidence exists to support the speculation that piscivorous birds are the major cause of this mortality, and although handling and transport stress have been measured for stocked fishes, little evidence exists that connects this stress to actual latent mortality.

This work task builds directly on the knowledge gained from Work Task C46 (closed) and takes the next step from observing stress indicators in stocked fishes to investigating how this translates into actual latent post-stocking mortality. This work may involve holding a subset of stocked fishes in a protected area for observation and recording survival rates after 24, 48, and 72 hours. Longer durations may also be explored if deemed necessary. A subsample of these fishes may also have their blood tested for levels of stress-indicating compounds.

In addition, a bioenergetics model of piscivorous bird predation will be further developed and tested, and observational studies may be employed to help calibrate the model. These studies may include performing counts of confirmed feeding of piscivorous birds on stocked razorback suckers and bonytail. This model is intended to help inform managers of the relative pressure that bird predation may be having on stocked native fishes.

Data collected during this study will be used to assess the effect of stocking treatments relative to stress-related mortality, bird predation, or other factors that may be accounting for immediate post-stocking mortality and will allow managers to better prioritize and target solutions, like those being tested under Work Task C61, or find new ways to improve survival of stocked fishes by identifying what factors are the greatest sources of immediate mortality.

Previous Activities: This was a new start in FY15. Previous activities have been conducted under Work Task G3 and included the development of a protocol and study plan to assess latent mortality of stocked fish. The development of a bioenergetics model was initiated in FY14. The purpose of the model was to suggest the potential pressure that available piscivorous birds could exert on stocked fish.

FY15 Accomplishments: Latent mortality within the first 72 hours following stocking of razorback suckers in Reach 2 was evaluated. No mortality was observed in the first 72 hours of stocking within the subsample of fish that was held at the stocking location.

Preliminary efforts, initiated under Work Task G3, were made to document bird predation on native fishes using remote passive integrated transponder (PIT) tag scanners as well as scanning beneath known roosts of piscivorous birds. Scanning was initiated in Laughlin Lagoon following a bonytail release in September 2015. Scanners were deployed on the tops of poles out of the water within the stocking area where cormorants were regularly observed. Game cameras were attached to the scanners to document bird usage and to correlate any PIT tag contacts with a particular species of bird. Two PIT tags were detected on multiple scanners within 24 hours post-release, and photo corroboration confirmed that the fish were consumed by a cormorant.

Additional scanning beneath the known roost sites in the lagoon documented 23 stationary tags that are assumed to be from deceased fish. These tags were from fish which had been released throughout the LCR MSCP area, and some were from fishes released as early as 2003.

The energy content (measured in calories) of razorback suckers and bonytail was planned to be collected and assessed in-house; however, specialized equipment was not available on loan or to rent, and the equipment cost for a single experiment could not be justified. This portion of the bioenergetics model development was postponed, and consequently, the FY15 budget expenditures were less than expected. This work will be completed at a facility more suited for the research needs.

FY16 Activities: The scanning of known bird roosts immediately following stocking events continues in FY16. Scanning continued to occur in Laughlin Lagoon through December 2015, which encompassed several stocking events and most notably a bonytail release on December 9. Continuous scanning for 10 days following this release resulted in the detection of 24 tags, which was 2.53 percent of the stocked fishes. In total, sporadic scanning from September through December resulted in the detection of 64 tags and confirmed predation by several species (osprey, cormorant, and great blue heron). A study plan will be completed, which will include post-release bird scanning directed at refining the parameters needed for bioenergetics modeling.

Razorback sucker work is being initiated to investigate latent mortality and the relative survival and dispersal of fish stocked using soft release techniques. Fish will be released in paired cohorts, with one of the cohorts being released into a netted off portion of a selected backwater. Telemetered fish will be released with each group, and remote PIT tag scanning will be conducted to look at immediate dispersal. Relative survival will be evaluated after several years of contact data have been collected.

Proposed FY17 Activities: Additional bird predation data may be collected in order to continue to refine the bioenergetics model. This work will accompany several native fish stocking events and primarily those scheduled for the Imperial Ponds Conservation Area.

Experimental releases of razorback suckers will continue in order to determine if fishes that are held for 3 days in a netted off section of a selected backwater have greater long-term survival (probability of re-contact) than fishes released without being held. These soft releases should allow the fishes ample recovery time following the handling and hauling associated with fish stocking events. This work will be accomplished using paired releases at three locations within Reach 3.

Pertinent Reports: N/A

Work Task C66: Marsh Bird Water Depth Analysis

FY15 Estimates	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$0	$0	$0	$100,000	$100,000	$20,000	$0

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

Start Date: FY16

Expected Duration: FY18

Long-Term Goal: Define marsh water depth requirements for covered marsh birds

Conservation Measures: MRM1 and MRM2 (CLRA, LEBI, and BLRA)

Location: LCR MSCP project area

Purpose: To identify the range of acceptable water depths in California black rail, western least bittern, and Yuma clapper rail breeding sites and ranges of acceptable daily, monthly, and annual variability

Connections with Other Work Tasks (Past and Future): Marsh bird habitat was studied previously under Work Task C24. The first year of funding was provided through Work Task G3.

Project Description: The Habitat Conservation Plan requires the creation of a minimum of 512 acres of marsh habitat for three LCR MSCP covered marsh bird species. All 512 marsh acres should have water depths no greater than 12 inches to provide habitat for Yuma clapper rails and western least bitterns, while 130 acres of marsh is required with water depths no greater than 1 inch to provide habitat for California black rails.

Water depths in California black rail, western least bittern, and Yuma clapper rail existing breeding sites along the lower Colorado River will be evaluated. Data will be analyzed to identify the range of water depths in California black rail, western least bittern, and Yuma clapper rail breeding sites throughout the breeding season and to identify the ranges of daily, monthly, and annual variability that can occur and still have successful breeding.

In 2009, under Work Task C24, vegetation surveys were conducted, water depth data were monitored at wells, and biweekly marsh bird surveys were conducted

throughout the breeding season at the Imperial National Wildlife Refuge in Fields 16 and 18. The locations of all California black rails, Yuma clapper rails, and western least bitterns were mapped in both fields. California black rails were first detected in Fields 16 and 18 in April and July 2009. Yuma clapper rails were consistently detected in Field 16 throughout summer, with a high of 21 birds. In Field 18, Yuma clapper rails were also detected in 2009. In 2011, a final report was prepared, giving recommendations on creation of marshes for both Yuma clapper rails and California black rails.

Previous Activities: This is a new start in FY16.

FY15 Accomplishments: This is a new start in FY16.

FY16 Activities: Existing daily river gauge data, which will be used to estimate relative depth measurements, and Yuma clapper rail breeding data collected from FY06–14 in Topock Gorge and Topock Marsh will be compiled and analyzed. Detections of Yuma clapper rails at each monitoring point during the three surveys conducted each year (known occupancy) will be compared to the range of water depth fluctuation occurring during that monitoring period. Occupancy modeling will be conducted to evaluate the relationship between the probability of the monitoring points being occupied by Yuma clapper rails during the breeding season and fluctuations in water depth.

Detection data for California black rails during breeding seasons and water depth measurements will be acquired after completion of the Topock Gorge Yuma clapper rail analysis. It is anticipated that there will be less California black rail data available in areas with water depth monitoring along the lower Colorado River. Data from other California black rail breeding areas may be acquired.

A total of 52 monitoring points have been surveyed for marsh birds each year in Topock Gorge from FY06–14, and a sufficient number of detections of Yuma clapper rails have been recorded each year for analyses. Daily water depth measurements from a gauge at Topock Gorge were also acquired. Yuma clapper rail detections at Topock Marsh were compiled, but accurate water depth data were unavailable; therefore, Topock Marsh data will not be analyzed.

Proposed FY17 Activities: Existing water depth measurements and California black rail breeding data will be compiled and analyzed. Detections of California black rails at each monitoring point during the three surveys conducted each year (known occupancy) will be compared to the range of water depth fluctuations occurring during that monitoring period. Occupancy modeling will be conducted to evaluate the relationship between the probability of the monitoring points being occupied by California black rails during the breeding season and fluctuations in water depth.

Pertinent Reports: N/A

WORK TASKS – SECTION D

System Monitoring

Work Task D1: Marsh Bird Surveys

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$25,000	$38,402.79	$290,472.87	$40,000	$40,000	$40,000	$40,000

Contact: Joe Kahl, (702) 293-8568, jkahl@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: System monitoring for marsh birds

Conservation Measures: MRM1 and MRM2 (LEBI, CLRA, and BLRA)

Location: Reach 3, Havasu National Wildlife Refuge, Arizona and California

Purpose: The purpose of this work task is to monitor Yuma clapper rails, California black rails, and western least bitterns along a designated reach of the lower Colorado River as part of the interagency system monitoring program. The information obtained through this task may be used in managing marsh bird habitat creation areas.

Connections with Other Work Tasks (Past and Future): Data obtained from Work Task F7 may also be used in the marsh bird system monitoring program described in this work task. The protocol developed for task will also be used for Work Task F7.

Project Description: Marsh bird surveys will be conducted in coordination with the U.S. Fish and Wildlife Service (USFWS) as part of a multi-agency, system-wide monitoring effort that has been ongoing annually since 1980. LCR MSCP surveys are conducted along the lower Colorado River between the I-40 Bridge, near Needles, California, and Lake Havasu, including Topock Gorge in the Havasu National Wildlife Refuge.

Prior to implementation of the LCR MSCP, a study was conducted to determine whether Yuma clapper rail surveys could be expanded to a multi-species protocol without compromising their detection rates. Information obtained from this study has produced a multi-species protocol for marsh birds, including the LCR MSCP covered species (Yuma clapper rails, California black rails, and western least bitterns). Marsh bird surveys, utilizing the multi-species protocol, will continue at designated survey points to track detections of covered species.

Previous Activities: The Bureau of Reclamation has monitored Yuma clapper rails within Topock Gorge since 1996 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort.

FY15 Accomplishments: Marsh bird surveys were conducted between the I-40 Bridge, near Needles, California, and Lake Havasu during March, April, and May 2015 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. Only two covered species were encountered: 85 Yuma clapper rail detections in March, 12 in April, and 109 in April – May; 18 western least bittern detections in March, 8 in April, and 45 in April – May. California black rails were not detected in 2015. The April survey was only 1 day due to high winds. The April – May survey was conducted at the end of April and the beginning of May. Data were compiled and entered into the Avian Knowledge Network database.

Survey methods were reviewed, and a second surveyor/operator was added to all surveys conducted by boat, which resulted in additional costs in FY15. The project budget has been increased accordingly beginning in FY16.

FY16 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 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. Surveys may also be conducted at the Havasu National Wildlife Refuge as needed. Data will be submitted to the USFWS. Information obtained through this work task may be used in planning future marsh bird habitat creation activities and research projects.

Proposed FY17 Activities: Marsh bird surveys will be conducted in Topock Gorge, the upper reaches of Lake Havasu, and other sites using the multi-species marsh bird survey protocol in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. Data will be submitted to the USFWS. Information obtained through this work task may be used in planning future marsh bird habitat creation activities and research projects.

Pertinent Reports: The report titled *Marsh Bird Surveys – 2015* will be posted on the LCR MSCP Web site upon completion.

Work Task D2: Southwestern Willow Flycatcher Presence/Absence Surveys

FY15 Estimates	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$675,000	$848,055.38	$7,621,908.70	$750,000	$750,000	$750,000	$750,000

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

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: System monitoring and post-development monitoring of southwestern willow flycatchers

Conservation Measures: MRM1, MRM2, and MRM4 (WIFL)

Location: Reaches 1–7 along the lower Colorado River (LCR), southern Nevada, lower Bill Williams River, lower Gila River, and the Virgin River between the Virgin River Gorge and Lake Mead. Life history study sites are located along: (1) the Virgin River at Mesquite, Nevada, (2) the Virgin River, near Mormon Mesa, Nevada, (3) Topock Marsh, Havasu NWR, Arizona, and (4) the Bill Williams River watershed, Arizona.

Purpose: To monitor southwestern willow flycatcher populations along the LCR from the Grand Canyon to the Southerly International Boundary with Mexico, describe demographics, and identify riparian habitat characteristics in locations occupied by the species

Connections with Other Work Tasks (Past and Future): Closed Work Task D3 provided information on southwestern willow flycatcher population numbers and demographics along the LCR.

Project Description: Presence surveys are conducted along the LCR from the Southerly International Boundary with Mexico to southern Nevada, including the lower Virgin River, lower Bill Williams River, and lower Gila River. Life history studies are conducted at known breeding areas.

Previous Activities: Presence surveys and life history studies for southwestern willow flycatchers have been conducted along the LCR since 1996.

FY15 Accomplishments: Presence surveys for southwestern willow flycatchers were conducted at 116 sites along the LCR and its tributaries in 2015, and life history studies were conducted at 41 sites. All LCR MSCP conservation areas were surveyed. System-wide surveys were conducted at the Pahranagat NWR, Meadow Valley Wash, Muddy River, Topock Marsh, Bill Williams River National Wildlife Refuge (Bill Williams River NWR), and Alamo Lake. Surveys are only conducted on the portion of the river below the Cibola National Wildlife Refuge to the Northerly International Border with Mexico once every 3 years. In FY15, these areas on the lower portion of the river were surveyed; thus, the number of sites that were surveyed was higher than in the previous 2 years. Surveys were not conducted on the Virgin River due to safety concerns, so efforts were for a second year redirected to Alamo Lake, Arizona, to increase the amount of demographic data collected. Habitat threat monitoring in FY15 focused on measuring salt cedar beetle defoliation. Life history study activities included banding, nest monitoring, habitat threat analyses, and microclimate analyses.

A total of 144 southwestern willow flycatchers were detected at 75 of the 116 sites during presence surveys, and 85 territories were documented (table 1). Surveyors confirmed that southwestern willow flycatchers were resident or breeding at 41 of the sites (within 9 study areas): Key Pittman, the Pahranagat NWR, River Ranch, Meadow Valley Wash, Muddy River, Warm Springs, Topock Marsh, the Bill Williams River NWR, the Palo Verde Ecological Reserve, and Alamo Lake (table 2).

Table 1.—Southwestern Willow Flycatcher Detections

Detection	Number
Total resident adults detected	144
New captures banded	30
Observed but not banded	37
Banded in previous year and recaptured in FY15	5
Banded in previous year and re-detected but not recaptured	64
Bird band confirmed – bird identity known	58
Bird band not confirmed – bird identity unknown	6
Total territories	85
Number of confirmed breeding territories	67
Pair with no nest found	2
Unpaired individuals	16
Total nestlings banded	75

Table 2.—Study Areas Where Resident Adults were Observed

Study Area	Number of Residents
Key Pittman	23
River Ranch	6
Pahranagat NWR	21
Meadow Valley Wash	5
Muddy River	3
Warm Springs	3
Topock Marsh	15
Bill Williams River NWR	11
Alamo Lake	56
Palo Verde Ecological Reserve	1
Total	144

One resident southwestern willow flycatcher was observed at LCR MSCP conservation areas in FY15. It was detected at Palo Verde Ecological Reserve Phase 4 in the same general area on seven consecutive visits from May 31 to June 14. The resident was observed defending a territory and engaged in lengthy songs, which were not solicited by call-playback. This is the first time a resident southwestern willow flycatcher has been detected under the LCR MSCP south of Parker Dam since 2003, when the LCR MSCP survey protocol was revised to more accurately identify southwestern willow flycatchers from other migrant willow flycatchers. In the system-wide surveys conducted south of Parker Dam, an additional 116 willow flycatcher detections were recorded between May 15 and June 12. Monitoring results suggest these willow flycatchers were not resident or breeding individuals but were most likely spring migrants and were not classified as southwestern willow flycatchers.

One willow flycatcher was observed at the Beal Lake Conservation Area on June 24, but no breeding evidence or band was observed; therefore, it could not be confirmed as a southwestern willow flycatcher.

In FY15, life history studies were conducted at Key Pittman, the Pahranagat NWR, Meadow Valley Wash, Muddy River, Warm Springs, Topock Marsh, the Bill Williams River NWR, and Alamo Lake. Attempts were made to identify, capture, and band all southwestern willow flycatcher adults and nestlings. A total of 30 adult southwestern willow flycatchers were banded, and banded birds from previous years were detected (see table 1).

Nest success was calculated for 85 southwestern willow flycatcher nests (table 3). Depredation was the major cause of nest failure (44 percent [%]). Brown-headed cowbird brood parasitism was observed in 9 (12%) of the 77 nests with eggs and nestlings.

Table 3.—Southwestern Willow Flycatcher Nest Success

Detection	Number of Adults
Nest successful and fledged young	44 (52%)
Nest failed	37 (43%)
Nest found empty (no indication of whether the young survived)	8 (9%)

Capture and re-detections were compared between FY14 and FY15 at sites monitored in both years (table 4). The distance between yearly sightings for these southwestern willow flycatchers (adults and juveniles) ranged between 0.1 and 30 miles, with an average of 2 miles.

Table 4.—Southwestern Willow Flycatcher Captures and Re-detections in FY15 of Birds from FY14 and Previous Years

Age	FY14	Detected Again in FY15	Detected in Different Study Area than Previous Year
Resident adults	100	49 (49%)	5 (5%)
Juveniles	61	13 (22%)	8
Juveniles from earlier year	N/A	4	

In 2015, several new mobile electronic field forms were developed so that almost all of the field data were collected electronically using data dictionaries. Data collected electronically can be directly integrated into the LCR MSCP database.

The project budget exceeded the FY15 estimate. The number of sites that were surveyed was higher than in the previous 2 years, as it included the portion of the river below the Cibola National Wildlife Refuge to the Northerly International Border with Mexico, which is surveyed every 3 years. In addition, the development, testing, and deployment of the mobile electronic field forms and the new database required more effort than was anticipated.

FY16 Activities: Presence surveys for southwestern willow flycatchers will be conducted along the LCR, lower Bill Williams River, and other riparian areas in southern Nevada. Life history studies will be conducted at the riparian areas in

southern Nevada, the Bill Williams River NWR, Alamo Lake, and Topock Marsh. Activities will include banding, nest monitoring, and microclimate analyses. Surveys will not be conducted on the Virgin River in 2016.

The LCR MSCP database for southwestern willow flycatcher monitoring and studies will continue to be developed. The monitoring objectives will be reviewed in light of the results from 2008–15, and changes will be made, if necessary, to focus the monitoring methods to inform habitat creation and management and to monitor southwestern willow flycatcher occupancy at conservation areas. The system-wide, post-development monitoring and any remaining research efforts will be divided into separate work tasks for future years. The results of this evaluation may be incorporated into future protocols, and a 10-year monitoring plan will be developed.

Proposed FY17 Activities: Presence surveys for southwestern willow flycatchers will be conducted at approximately 15 study areas along the LCR, lower Bill Williams River, Virgin River, and other riparian areas in southern Nevada. Life history studies will be conducted at the riparian areas in southern Nevada, the Bill Williams River NWR, Alamo Lake, and Topock Marsh. Activities will include banding, nest monitoring, and microclimate analyses.

Testing of the LCR MSCP southwestern willow flycatcher database will be finalized and fully implemented.

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

Work Task D5: Monitoring Avian Productivity and Survivorship

FY15 Estimates	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$250,000	$300,836.44	$2,851,772.52	$250,000	$250,000	$250,000	$250,000

Contact: Chris Dodge, (702) 293-8115, cdodge@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 lower Colorado River (LCR)

Conservation Measures: MRM1 and MRM2 (WIFL, YBCU, ELOW, GIFL, GIWO, VEFL, BEVI, YWAR, and SUTA)

Location: Reach 3, Beal Lake Conservation Area (BLCA), Havasu National Wildlife Refuge (Havasu NWR), Arizona; and Reach 4, Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1) and the Cibola Valley Conservation Area (CVCA), Arizona

Purpose: To collect intensive, site-specific data on avian species demographics, physical condition, species composition and diversity, and site persistence at existing and created habitat sites

Connections with Other Work Tasks (Past and Future): Data from this work task are 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 Monitoring Avian Productivity and Survivorship (MAPS) banding stations located at habitat creation sites may also be used for post-development monitoring.

Project Description: Under this work task, conservation areas and existing habitat sites along the LCR that represent typical avian riparian habitat will be monitored. Banding allows for the collection of detailed information about avian species' use patterns and demographics, and this site-specific data can be used to characterize habitats and monitor habitat use, population trends, and demographics of avian species along the LCR.

Avian populations throughout the United States, Canada, and Mexico are monitored using the MAPS protocol. Long-term population trend data are collected by conducting intensive banding throughout breeding seasons. Data collected are analyzed by the Institute for Bird Populations, and long-term population trends are determined on a regional and continental level, as the larger database has increased statistical power that cannot be economically duplicated at a site-specific level.

The Bureau of Reclamation established a MAPS banding station at the Cibola NWR Unit #1 Nature Trail in 2002 prior to LCR MSCP implementation. In 2005, an additional station was established on the Havasu NWR, at the New South Dike, and in mixed cottonwood-salt cedar habitats. These sites provided data from different reaches of the LCR and from different habitat types to allow for comparisons among areas more typically found along the LCR and habitat creation sites like the LCR MSCP conservation areas.

The Institute for Bird Populations recommends netting birds at MAPS banding stations a minimum of 5 years to acquire site-specific data. After 5 years, each site will be evaluated and a decision made to continue, discontinue, or move the station to a new location.

Previous Activities: MAPS banding has been conducted during different seasons to provide information on habitat use by birds during the breeding and non-breeding seasons.

Winter banding was conducted from 2002 through 2005 at the Pratt Restoration Site near Yuma, Arizona, at Cibola NWR from 2002 to 2011, and at the Havasu NWR from 2005 to 2009. Winter banding was discontinued in 2011.

Fall migration banding was conducted at the Pratt Restoration Site and the Cibola NWR from 2002 to 2005. Data on fall migration and winter use were recorded using an adapted MAPS protocol similar to protocols from migration banding projects throughout the West and the Monitoreo de Sobrevivencia Invernal (MOSI) protocol that is used in Mesoamerica. Fall banding was discontinued in 2005.

Summer MAPS banding has been conducted at six locations:

- BLCA (2009 to 2016).
- Cibola NWR Unit # 1 (2002 to 2016).
- CVCA (2011 to 2015).
- Havasu NWR site (2005 to 2008) – This site was abandoned as a MAPS site in 2009 after a fire in 2008 burned a significant portion of the habitat.

- Headgate Rock Dam site at Parker, Arizona (2000 to 2004).

- The Colorado River Lake Mead site on the Colorado River above Pearce Ferry in Lake Mead National Recreation Area (2002).

Color banding target species such as Bell's vireo, yellow warbler, and summer tanager was initiated in August 2008 at the banding sites to monitor site persistence during the breeding and winter banding seasons.

FY15 Accomplishments: Banding was conducted at three conservation areas during summer using the MAPS protocol. Banding was conducted once during every 10-day banding period for 5 hours a day, beginning 1/2 hour before sunrise. During the breeding season, there were a total of 184 captures at Cibola NWR Unit #1, 126 total captures at the BLCA, and 82 captures at the CVCA.

Three LCR MSCP listed species were captured and color banded during the MAPS season. There was one vermilion flycatcher at Cibola NWR Unit #1, nine yellow warblers and six summer tanagers at the BLCA, and two summer tanagers at the CVCA. Two LCR MSCP listed species were captured and banded but not color banded: one Bell's vireo at the BLCA and one Gila woodpecker at Cibola NWR Unit #1.

One migrant willow flycatcher was banded at Cibola NWR Unit #1 on May 5, one was heard on May 27, and one was heard on June 2. Two migrant willow flycatchers were banded at the CVCA, one on May 14 and another on August 6. One migrant willow flycatcher was heard at the BLCA on June 18 and one was banded on August 7. Yellow-billed cuckoos were heard at Cibola NWR Unit #1 on June 16, at the CVCA from July 8 through July 29, and at the BLCA from June 18 through August 7. No yellow-billed cuckoos were banded during MAPS sessions or MAPS summer target netting in FY15.

One yellow warbler and one summer tanager were recaptured at the BLCA. They had both been captured and color banded in 2015. There were not any recaptures from previous years, but a yellow warbler was re-sighted at the BLCA on April 23 that was color banded in 2010.

An evaluation was initiated to identify the benefits of using the MAPS method for LCR MSCP system-wide monitoring purposes. The MAPS and double sampling methods used under Work Task F2 both detected lower riparian bird species diversity at the CVCA than at other conservation areas. The double sampling method provides a more complete picture of diversity, territory locations, and nest locations at the monitoring site than the MAPS protocol.

The value of continuing MAPS monitoring at the BLCA, CVCA and Cibola NWR #1 was evaluated. The CVCA is located 3 miles from another MAPS station at Cibola NWR Unit #1, and there are consistently fewer captures of birds at the CVCA than at Cibola NWR Unit #1. The covered species detected here are

also being documented by the post-development riparian bird surveys (F2), southwestern willow flycatcher surveys (D2), and yellow-billed cuckoo surveys (D7). It appears that there is limited value with continuing an annual MAPS station at the CVCA, so it will be discontinued after FY15.

The project budget exceeded the FY15 estimate. Additional labor was required for the evaluation of the MAPS method to identify its benefits for LCR MSCP system-wide and conservation area monitoring needs.

FY16 Activities: MAPS banding stations will continue to operate at the Cibola NWR and BLCA during the 2016 breeding season. Color banding of LCR MSCP covered species will continue to be implemented to increase the effective recapture rate. A visual identification of a color-banded bird qualifies as a recapture for statistical purposes. The evaluation will continue in order to identify if the information gathered from the MAPS banding stations is meeting LCR MSCP system-wide and conservation area monitoring needs. If the MAPS stations meet monitoring needs, the sampling intensity (number of stations) will be evaluated.

Proposed FY17 Activities: Breeding season monitoring will continue in 2017 based on the recommendations from the project evaluation.

Pertinent Reports: The *2014–2015 MAPS Summary Banding Report* will be posted on the LCR MSCP Web site upon completion.

Work Task D6: System Monitoring for Riparian Obligate Avian Species

FY15 Estimates	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$480,000	$368,062.30	$2,316,765.90	$150,000	$ 480,000	$480,000	$480,000

Contact: Beth Sabin, (702) 293-8435, lsabin@usbr.gov

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: System monitoring for avian covered species

Conservation Measures: MRM1 and MRM2 (ELOW, GIWO, VEFL, BEVI, YWAR, and SUTA)

Location: LCR MSCP planning area and the Bill Williams River

Purpose: To monitor riparian obligate avian species covered under the LCR MSCP in order to document the current population abundance, long-term population trends, habitat use, and distribution within the LCR MSCP planning area and the Bill Williams River

Connections with Other Work Tasks (Past and Future): Data collected during post-development monitoring of habitat conservation areas (F2) may also be used under this work task. Information obtained through this work task will also be used in association with Work Task C24 to help define habitat requirements for riparian obligate bird species and Work Tasks D2 (southwestern willow flycatcher) and D7 (yellow-billed cuckoo) that monitor single avian species. Information obtained through Work Tasks C24, C36 (closed), and C52 will be used to monitor elf owl and gilded flicker breeding populations within the LCR MSCP area.

Project Description: Riparian habitat along the lower Colorado River and the Bill Williams River below Alamo Dam will be monitored for Arizona Bell's vireo, elf owl, Gila woodpecker, gilded flicker, Sonoran yellow warbler, summer tanager, and vermilion flycatcher. It is inefficient to monitor all covered species individually throughout the entire LCR MSCP planning area. Many bird populations can be monitored effectively using multi-species survey protocols. Arizona Bell's vireos, Gila woodpeckers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers will be monitored together using standard

breeding bird survey methods. Elf owls will be monitored using a species-specific call-playback method. The presence and breeding of the covered species will be documented and analyzed to estimate species' distribution and abundance throughout the lower Colorado and Bill Williams Rivers.

Previous Activities: In FY05–06, surveys for Arizona Bell's vireos, Gila woodpeckers, gilded flickers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers were conducted using random point-count transects. A new double sampling rapid/intensive area search protocol, which provided density estimates of the six focal species and other common species within the study area, was initiated in FY07. Surveys were conducted in the riparian habitat of the lower Colorado and Bill Williams Rivers. In 2013 and 2014, surveys were conducted in the Virgin River in areas occupied or previously occupied by southwestern willow flycatchers.

Of the six covered species surveyed under this protocol, Arizona Bell's vireos and Sonoran yellow warblers have had the largest population sizes within the study area. Summer tanagers and Gila woodpeckers have been present within the study area, and vermilion flycatchers and gilded flickers have been rarely detected. Gilded flickers have only been detected breeding along the Bill Williams River east of Planet Ranch and use the riparian areas as foraging habitat.

Elf owls were monitored during the breeding season from FY08 to FY10. Each year, surveys were conducted at 21 survey sites and 45 single call stations in suitable habitat within the LCR MSCP planning area. Only one elf owl was detected near Blankenship Bend during that 2-year period.

Monitoring methods were evaluated in order to improve accuracy and reduce monitoring costs. Elf owl surveys were stopped after the FY10 season, and an evaluation of the protocol was initiated under Work Task C24. In FY12, the double sampling rapid/intensive area search protocol was improved: 2 weeks were added to the beginning of the field season to more accurately estimate the population of early-nesting species, field crew training was improved, and some processes, such as data analyses, were automated.

In addition, an analysis was conducted from FY11 to FY13 to test the assumption that estimation is unbiased during the intensive area search surveys used to monitor Arizona Bell's vireos, Gila woodpeckers, gilded flickers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers. Twenty-four plots were surveyed using intensive surveys and an enhanced intensive survey. Comparing the survey types across all species, on average, enhanced intensive sampling (complete count) produced 11.2, or 16.5 percent, additional territories compared to standard intensive sampling. There are many biological reasons that could account for this, including onset of breeding, migration arrival time, detectability throughout the season, territory size, breeding habitat, behavior, and parental care. Through the intensive and enhanced intensive effort surveys, new life history

information was acquired for many of the riparian species in the project area, including a better understanding of arrival and departure times for migrants, unique calls and songs not previously documented, second clutches and re-nesting attempts, and a better understanding of territory sizes and partial territories.

FY15 Accomplishments: Eighty system-wide plots were surveyed with the double sampling rapid/intensive area search protocol.

- Rapid surveys — A total of 192 species were recorded either as territorial breeders, non-territorial breeders, migrants, or non-breeders.
- Intensive surveys — A total of 112 species were recorded either as territorial breeders, non-territorial breeders, migrants, or non-breeders.

The estimated number of territories of LCR MSCP covered species in the program area from FY15 are shown in table 1.

Table 1.—Population Estimates for LCR MSCP Covered Species in 2015

Focal Species	Population Estimates
Sonoran yellow warbler	1,721
Arizona Bell's vireo	1,263
Gila woodpecker	829
Summer tanager	221

No vermilion flycatchers were detected in FY15 during surveys conducted under this work task. There were two breeding gilded flicker pairs detected near Lincoln Ranch along the Bill Williams River. The territories were mostly outside the plot in upland habitat. The birds were not nesting within the plot but foraging within it. There were not enough pairs of gilded flickers detected in FY15 to calculate population estimates.

Inconsistencies were found in the 2011–14 population estimates and confidence intervals calculated with the DS statistical software program. Equations were programmed into SAS, a commercial statistical program, and population estimates and confidence intervals for 2011–15 were recalculated for the summary report.

Plot-based vegetation measurements, to identify how habitat characteristics differ from where birds nest and where they do not nest, were not conducted in FY15. This reduced effort resulted in a cost savings in FY15. Light detection and

ranging (LiDAR) vegetation monitoring was found to be a more accurate and less expensive way to assess the differences among vegetation structures. Vegetation monitoring was conducted under Work Task F1.

FY16 Activities: System-wide surveys will not be conducted in FY16. The protocol will be reviewed in light of the results from study and peer reviews, and changes will be made, if necessary, to system-wide (Work Task D6) and post-development (Work Task F2) avian monitoring to improve the accuracy of monitoring methods and to clarify the monitoring questions the data will inform. A 10-year monitoring plan will be developed. System-wide surveys will resume in FY17.

Proposed FY17 Activities: System-wide surveys will resume in FY17. The protocols will be updated, as needed, following the evaluation in FY16.

Pertinent Reports: The report titled *Lower Colorado River Riparian Bird Surveys, 2013* is posted on the LCR MSCP Web site.

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

FY15 Estimates	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$750,000	$832,589.27	$5,328,636.18	$750,000	$650,000	$650,000	$650,000

Contact: Barbara Raulston, (702) 293-8396, braulston@usbr.gov

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: System-wide and post-development monitoring for yellow-billed cuckoos

Conservation Measures: MRM1 and MRM2 (YBCU)

Location: Protocol level surveys are conducted in suitable habitat within the LCR MSCP boundary

Purpose: To conduct surveys to monitor existing yellow-billed cuckoo populations along the lower Colorado River (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): Under Work Task C37 (closed), the hydrologic conditions preferred by southwestern willow flycatchers and yellow-billed cuckoos have been measured.

Project Description: Yellow-billed cuckoos use cottonwood-willow habitat and may act as an umbrella species for other covered avian species that use these habitats. A standardized survey protocol (issued by the U.S. Fish and Wildlife Service on April 22, 2015) will be used to determine the presence of yellow-billed cuckoos at conservation areas consisting of cottonwood and willow habitat at least 2 years old.

Previous Activities: Yellow-billed cuckoo life history and monitoring studies began in FY06. Prior to the creation of riparian habitats under the LCR MSCP, the only large breeding population of yellow-billed cuckoos was on the Bill Williams River National Wildlife Refuge, with a few scattered pairs elsewhere along the LCR. The wide-ranging behavior and lack of strict territory boundaries of yellow-billed cuckoos precludes the confirmation of nesting with surveys alone. Instead, criteria (timing, location, and persistence of all detected yellow-billed cuckoos)

defining “possible,” “probable,” and “confirmed” nesting have been developed based on survey results and observed behaviors of cuckoos. Confirmed breeding of yellow-billed cuckoos has been documented at the Palo Verde Ecological Reserve (PVER) every year beginning in 2009, with nesting also confirmed at the Cibola Valley Conservation Area (CVCA) (2008–14), the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1) (2010–12, 2014, and 2015), and at the Beal Lake Conservation Area (BLCA) (2010, 2011 and 2015). Nesting activity has been documented late into September at the PVER. The total number of yellow-billed cuckoos banded between FY08 and FY14 was 284 (134 adults and 150 young).

FY15 Accomplishments: Work in FY15 included surveys at 37 sites along the LCR and the Bill Williams River, nest monitoring, banding of young and adults, telemetry, and migration tracking with a Global Positioning System (GPS).

A total of 48 confirmed breeding territories and an additional 21 probable and 33 possible breeding territories were detected in FY15. Forty-six territories were confirmed at LCR MSCP conservation areas, 1 at the BLCA, 41 at the PVER (Phases 2–7), and 4 at Cibola NWR Unit #1 (Crane Roost). There were two confirmed territories on the system-wide plots, both at the Bill Williams River National Wildlife Refuge. A total of 39 nests were monitored: 1 at the BLCA, 33 at the PVER, 3 at Cibola NWR Unit #1, and 2 on system-wide plots. Using the Mayfield method, nest success was estimated to be 42 percent, with at least 43 successfully fledged young produced.

Forty-five adult yellow-billed cuckoos were captured in FY15, including 32 newly banded and 13 that were banded in previous years. An additional 39 young were banded from 20 nests. Thirteen banded adults were recaptured, including the oldest known yellow-billed cuckoo. It is an eight-year-old male banded as a chick in 2008 at CVCA Phase 01. It was recaptured at Cibola NWR Unit #1 (Crane Roost), and successfully nested in FY15. This male yellow-billed cuckoo had not been observed since FY08. Three of seven birds fitted with GPS units in FY14 were also recaptured, and another seven birds were fitted with GPS units in FY15. Another two previously banded birds were re-sighted, including two at BLCA: one male was captured in 2012 at the CVCA, approximately 152 kilometers (94.5 miles) from the BLCA, and a female was banded in 2014 at Cibola NWR Unit #1 approximately 157.5 kilometers (97.5 miles) from the BLCA.

The project budget exceeded the FY15 estimate. The development, testing, and deployment of mobile electronic field forms and a new database required more effort than was anticipated, and additional funds were required to purchase GPS equipment and software.

FY16 Activities: For FY16, the level of effort and scope of the project have been reduced. Intensive nest monitoring and capture and banding of birds to

document activities of specific individuals will no longer be conducted, as successful breeding and nesting have been documented within LCR MSCP created habitats, and birds have continued to use the habitats for multiple years. Call-playback surveys will be conducted only at conservation areas with cottonwood and willow at least 2 years old. The Laguna Division Conservation Area will be surveyed for the first time. System-wide areas will not be monitored in FY16, as nesting continues to occur primarily on LCR MSCP conservation areas. Followup surveys to detect breeding will be conducted at conservation areas where breeding has yet to be documented. Additional followup visits will be conducted to locate birds fitted with GPS devices during FY15; if found, the birds will be captured and the data downloaded and analyzed. Birds banded in previous years will be re-sighted incidentally to these activities.

Proposed FY17 Activities: Call-playback surveys will be conducted at conservation areas planted with cottonwood and willow at least 2 years old. Followup surveys to detect breeding will be conducted at conservation areas where breeding has yet to be documented. Birds banded in previous years will be re-sighted incidentally to these activities. The monitoring objectives will be reviewed in light of the results from FY07 to FY16, and changes will be made, if necessary, to focus the monitoring methods to inform habitat creation and management and to monitor yellow-billed cuckoo occupancy at conservation areas. The results of this evaluation may be incorporated into future protocols, and a 10-year monitoring plan will be developed.

Pertinent Reports: The *Yellow-billed Cuckoo Distribution, Abundance, and Habitat Use on the Lower Colorado River and Tributaries, 2014 Annual Report* has been posted on the Web site as well as a summary report covering this work between 2008 and 2012. The annual report for 2015 will also be posted upon completion.

Work Task D8: Razorback Sucker and Bonytail Stock Assessment

FY15 Estimate	F15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$850,000	$846,376.22	$5,723,554.08	$925,000	$925,000	$925,000	$925,000

Contact: Jim Stolberg, (702) 293-8206, jstolberg@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Conduct long-term system monitoring of razorback suckers and bonytail

Conservation Measures: RASU6 and BONY5

Location: The lower Colorado River within the LCR MSCP planning area, including reservoirs and connected channels, from Lake Mead downstream to Imperial Dam

Purpose: To supplement and maintain sufficient knowledge and understanding of razorback sucker and bonytail populations within the LCR MSCP planning area in order to have an effective Adaptive Management Program

Connections with Other Work Tasks (Past and Future): Monitoring data for razorback suckers and bonytail have been or will be gleaned from work accomplished under Work Tasks C8 (closed), C12 (closed), C13, C15 (closed), F5, and G3.

Project Description: Under this work task, razorback sucker and bonytail population and distribution data will be collected and organized to maintain up-to-date, system-wide, stock assessments for these species. Data acquisition work is accomplished by one 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 under other work tasks. Additionally, as short-term research activities are completed under separate work tasks, a portion of those activities may transition into or be included as part of ongoing, long-term monitoring projects under this work task.

Work routinely includes trammel netting and electrofishing, but visual surveys are also periodically conducted as well as surveys using specialized equipment and

techniques (e.g., scuba divers, underwater photography, and video recordings). Funding described under this work task provides for all costs associated with conducting field surveys, including salaries, travel, and materials necessary to accomplish this work. Funding for monitoring agreements, gleaning, or capturing data from ongoing research actions and monitoring programs; transfer of the data into record archives; and organizing the data into a cohesive report is also provided under this work task.

Previous Activities: In cooperation with the Arizona Game and Fish Department and Nevada Department of Wildlife, fall fish surveys on Lake Mead have been conducted since 1999. Reclamation has also participated in interagency cooperative Native Fish Roundups on Lake Mohave since 1987 and on Lake Havasu (including the river reach below Davis Dam) since 1999. This participation has continued under the LCR MSCP, beginning in 2005, when the program was implemented. Additional monitoring of native fish populations outside of these annual events has also been conducted under this work task as short-term research activities have transitioned into long-term monitoring projects.

FY15 Accomplishments: Accomplishments for this work task have been summarized by river reach.

Reach 1 (Lake Mead): In cooperation with the Arizona Game and Fish Department and Nevada Department of Wildlife, annual fall gill net surveys of Lake Mead were conducted. Participating agencies were responsible for sampling Boulder Basin, Virgin Basin, Temple Basin, Gregg Basin, and the Overton Arm. LCR MSCP staff captured a total of 299 fish representing 10 different species from the Virgin and Temple Basins. Two razorback suckers were captured during this effort. No additional native fish species were contacted.

Collection of wild-born razorback sucker larvae took place at all major spawning sites (Las Vegas Bay, Echo Bay, and the Muddy River/Virgin River inflow) over the course of the spawning season. A total of 339 larvae were captured, with 104 larvae from Las Vegas Bay, 137 larvae from Echo Bay, and 98 larvae from the Muddy River/Virgin River inflow area. All larvae collected through this effort were returned to the lake following each sampling period, as razorback sucker larval abundance was primarily used only as a means of identifying spawning locations during the 2014–15 field season.

Monitoring of the Lake Mead adult razorback sucker population also continued in FY15. Twenty sonic-tagged fish were contacted throughout the year using active and passive telemetry. Monitoring sonic-tagged fish provided the general location of razorback sucker populations, the location of spawning sites, habitat association data within the long-term monitoring study area, and lake-wide and seasonal movement patterns within and among spawning areas. Trammel netting conducted during the spawning season resulted in the capture of 18 razorback

suckers: 2 from Las Vegas Bay, 1 from Echo Bay, and 15 from the Muddy River/Virgin River inflow area. Of the 18 razorback suckers captured, 9 were recaptured fish. The remaining razorback suckers captured were untagged and presumed to be wild-spawned fish (hereafter referred to as wild). These fish included two from Las Vegas Bay and seven from the Muddy River/Virgin River inflow area. Aging information was obtained from 8 razorback suckers during the 2015 study year, bringing the total number of razorback suckers aged as part of the long-term monitoring program to 478. The ages of wild razorback suckers captured from long-term monitoring areas in 2015 ranged from 5 to 10 years old.

No Lake Mead razorback sucker population estimate is provided for the 2014–15 study year, as low recapture rates produced an unrealistic estimate in the statistical program MARK. Population estimates have, however, been consistent for the previous 5 study years (2010 – 541, 2011 – 733, 2012 – 596, 2013 – 597, and 2014 – 589). Additional sampling efforts are planned for FY16 so that a reliable estimate may be obtained.

Reach 2 (Lake Mohave): A total of 15,899 razorback suckers were successfully repatriated into Lake Mohave in FY15. This is an increase from the number of razorback suckers stocked in 2014 (11,789) and above the targeted 8,000 as outlined in the Native Fish Augmentation Plan.

Annual razorback sucker roundups were conducted in December and March. During this effort, 200 razorback suckers were captured using trammel nets. Additionally, electrofishing was conducted above Willow Beach in February, June, July, September, and October (13,952 seconds and 63 razorback suckers captured). The use of remote sensing, which was expanded in 2011 to include the lotic portion of Lake Mohave upstream of Willow Beach, was also continued. Continued improvements in remote passive integrated transponder (PIT) tag antenna design have allowed for sampling in the high flow conditions of that reach, thereby contacting a large number of razorback suckers that had been previously undetected through other sampling methods.

In FY15, a total of 98,720 remote-sensing PIT tag contacts were recorded lake-wide. In the river section of Lake Mohave above Willow Beach, 6,385 hours of scan time resulted in 11,269 total contacts, representing 1,549 unique PIT tags. Throughout the rest of Lake Mohave, an effort of 23,008 hours of scan time resulted in 87,451 contacts, representing 1,510 unique PIT tags. In summary, a total of 3,059 unique PIT tags were contacted in 29,393 hours of scan time in FY15. This is slightly higher than the 2,777 PIT tags contacted in 8,844 hours of scan time in 2014, but it is very similar to the results from 2013 (3,321 PIT tags contacted in 11,293 hours of scan time).

The razorback sucker population in Lake Mohave was estimated from two data sources in FY15: (1) trammel net capture data obtained during the annual, multi-agency March roundup and (2) remote PIT scanning data collected during the sample year. Based on trammel net data from the FY15 field season,

the repatriate population estimate for Lake Mohave is 2,230 (95-percent [%] confidence interval [CI] from 922 to 5,963). This estimate represents less than 1% of the total number of repatriates released into Reach 2 as of March 1, 2014. Based on 2014–2015 remote PIT scanning, the Lake Mohave repatriate population was estimated at 3,505 individuals (95% CI from 3,279 to 3,756). Subpopulation estimates using zone-specific scanning were also calculated and estimated the basin (River Miles 13–29) population at 1,808 (95% CI from 1,635 to 2,009) and the river (River Mile 43–63) population at 2,039 (95% CI from 1,861 to 2,245).

Reach 3 (Lake Havasu): A total of 6,348 razorback suckers and 5,729 bonytail were released into Reach 3 during FY15; all fish were released with a PIT tag.

Capture/contact data were acquired through Work Tasks C53, C64, F5, ongoing multi-agency native fish roundups, and from other annual surveys conducted by LCR MSCP partners. A fall and spring netting survey was conducted throughout Topock Gorge and lower Lake Havasu. Razorback sucker contacts were more frequent in Topock Gorge than Lake Havasu, but the results were comparable to past years. Bonytail contacts via scanning are still rare and typically only occur for the first several months post-release. Large numbers of razorback suckers continued to be contacted in the riverine portions near Needles, California, and select backwaters throughout Topock Gorge. Two new spawning aggregations were located at alluvial washes just south of Needles, California. Based on the species composition and relative numbers of captures, the non-native fish community in these locations did not appear to be substantially different than in previous years.

Remote PIT scanning has continued to improve razorback sucker contact rates. All survey methods conducted in Reach 3 resulted in 4,179 unique razorback sucker and 188 bonytail contacts. The current razorback sucker population estimate for Reach 3 is 4,795 (95% CI from 4,496 to 5,124). Size at release is the most critical factor correlated with contact rate, which is considered an index of survival. Season also appears to be an important factor; fish released in spring continued to have higher contact rates (survival). These correlations between survival and total length at release and season of release are based on limited data. To provide better comparisons, releases directed at validating these results may be incorporated into future fish augmentation strategies.

Reaches 4 and 5 (Parker Dam to Imperial Dam): A total of 3,494 razorback suckers were stocked above Headgate Rock Dam during FY15; all fish were released with a PIT tag. A total of 1,797 razorback suckers and 4,864 bonytail were stocked below Palo Verde Diversion Dam during the fiscal year; all fish were released with a PIT tag.

Monthly PIT tag scanning and one netting survey in February 2015 yielded 236 razorback suckers and 258 bonytail contacted in Reaches 4 and 5. Only

one fish, a razorback sucker, was contacted by remote scanning in Reach 5. Additionally, 18 razorback sucker larvae were contacted in Reach 4, and 3 razorback sucker larvae were contacted in Reach 5.

FY16 Activities: Monitoring data will be collected for Reaches 1–5. Information will be gleaned from ongoing fish research activities as well as through fish monitoring field work. Field work will include trammel netting, electrofishing, remote sensing of PIT-tagged fish, and active and passive tracking of sonic-tagged fish.

Additional monitoring will occur in Reaches 1 and 3 during FY16 to supplement the current level of effort and offset the completion of other research-based work tasks (C13 and C45 [closed]). The funding increases for D8 in FY16 represent this redistribution of efforts under Species Research (Section C) work tasks into monitoring under Work Task D8. Overall, this will result in lower total program expenditures based on a less intensive sampling effort, as only a portion of these research efforts will transition into monitoring under Work Task D8. This less intensive effort will be accomplished primarily through the deployment of remote PIT tag sensing units, so funding was increased to include the costs associated with the acquisition of these units and their long-term maintenance.

Monitoring efforts, including the expanded use of scanners and netting, will be increased for Reaches 4 and 5 below Palo Verde Diversion Dam. These results will be used to guide future stocking locations and additional directed research under Work Tasks C64 and C65.

Proposed FY17 Activities: Monitoring efforts will continue in all river reaches as previously outlined, and participation in multi-agency field surveys will continue. As research-based work tasks are completed in Reaches 1–5, gaps in native fish community sampling data are expected. Efforts under Work Task D8 will fill a portion of these gaps by maintaining the appropriate level of system-wide monitoring of native fishes in the lower Colorado River for the life of the program.

Pertinent Reports: The reports titled *Razorback Sucker Studies on Lake Mead, Nevada and Arizona 2014–2015 Final Annual Report*, *Demographics and Monitoring of Repatriated Razorback Sucker in Lake Mohave 2015—Annual Report*, *Comparative Survival of Repatriated Razorback Sucker in Lower Colorado River Reach 3 – 2014 Annual Report*, *Comparative Survival of Repatriated Razorback Sucker in Lower Colorado River Reach 3 – 2015 Annual Report*, and *Movements of Sonic Tagged Razorback Suckers Between Davis and Parker Dams (Lake Havasu) Final Report* will be posted on the LCR MSCP Web site following review.

Work Task D9: System Monitoring and Research of Covered Bat Species

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$380,000	$404,116.29	$1,670,233.47	$390,000	$140,000	$140,000	$140,000

Contact: Allen Calvert, (702) 293-8311, acalvert@usbr.gov

Start Date: FY04

Expected Duration: FY55

Long-Term Goal: System-wide monitoring and species research will be conducted for LCR MSCP bat species to monitor distribution and evaluate habitat implementation success

Conservation Measures: MRM1 (WRBA, WYBA, CLNB, and PTBB), WRBA1, and WYBA1

Location: System-wide along the lower Colorado River (LCR) below Hoover Dam

Purpose: To conduct system-wide monitoring and research on the distribution of covered bat species utilizing roost surveys, acoustic survey techniques, and capture techniques

Connections with Other Work Tasks (Past and Future): System-wide monitoring data will be used in conjunction with post-development monitoring (F4) to document habitat use of covered bat species.

Project Description: Several survey techniques will be used to detect the presence of covered and evaluation bat species. Acoustic surveys will be used to document their presence in existing riparian habitats. Roost surveys will be conducted to track bat populations and to survey species such as the Townsend's big-eared bat and California leaf-nosed bat, which are not readily detected by acoustic technology. Individual bats will be captured using techniques such as mist netting to obtain reference calls for bat identification and to verify reproductive status.

Previous Activities: An LCR bat monitoring protocol was produced to assist in the development of a system-wide distribution and demography monitoring plan for covered bat species. A system-wide acoustic monitoring program was

implemented that coordinated the collection and analyses of acoustic bat data for system-wide monitoring of the LCR. Five permanent acoustic monitoring stations were placed along the river and were used to collect data on bat species presence at the monitoring sites (year round through FY14). In FY14, a foraging distance study was started that used radio tracking techniques to estimate how far California leaf-nosed and Townsend's big-eared bats would forage from their roosts to clarify the distances between roosts and conservation areas in Conservation Measures CLNB2 and PTBB2.

FY15 Accomplishments: The five permanent acoustic monitoring stations were operated from June – August to detect bat presence. In FY15, data collected at an acoustic monitoring station at the 'Ahakhav Tribal Preserve, previously reported under Work Task F4, was moved to Work Task D9 as a system-wide monitoring site, as it is not a LCR MSCP conservation area.

California leaf-nosed and Townsends big-eared bat roost outflight counts were conducted in winter and early summer at 10 mines along the LCR. Based on the roost outflight counts, populations at these roosts continue to appear stable.

A foraging distance study of California leaf-nosed and Townsend's big-eared bats along the LCR continued in FY15. California leaf-nosed bats were radio tracked from a mine near Palo Verde, California, in February and August to determine how far they would forage from known roosts during winter and summer. Preliminary data suggest that California leaf-nosed bats have the ability to travel up to and possibly more than 10 miles to forage on a given night during the winter season. Data from the summer season is still being analyzed. In addition, bats were captured at conservation areas located near Blythe, California, in February and August to determine where their roosts were and how far those roosts were from the conservation areas during winter and summer. Preliminary data show that California leaf-nosed bats captured at the Palo Verde Ecological Reserve were tracked by air to an area within Colorado River Indian Tribe lands during February. California leaf-nosed bats captured at the Cibola Valley Conservation Area and the Cibola National Wildlife Refuge Unit #1 Conservation Area were radio tracked in February to areas of the Trigo Mountains and likely roosted at the Hart Mine, which is over 9 miles from the Cibola Valley Conservation Area. In August, they were tracked to a very rugged area of the Trigo Mountains and may be using natural cave features rather than mines. Determining the exact roost locations was difficult due to the rugged terrain.

Capture surveys were conducted at the 'Ahakhav Tribal Preserve once a month from May – September. A total of 181 bats of 9 species were captured, including 8 western yellow bats and 6 California leaf-nosed bats.

The project exceeded the estimated budget due to additional staff time involved in netting captures and tracking during the foraging distance study.

FY16 Activities: The five permanent acoustic monitoring stations will continue to operate. Data will be collected and analyzed for covered and evaluation species presence during the summer peak activity periods. Station data from the five non-LCR MSCP managed sites will be analyzed together with the nine habitat creation area stations (F4) as a single acoustic monitoring network to document trends in LCR MSCP species activity levels across the program area. Archived acoustic data will be organized, analyzed, and compiled so that it may be entered into a single database.

California leaf-nosed bat roost outflight counts will be conducted during the winter season. It has been determined that there will be sufficient system-wide mine outflight baseline data after winter FY16 to inform conservation area analyses; therefore, roost outflight counts will no longer be necessary on an annual basis. This will complete the baseline data collection effort.

The foraging distance study of California leaf-nosed and Townsend's big-eared bats will continue. In February 2016, field work will be conducted to capture up to 12 California leaf-nosed bats at a known winter roost near Yuma, Arizona, and to radio track them for approximately 2 weeks. During that time, capture surveys will be conducted at Bureau of Land Management restoration sites near Mittry Lake and at Yuma East Wetlands. If California leaf-nosed bats are captured during these surveys, they will also be radio tracked to determine where their roost is as well as how far away they will forage from that roost. In August, field work will be conducted to capture up to 12 Townsend's big-eared bats at a known summer roost and to radio track them for 2 weeks. In summer, California leaf-nosed and/or Townsend's big-eared bats will be radio tracked opportunistically during bat monitoring activities at conservation areas (F4).

Standardization of data and development of mobile electronic field forms for bat monitoring activities will continue.

Proposed FY17 Activities: The five permanent acoustic monitoring stations will continue to operate, and data will be analyzed for covered and evaluation species presence during the summer peak activity periods. Data will also be analyzed using the nine habitat creation area stations. The foraging study will continue and will focus on tracking bats from foraging areas. Standardization and consolidation of data and development of mobile electronic field forms for bat monitoring activities will continue. System-wide monitoring objectives will be defined and a monitoring plan developed for FY18–28. Costs in FY17 are expected to decrease for this work task as efforts are shifted to monitoring additional conservation area acreage under post-development monitoring (Work Task F4).

Pertinent Reports: The report titled *Monitoring of LCR MSCP Bat Species as Determined by Acoustic Sampling, 2013 Summary Findings* has been posted on the LCR MSCP Web site. The report titled *Roost Surveys and Monitoring for Lower Colorado River Bat Species – 2013 Annual Report* has also been posted. The report titled *Monitoring of LCR MSCP Bat Species as Determined by Acoustic Sampling, 2014 Summary Findings* will be posted upon completion.

Work Task D10: System Monitoring of Rodent Populations

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$40,000	$37,704.76	$212,226.74	$40,000	$40,000	$40,000	$40,000

Contact: Allen Calvert, (702) 293-8311, acalvert@usbr.gov

Start Date: FY11

Expected Duration: FY55

Long-Term Goal: System-wide monitoring to document the presence of possible source populations of LCR MSCP covered rodents along the lower Colorado River (LCR)

Conservation Measures: AMM1, AMM6, MRM2, DPMO1, CRCR1, CRCR2, YHCR1, and YHCR2

Location: System-wide along the LCR, including the Bill Williams River

Purpose: The purpose of this work task is to conduct presence surveys of Colorado River cotton rats, Yuma hispid cotton rats, and desert pocket mice within existing habitat along the LCR.

Connections with Other Work Tasks (Past and Future): System-wide monitoring will be used in conjunction with post-development monitoring (F3) and small mammal research (C27) to document habitat at capture locations.

Project Description: Surveys will be conducted to detect the presence of Colorado River cotton rats, Yuma hispid cotton rats, and desert pocket mice within selected areas that have potential habitat on the LCR outside LCR MSCP conservation areas. Surveys may be conducted in the extreme edges of each species' range in an attempt to document the outer limits of their respective distributions within the LCR MSCP planning area.

Previous Activities: Presence surveys were conducted in potential Colorado River and Yuma hispid cotton rat habitat within the LCR MSCP area from FY11 to FY14 to document each species' range and to collect genetic samples. Colorado River cotton rats were detected in Reaches 3–4, and Yuma hispid cotton rats were detected in Reaches 6–7. Desert pocket mice were detected at many survey areas, but the subspecies cannot be determined.

FY15 Accomplishments: Small mammal live trapping surveys were conducted within previously occupied locations to document the presence of Colorado River and Yuma hispid cotton rats. Areas surveyed included Pintail Slough in the Havasu National Wildlife Refuge and the Pratt Agricultural Lease near Yuma, Arizona. One Colorado River cotton rat and four desert pocket mice were captured at Pintail Slough. No Yuma hispid cotton rats were captured at the Pratt Agricultural Lease.

FY16 Activities: System-wide surveys will be conducted to detect the presence of Colorado River cotton rats and Yuma hispid cotton rats within selected areas that have potential habitats along the LCR outside LCR MSCP conservation areas. System-wide monitoring objectives for 2017–27 will be defined. If potential habitats are discovered in areas that can inform LCR MSCP habitat creation, monitoring may be conducted to document Colorado River cotton rat and Yuma hispid cotton rat presence.

Proposed FY17 Activities: Rodent presence surveys will be conducted to meet system-wide monitoring objectives throughout the LCR system.

Pertinent Reports: The 2012–14 combined report will be posted on the LCR MSCP Web site upon completion.

Work Task D12: Lowland Leopard Frog and Colorado River Toad Surveys

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$25,000	$16,710.85	$437,414.37	$35,000	$35,000	$0	$0

Contact: Allen Calvert, (702) 293-8311, acalvert@usbr.gov

Start Date: FY10

Expected Duration: FY17

Long-Term Goal: To document the existing populations of lowland leopard frogs and Colorado River toads along the lower Colorado River (LCR) and understand their habitat requirements

Conservation Measures: LLFR1 and CRTO1

Location: Within Reaches 3–7 of the LCR MSCP boundary and the Bill Williams River

Purpose: To better define the distribution, habitat requirements, and factors limiting the distribution of lowland leopard frogs and Colorado River toads using a system-wide monitoring approach

Connections with Other Work Tasks (Past and Future): Populations that are found during system-wide surveys may be included in in the habitat study conducted under Work Task C62.

Project Description: System-wide surveys for lowland leopard frogs and Colorado River toads will be conducted along the LCR and the Bill Williams River. It is unknown if any populations still exist along the LCR. Lowland leopard frogs have been observed on the Bill Williams River, and surveys will help determine the distribution of this population. Habitat characteristics will also be gathered in conjunction with surveys where the presence of either species is confirmed.

Previous Activities: In FY11, 139 locations along the LCR and the Bill Williams River were surveyed. Neither species was documented on the main stem LCR. Six Colorado River toads were found at Planet Ranch, and no lowland leopard frogs were found. Lowland leopard frogs and Colorado River toads were

found on the Bill Williams River, east of Planet Ranch, in FY12 and FY13. In FY14, a survey methodology study was implemented to evaluate five different survey methods.

FY15 Accomplishments: Presence surveys for detecting lowland leopard frogs were initiated on February 10, 2015, and ended on May 1, 2015. Five sampling methods were tested, including visual encounter surveys (VESs), call-playback surveys, minnow trap surveys, digital automated recorders (DARs), and environmental deoxyribonucleic acid (eDNA). Four survey sessions were conducted during the reporting period for the lowland leopard frog, with 50 hours of VESs and over 43,000 trap-hours. The VESs, call-playback surveys, minnow trap surveys, and DAR methods were successful in detecting lowland leopard frogs. The results of the eDNA analysis will be available in FY16. An analysis to compare the detection rates will be completed in FY16.

Surveys for the Colorado River toad were initiated on July 6, 2015, and concluded on October 6, 2015. The VESs, call-playback surveys, and DAR methods were tested; minnow traps and eDNA were not used in FY15 because the study site remained dry for the entire season. Over 150 hours of VESs with call-playback were conducted, and over 80 hours of audio were recorded. Six Colorado River toads were observed during VES surveys, but no frogs were heard on the DARs.

FY16 Activities: Monitoring continued for the Colorado River toad into the fall of 2015. Tests will continue with the five sampling methods in spring for lowland leopard frogs and summer for the Colorado River toads. An analysis of the methods and draft protocols for Colorado River toads will be prepared to inform LCR MSCP decisions regarding methods to be used for future presence monitoring.

Proposed FY17 Activities: After two spring seasons of collecting lowland leopard frog detection data, an analysis of the methods and draft protocols for lowland leopard frogs will be prepared to inform LCR MSCP decisions regarding methods to be used for future presence monitoring.

Pertinent Reports: The FY14 annual report is in the review queue and will be posted on the LCR MSCP Web site upon completion. The FY15 annual report will also be posted upon completion.

WORK TASKS – SECTION E

Conservation Area Development and Management

Work Task E1: Beal Lake Conservation Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$300,000	$280,221.40	$3,987,475.52	$400,000	$250,000	$1,300,000	$250,000

Contact: Laken Anderson, (702) 293-8153, landerson@usbr.gov

Start Date: FY04

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: WIFL1, WRBA2, WYBA3, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, MNSW2, MNSW2, BONY2, and RASU2

Location: Reach 3, Havasu National Wildlife Refuge, Arizona, 0.5 mile east of River Miles 238 and 239

Purpose: To create and manage a mosaic of native land cover types for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Work Tasks E1 and E2 (closed) have been combined into the Beal Lake Conservation Area (BLCA). Vegetation and species monitoring are being addressed under Work Tasks F1–F4, and monitoring of native fishes is being addressed under Work Task F5. Portions of restoration research at the BLCA have been funded under Work Task G3.

Project Description: Beal Lake was 225 acres of shallow, low-quality aquatic habitat that was dredged in 2001 and stocked with native fishes. Management of Beal Lake is a continuation of the commitment to construct habitat for native fishes under the 1997 Biological and Conference Opinion. Continued maintenance and management obligations for the lake, as well as research and development of the backwater as native fish habitat, were subsumed under the LCR MSCP in 2005. Experimentation and restoration of the adjacent riparian area began in 2001. Three distinct planting efforts have been completed and resulted in 116 acres of various native land cover types, including cottonwood-willow, honey mesquite, and marsh. In 2010, the Beal Lake riparian (E1) and backwater (E2 [closed]) work tasks were combined when the Steering Committee formally adopted the work tasks as the Beal Lake Conservation Area.

The conservation area includes both the 225-acre backwater and 116 acres of cottonwood-willow, honey mesquite, and marsh.

Annual Maintenance and Management:

Riparian Fields: Irrigation is provided to the riparian fields from March through mid-September using a diesel-driven pump and a series of alfalfa valves, which deliver water to individual cells. The system required onsite personnel to fuel, start, and maintain the pump as well as manually open and close the alfalfa valves. The marsh receives surface water from Topock Marsh through a gravity flow connection but can also be managed with the diesel-driven pump. Access roads through the conservation area are bladed and maintained with type-2 road base.

Beal Lake: Maintenance and manual cleaning of the screens that allow surface flows to move from Topock Marsh into Beal Lake occurs biweekly from March to mid-September. Water surface elevations within Beal Lake and Topock Marsh are monitored using the established gauging stations, which can be accessed remotely. A series of water control structures, which has been installed to allow connection to or isolation of Beal Lake from Topock Marsh, requires annual maintenance. Using these structures, the lake can also be drawn down for fisheries or salinity management, using either a dewatering system installed at the south end of the lake or the diesel-driven pump.

Previous Activities:

Riparian Fields: The riparian area has been irrigated and managed since 2001.

Beal Lake: Previous native fish stockings have maintained a population of approximately 100 razorback suckers. However, golden algae were confirmed within Beal Lake following a fishkill in February 2013. There were no detections of any fishes using electrofishing or remote passive integrated transponder scanning surveys for several months following the toxic algae event. By mid-summer, young-of-year largemouth bass were observed in the backwater. The backwater was hydrologically isolated from Topock Marsh following the fishkill; this closure resulted in a rapid increase in specific conductivity, which approached 11,000 microsiemens per centimeter in FY14. Since 2013, native fishes have not been contacted in the lake, and native fish stockings have not yet resumed. The lake is monitored monthly, and no algae have been detected since May 2013.

FY15 Accomplishments:

Maintenance/Restoration/Management:

Riparian Fields: Using the diesel-driven pump, 907 acre-feet of water was delivered to the 116 acres of cottonwood-willow.

In April 2015, there was a possible sighting of a northern Mexican gartersnake within the BLCA along the maintenance road between cells N and EE. Five photographs were provided for identification. There was a second observation on May 4, 2015, in the same area, and two photographs were provided for identification. The gartersnake is not an LCR MSCP covered species but was listed as threatened under the Endangered Species Act in July 2014. On June 9, 2015, an informal consultation was initiated under the LCR MSCP for maintenance activities occurring at the Beal Lake Conservation Area that may affect the northern Mexican gartersnake.

Beal Lake: Water surface levels were monitored using the established gauging stations. A discrepancy between the U.S. Fish and Wildlife Service gage at the South Dike and the gage in Topock Marsh adjacent to Beal Lake was noted. An informal survey of the staff gages was conducted in May 2015 to identify the source of the discrepancy.

Clearing of the unlined inlet ditch, which connects Topock Marsh to Beal Lake, was conducted and took 3 weeks to complete. Cattails were removed from the ditch using an excavator, placing the material in the dredge spoil field directly south of the ditch. This activity enhanced surface water flows; however, deepening of the channel in conjunction with other site improvements would minimize future long-term maintenance costs. Both the northern and southern boat ramps were cleared of vegetation and graded for ease of launching boats during monitoring efforts. The southern boat ramp was lined with riprap.

Monitoring:

Riparian Fields: Monitoring was conducted at the BLCA for vegetation, birds, bats, small mammals, and MacNeill's sootywings.

Vegetation data were collected in FY15 using light detection and ranging (LiDAR) remote sensing techniques.

Marsh bird surveys were conducted on three occasions at the wetland portions of the site. Western least bitterns and Yuma clapper rails were detected and are presumed to be breeding at the site.

Riparian bird surveys were conducted at the BLCA from April 15 to June 15, 2015, using the LCR MSCP's double sampling protocol. Arizona Bell's vireos,

Sonoran yellow warblers, and summer tanagers were confirmed breeding. Avian mist netting following the Monitoring Avian Productivity and Survivorship (MAPS) protocol was conducted from early May to early August. Sonoran yellow warblers, Arizona Bell's vireos, and summer tanagers were captured. Southwestern willow flycatcher surveys were conducted. One willow flycatcher was detected at the site on June 24; since no breeding evidence was observed and the bird was not observed after this visit, it is assumed this individual was a migrant. Yellow-billed cuckoo surveys were conducted between late June and early August, and breeding was confirmed.

The BLCA was mist netted for bats once per month from May to September 2015. California leaf-nosed and Townsend's big-eared bats were captured. In conjunction with the bat capture surveys, the established long-term acoustic bat station was used to detect LCR MSCP bat species. Western red bats, western yellow bats, California leaf-nosed bats, and Townsend's big-eared bats were detected during acoustic surveys.

Small mammal trapping was conducted in spring. No cotton rats were detected, but desert pocket mice were captured.

Surveys were conducted for MacNeill's sootywings in 2015. Individuals were detected in May.

Beal Lake: The water quality at Beal Lake was monitored throughout the backwater using permanently deployed multi-parameter instruments. Low levels of dissolved oxygen and high temperatures were observed locally but not lake-wide. Conductivity decreased to nearly 6,000 microsiemens per centimeter once the backwater was reconnected to Topock Marsh and the inlet canal was cleared to allow for better water flow. Zooplankton and phytoplankton results continue to show relatively low levels of plankton biomass. No golden algae have been detected in Beal Lake since May 2013.

FY16 Activities:

Maintenance/Restoration/Management:

Riparian Fields: Continued irrigation of the riparian fields will be conducted from March through September. No construction, restoration, or new management activities are planned within the riparian fields of the BLCA.

Beal Lake: Maintenance and manual cleaning of the screens that allow surface flows to move from Topock Marsh into Beal Lake will be conducted. Permanent removal of the four downstream wedge wire screens on the rock structure will be performed in March. A cage to exclude small mammals will be installed on the downstream end of the culverts, and clean screens will be reconnected on the upstream side of the culverts. Beginning in 2016, an annual maintenance

schedule will be managed for the four upstream wedge wire screens along the rock structure. The screens will be removed and replaced with clean screens. The removed screens will be pressure washed and stored until the next year when the cycle repeats to help induce flow to Beal Lake.

A drawdown of Beal Lake is scheduled, and any change in salinity will be tracked. Water levels will continue to be monitored using the established gauging stations. A formal survey will be conducted to confirm accuracy and the source of the discrepancy of the instruments adjacent to Beal Lake and the U.S. Fish and Wildlife Service gage located at the South Dike.

Monitoring:

Riparian Fields: Vegetation data will be collected in May 2016 using LiDAR remote sensing techniques. Marsh bird surveys will be conducted in March and April. General bird surveys and MAPS bird banding will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat capture surveys and acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Beal Lake: Monitoring activities at Beal Lake will be focused on water quality and plankton, with limited fish monitoring. Golden algae sampling will continue throughout the year. Research projects will be outlined for the next few years, and official study plans will be completed in FY16.

Proposed FY17 Activities:

Maintenance/Restoration/Management:

Riparian Fields: Riparian fields will be irrigated from March through September. No construction, restoration, or new management activities are planned within the riparian fields of the BLCA.

Beal Lake: Maintenance, cleaning, and rotation of the wedge wire screens within the unlined ditch are anticipated. Beginning in FY17, permitting and environmental compliance for the proposed dredging of Beal Lake is expected to begin. The dredging will help provide deeper areas within the lake for native fishes to seek thermal refuge and escape from predation. When dredged in 2001, the depth of the dredge channels was approximately 6 feet. Coordination and concepts will be agreed upon with partners and presented to the Steering Committee through the work plan process. Dredge material quantities will be verified, and the location of the spoil piles will be determined after coordinating with staff at the Havasu National Wildlife Refuge.

Monitoring:

Riparian Fields: Information from LiDAR vegetation data collected during FY15 and/or FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond. Marsh bird surveys will be conducted in March and April. General bird surveys and MAPS bird banding will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat capture surveys and acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Beal Lake: The activities from FY16 will continue into this year, and research projects outlined in FY16 will be initiated.

Pertinent Reports: The *2015 Beal Lake Conservation Area Annual Report*, will be posted on the LCR MSCP Web site once integration of the data collected throughout the calendar year is complete.

Work Task E4: Palo Verde Ecological Reserve

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$500,000	$822,212.91	$9,320,891.26	$500,000	$600,000	$600,000	$600,000

Contact: Darrin Miller, (702) 293-8166, dmiller@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: WIFL1, WRBA2, WYBA3, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2

Location: Reach 4, River Miles 129–133, California

Purpose: To create and manage a mosaic of native land cover types for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Vegetation is being addressed under Work Tasks F1–F4, wildlife under Work Tasks D2, D6, D7, D9, and D10, and insect populations were evaluated under Work Tasks C5 (closed) and C6 (closed).

Project Description: The Palo Verde Ecological Reserve (PVER) encompasses more than 1,300 acres. This property has been made available for LCR MSCP habitat restoration activities by the California Department of Fish and Wildlife. Development of the project is intended to satisfy both the LCR MSCP Habitat Conservation Plan requirements and California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

The eastern boundary of the property (more than 4 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. Each year, a portion of the active crop acreage was taken out of production to develop the next phase of native habitat. The intent was to create as much riparian habitat as practical. Generally, all phases at the PVER are targeted for southwestern willow flycatchers, yellow-billed cuckoos, and other covered species. The final phase was planted in FY13. The Palo Verde

Irrigation District (PVID) provides water to the PVER. Since the California Department of Fish and Wildlife manages a portion of PVER for their purposes, the costs associated with irrigation, electricity, and water is proportional to the amount of acreage that has been converted to habitat.

Riparian planting has resulted in the establishment of 945 acres of cottonwood-willow and 78 acres of honey mesquite, which are both managed for LCR MSCP covered species.

Annual Maintenance and Management: A local farmer diverts and irrigates the various phases based on site conditions and species planted. This provides local knowledge of weather and farming practices, which are applied to the management of the conservation area. The farmer and his employees are an onsite presence and provide early recognition of issues or concerns. The farmer is also responsible for assessing the water needs of the trees and, in coordination with the PVID and the LCR MSCP, orders and delivers the water. Removal of vegetation along the roadside and ditches is typically performed quarterly to reduce the potential of wildfires in conjunction with maintenance of the irrigation canals, gates, and roads.

The annual costs associated with operating within the PVID, such as water taxes, water tolls, electrical power utility bills, and assessments for district operation, are included in the annual maintenance costs.

Riparian Fields: Water is ordered through and provided by the PVID. At the PVER, two pump platforms delivery of the water to individual phases. Checks, which are small borders placed within a given field, allow for flooding of only a portion of a field and provide additional flexibility to create and maintain standing water or saturated soil areas for covered species. Irrigation occurs throughout the year and is expected throughout the life of the LCR MSCP.

Previous Activities: Over 1.8 million native trees and shrubs have been established on 1,023 acres at the PVER. Native trees have been irrigated and managed since 2006.

FY15 Accomplishments:

Maintenance/Restoration/Management: All phases have been planted and were managed for LCR MSCP covered species. Irrigation cycles were established and water ordered through the PVID. Replacement of the existing pump at heading JO2 with two 30-cubic-foot-per-second electric irrigation pumps, delivery pipes, an electrical upgrade, and a pump stand began in 2014 and was completed during the PVID's annual outage in January 2015. Due to delays in the start of construction on the new pumps and pump stand, and a longer than expected construction phase, the approved budget was exceeded.

Monitoring: Monitoring was conducted at the PVER for vegetation, birds, bats, small mammals, and MacNeill's sootywings.

Vegetation data were collected in FY15 using light detection and ranging (LiDAR) remote sensing techniques.

Riparian bird surveys were conducted at the PVER from April 15 to June 15, 2015, using the LCR MSCP double sampling protocol. Gila woodpeckers, Sonoran yellow warblers, and vermilion flycatchers were detected breeding at the site. Summer tanagers were detected but were not observed breeding. Southwestern willow flycatcher surveys were conducted, and a resident bird was detected defending a territory from May 31 to June 14, but there was no evidence of breeding. Yellow-billed cuckoo surveys were conducted between late June and early August. Breeding was confirmed again in FY15.

The PVER was mist netted for bats once per month from May to September 2015. Western yellow bats and California leaf-nosed bats were captured. In conjunction with the bat capture surveys, the two established long-term acoustic bat stations were used to help detect LCR MSCP bat species. Western red bats, western yellow bats, California leaf-nosed bats, and Townsend's big-eared bats were detected during acoustic surveys.

Small mammal trapping was conducted in fall and spring. Colorado River cotton rats were captured.

Surveys were conducted for MacNeill's sootywings in 2015. Individuals were detected in April and June.

FY16 Activities:

Maintenance/Restoration/Management: The entire conservation area is now fully developed and has transitioned from development into maintenance and monitoring. No construction, restoration, or changes to management activities are planned.

The site operations and maintenance budget for FY16 and beyond has been increased to reflect actual operation costs. Since development is now complete, the management plan for the entire conservation area will be drafted.

Monitoring: Vegetation data will be collected in May 2016 using LiDAR remote sensing techniques. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat capture surveys and acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Proposed FY17 Activities:

Maintenance/Restoration/Management: Irrigation and management of the conservation area will continue on the same schedule until data become available that indicate adjustments are needed. No construction or restoration activities are planned.

Monitoring: Information from LiDAR vegetation data collected during FY15 and/or FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat capture surveys and acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Pertinent Reports: The *2015 Palo Verde Ecological Reserve Annual Report*, will be posted on the LCR MSCP Web site once integration of the data collected throughout the calendar year is complete.

Work Task E5: Cibola Valley Conservation Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$700,000	$722,727.85	$11,351,713.78	$750,000	$800,000	$850,000	$850,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: WIFL1, WRBA2, WYBA3, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2

Location: Reach 4, River Miles 99–104, Arizona

Purpose: To 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 Work Tasks F1–F4 and F6.

Project Description: In 2007, 1,309 acres of land serviced by the Cibola Valley Irrigation and Drainage District were secured under the LCR MSCP, and the Cibola Valley Conservation Area (CVCA) was established. The Arizona Game and Fish Department (AGFD) acquired the CVCA in September 2007 through a multi-organizational agreement involving the AGFD, the Bureau of Reclamation, the Mohave County Water Authority, The Conservation Fund, and the Hopi Tribe. Through these agreements, the AGFD acquired CVCA fee title and water entitlements. The acreage for LCR MSCP covered species is managed under the LCR MSCP.

The CVCA 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). Seven phases have been restored with native vegetation, and the remainder is farmed for cotton and alfalfa. The area is bordered to the south by the Cibola National Wildlife Refuge and on the

east by unimproved land under the jurisdiction of the Bureau of Land Management. The river forms the north and west boundaries, except for the Palo Verde Oxbow, from River Miles 98.8 to 104.9.

Annual Maintenance and Management: A local farmer diverts and irrigates the various phases based on site conditions and species planted. This provides local knowledge of weather and farming practices, which are applied to the management of the conservation area. The farmer and his employees are an onsite presence and provide early recognition of issues or concerns. The farmer is also responsible for assessing the water needs of the trees and, in coordination with the Cibola Valley Irrigation and Drainage District (CVIDD) and the LCR MSCP Office, orders and delivers the water. Removal of vegetation along the roadside and ditches is typically performed quarterly to reduce the potential of wildfires in conjunction with maintenance of the irrigation canals, gates, and roads.

The annual costs associated with operating within the CVIDD, such as water taxes, water tolls, electrical power utility bills, and assessments for district operation, are included in the annual maintenance costs.

Cottonwood-Willow: Water is ordered through and provided by the CVIDD. Checks, which are small borders placed within a given field, allow for flooding of only a portion of a field. These provide additional flexibility to create and maintain standing water or saturated soil areas for covered species. Irrigation occurs throughout the year and is expected throughout the life of the LCR MSCP.

Honey Mesquite: Water is ordered through and provided by the CVIDD. However, for honey mesquite, water is only used for establishment. Flood irrigation is reduced during establishment by creating deep furrows and planting only within the furrows. Typically, irrigation is concluded within 3 years when the roots have reached the groundwater table.

Previous Activities: Through FY14, over 700 acres of cottonwood-willow and honey mesquite have been established in Phases 1–6 and are being managed for LCR MSCP covered species.

FY15 Accomplishments: In the spring of FY15, Phase 7, consisting of 72 acres, was planted with mesquite and cottonwood trees in accordance with the *Cibola Valley Conservation Area Restoration, Development, and Monitoring Plan: Phase 7*. The riparian and mesquite trees for the FY16 planting of Phase 8 (111 acres) were purchased in FY15 in accordance with the *Cibola Valley Conservation Area Restoration, Development, and Monitoring Plan: Phase 8*.

Maintenance/Restoration/Management: Management, maintenance, irrigation, and monitoring of the established habitat created over the past 9 years continued. Established phases developed as cottonwood-willow (Phase 1, 2, and 3) continued

to be flood-basin irrigated. Phase 7 was also irrigated using furrows following planting and will continue to be irrigated for three growing seasons until the mesquite have established.

No major construction or repairs were needed on the irrigation canals within the conservation area; however, an inventory was completed, and areas were identified for repair/replacement. Sections of canals that were identified as needing repair during the inventory will be scheduled for repair or replacement in conjunction with other conservation areas.

Monitoring: Monitoring was conducted at the CVCA for vegetation, birds, bats, small mammals, and MacNeill's sootywings.

Vegetation data were collected in FY15 using light detection and ranging (LiDAR) remote sensing techniques.

Riparian bird surveys were conducted at the CVCA from April 15 to June 15, 2015, using the LCR MSCP double sampling protocol. Summer tanagers were detected breeding at the site. No other LCR MSCP species were detected. Avian mist netting following the Monitoring Avian Productivity and Survivorship (MAPS) protocol was conducted from early May to early August. Summer tanagers were captured, and yellow-billed cuckoos were heard while conducting the MAPS protocol. Southwestern willow flycatcher surveys were conducted, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted between late June and early August. Several individuals were detected, but breeding could not be confirmed this year.

The CVCA was mist netted for bats once per month from May to September 2015. Western yellow bats, western red bats, and Townsend's big-eared bats were captured. In conjunction with the bat capture surveys, the established long-term acoustic bat station was used to detect LCR MSCP bat species. Western red bats, western yellow bats, California leaf-nosed bats, and Townsend's big-eared bats were detected during acoustic surveys.

Small mammal trapping was conducted in fall and spring. Colorado River cotton rats were captured.

Surveys were conducted for MacNeill's sootywings in 2015. Individuals were detected in May and June.

FY16 Activities: The planting of Phase 8 is scheduled for April 2016 and will include a mosaic of low- and high-density riparian species (cottonwood and willow) and mesquite planted in furrows. The Restoration, Development, and Monitoring Plan for the planting of Phase 10 and 11 will be drafted. The plants for Phase 9 will be ordered in FY16 to allow time for propagation, and the planting to take place in FY 17.

Maintenance/Restoration/Management: Regular management, maintenance, irrigation, and monitoring will continue. Irrigation will be provided to Phase 1, 2, and 3 (cottonwood-willow) and to the furrows within Phase 7 (honey mesquite). Phase 8 will be watered regularly after planting is complete.

Monitoring: Vegetation monitoring will continue. Vegetation data will be collected in May 2016 using LiDAR remote sensing techniques. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat capture surveys and acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Proposed FY17 Activities:

Maintenance/Restoration/Management: Regular management, maintenance, irrigation, and monitoring will continue. Irrigation will be provided to Phases 1, 2, and 3 (cottonwood-willow) and to the furrows within Phases 7 and 8 (honey mesquite). The plants for Phase 9 will be ordered in FY17 to allow time for propagation, and the planting to take place in FY18. Field preparation will begin in FY17 for planting Phase 9 using the same mosaic approach as Phase 8.

Monitoring: Vegetation monitoring will continue. Information from LiDAR vegetation data collected during FY15 and/or FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat capture surveys and acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Pertinent Reports: The *2015 Cibola Valley Conservation Area Annual Report* will be posted on the LCR MSCP Web site once integration of the data collected throughout the calendar year is complete.

Work Task E9: Hart Mine Marsh

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$250,000	$204,369.70	$6,822,956.73	$250,000	$250,000	$250,000	$200,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: CLRA1, LEBI1, BLRA1, and CRCR2

Location: Reach 4, Cibola National Wildlife Refuge, River Mile 92, Arizona

Purpose: To create and manage marsh habitat for Yuma clapper rails, western least bitterns, California black rails, and Colorado River cotton rats

Connections with Other Work Tasks (Past and Future): Vegetation and species monitoring are being addressed under Work Tasks F1–F4 and F7.

Project Description: Hart Mine Marsh was a decadent marsh located on the Cibola National Wildlife Refuge that was restored and expanded to create functional habitat for covered species. This was accomplished by the installation of control structures to manage water levels, providing sources of higher-quality surface water flows, making physical changes to the site's topography, and by planting and supporting native wetland and marsh vegetation. The approach was to remove a substantial amount of existing salt cedar from the site, deepen areas of existing open water, contour areas adjacent to those deeper areas, and manage water at the higher elevations to promote and sustain marsh cover type vegetation and wetland functions. The creation of habitat included both the establishment of native plants and management of water levels to meet performance standards for integrating emergent vegetation and open water at varying depths into a mosaic of marsh habitats.

Annual Maintenance and Management: The primary source of water for Hart Mine Marsh is drainage water from fields in Farm Unit #1 on the Cibola National Wildlife Refuge, which is delivered through Arnett Ditch into the marsh. However, raw Colorado River water can also be pumped and delivered either into the Arnett Ditch or directly into the marsh. The increased management

flexibility of the two sources of water, along with a series of water control structures, allow for stable water level management as well as the ability to manage salinity. Water deliveries are used to maintain static water levels during marsh bird nesting season and for flushing of the marsh in winter to manage salinity.

Vegetation maintenance at the marsh employs an integrated pest management approach that use both manual (hand pulling) and chemical (herbicide) treatment of invasive species, including salt cedar, phragmites, and five-hook bassia.

The annual costs associated with operating the marsh include operation and maintenance of the water control structures, maintenance of the pumping system and electrical costs, invasive and non-native vegetation control, and road maintenance.

Previous Activities: In FY09, the first phase of construction was completed and resulted in 92 acres of marsh. In FY10, Phase 2 of construction was completed and resulted in the creation of an additional 163 acres of marsh, for a total of 255 acres.

The marsh has been managed for LCR MSCP covered species since 2009. Yuma clapper rails, California black rails, and western least bitterns have been detected on the conservation area.

FY15 Accomplishments:

Maintenance/Restoration/Management: The majority of the activities that occurred in FY15 were for management, maintenance, and monitoring of the established marsh. Monitoring of abiotic and biotic parameters was also conducted. The U.S. Fish and Wildlife Service (USFWS), using non LCR MSCP funding, performed a salinity soil sampling study in the spring of 2015. The findings of this study concluded that current marsh management maintains salinity levels below established thresholds for marsh vegetation.

Pump Stand Replacement: The USFWS and the Bureau of Reclamation have entered into an agreement to replace aging pump stands at both Hart Mine Marsh and the Cibola National Wildlife Refuge Unit #1 Conservation Area. The USFWS has contributed $712,000, as their share, for the replacement of the pump stands and pumps at both areas. The funds to design and implement the replacement are being leveraged under the LCR MSCP. Progress will be tracked under this work task and Work Task E24; however, expenditures will not be shown for the work funded by the USFWS.

Initial planning and design started in FY15 for these upgrades, which will include abandoning the existing pump stand and constructing a new one. The pump stand replacement was targeted as a priority since it has exceeded its normal operational lifespan.

Monitoring: Monitoring was conducted at Hart Mine Marsh for vegetation, marsh birds, and MacNeill's sootywings.

Vegetation data were collected in FY15 using light detection and ranging (LiDAR) remote sensing techniques.

Marsh bird surveys were conducted on three occasions at the wetland portions of the site. Western least bitterns and Yuma clapper rails were detected and are presumed to be breeding at the site. California black rails were not detected.

Surveys were conducted for MacNeill's sootywings in 2015 on the northeastern corner of Hart Mine Marsh. Individuals were detected in April and May.

FY16 Activities:

Maintenance/Restoration/Management: Management and monitoring of the marsh will continue.

Minor construction activities planned for FY16 include upgrades to the water control infrastructure. Frequently used canal gates will be retrofitted (new headrails and stems will be installed) so that they can be exercised (raised and lowered) with a gas-powered or electric actuator. Currently, the gates can only be exercised by manually turning a handwheel, which requires large inputs of manual labor. The retrofit and upgrade will allow for more efficient use of labor resources and will also allow the gates to be exercised on a more frequent basis. Frequent exercising of the gates will ensure that that they do not seize and will prevent the subsequent damage that typically occurs when attempting to unseize an immobilized gate.

Arnett Ditch conveys water from both the Colorado River and the agricultural fields north of Hart Mine Marsh, to the marsh, and eventually drains back into the Colorado River. Cattails have overgrown the drain, and approximately 1 mile of the drain is scheduled to be cleared.

Pump Stand Replacement: The preliminary design, including addressing sediment intake at this site, will be initiated. However, the pump stand at the Cibola National Wildlife Refuge Unit #1 Conservation Area will be replaced first, and therefore, activities for replacement of the Hart Mine Marsh pump stand will be minimal.

Monitoring: Marsh bird surveys will be conducted March, April, and May.

Vegetation data will be collected in May 2016 using LiDAR remote sensing techniques.

Proposed FY17 Activities:

Maintenance/Restoration/Management: Management and monitoring of the marsh will continue. No construction, restoration, or changes to the marsh management area anticipated.

Pump Stand Replacement: The pump stand is in a shallow section of the river; sediment transport and entrainment modeling is anticipated to refine the design.

Monitoring: Marsh bird surveys will be conducted in March, April, and May.

Information from the LiDAR vegetation data collected during FY15 and/or FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond.

Pertinent Reports: The *2015 Hart Mine Marsh Conservation Area Annual Report* will be posted on the LCR MSCP Web site once integration of the data collected throughout the calendar year is complete.

Work Task E13: McAllister Lake

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$0	$0	$127,336.82	$0	$50,000	$400,000	$400,000

Contact: Andrea Finnegan, (702) 293-8203, afinnegan@usbr.gov

Start Date: FY05 (closed in FY07; reopened in FY17)

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: BONY2, RASU2, and LEBI1

Location: Reach 5, Imperial National Wildlife Refuge (Imperial NWR)

Purpose: To evaluate a method of water quality improvement and maintenance by dewatering McAllister Lake and inducing groundwater recharge to manage salinity

Connections with Other Work Tasks (Past and Future): Monitoring of native fishes is being addressed under Work Task F5.

Project Description: McAllister Lake is a shallow, approximately 40-acre isolated flood plain lake located on the Imperial NWR. Management of the lake is a continuation of the commitment to construct habitat for native fishes under the 1997 Biological and Conference Opinion (1997 BO). Continued maintenance and management obligations of McAllister Lake, as well as research and development of the backwater as native fish habitat, were subsumed under the LCR MSCP in 2005.

McAllister Lake was identified under Reasonable and Prudent Alternative Number 3 in the 1997 BO as a backwater to be developed and managed for native fishes. The intent is to make improvements to the backwater and design and implement a pumping system to circulate water capable of allowing management of salinity and other water quality parameters at levels suitable for supporting native fishes.

The concept for restoration and development of McAllister Lake would include the implementation of substantial measures to improve infrastructure and better manage water quality and would involve the creation of a permanent or

semipermanent pumping station on a constructed berm between McAllister Lake proper and the western lobe of the lake. The creation of this dyke would protect the lake proper section of McAllister Lake from potential river flooding events. By using borrowed material from both McAllister Lake proper and the western lobe, an additional benefit of the construction of this dyke would be localized deepening in these pump-out areas. These deeper areas may, in turn, provide thermal refuge for native fishes. They could also potentially increase the subsurface hydraulic connection to the adjacent Colorado River, which could help to enhance water quality and water exchange efficiency. The excavation of these areas may also remove sediments with high biological oxygen demand, as identified by previous research, further improving water quality in both sections of the lake. The water exchange provided by the periodic operation of the pumping system may potentially dampen accumulation rates of selenium within the lake. It is recognized that implementation a pumping system at this remote location will likely require installation of either a solar- or diesel-powered pumping system. Implementation and operation of such a system has both esthetic and technical issues to overcome, and there are tradeoffs for each.

If the system is installed, operations and maintenance will continue under Work Task E13. If the proposed development is not implemented and the system is not installed due to incompatibilities with Imperial NWR missions, discussions with the U.S. Fish and Wildlife Service (USFWS), the Imperial NWR, and Refuge Complex Managers, as well as the USFWS Ecological Services Field Office, will commence. If, based on the outcome of these discussions, it is decided that the work task should be closed, all commitments to McAllister Lake under the 1997 BO will have been satisfied. Likewise, if long-term development and management efforts at McAllister Lake prove to be ineffective in providing adequate conditions for supporting native fish populations, or result in regular management actions that are not sustainable or consistent with Imperial NWR missions, discussions may commence with the USFWS, the Imperial NWR, and Refuge Complex Managers, as well as the USFWS Ecological Services Field Office. Again, if the work task is closed, based on the decisions from these discussions, all commitments to McAllister Lake under the 1997 BO will have been satisfied.

Previous Activities: The LCR MSCP's restoration group 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 included that for groundwater and surface water levels as well as 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 assess how quickly the lake's water quality would degrade if pumping was stopped; the level of

degradation would indicate the required pumping frequency needed to maintain sufficient water quality to support native fishes. After an approximately 18-month period with no pumping, salinity levels (measured as specific conductance) increased from approximately 4,000 to approximately 10,000 microsiemens per centimeter.

Results from these investigations suggested that salinity levels could be reduced through pumping and subsequent induced subsurface recharge but that regular water management (flushing) of the lake would be necessary to maintain desired salinity ranges. Some additional concerns were raised regarding managing McAllister Lake for native fishes, including the detection of heavy metals (arsenic and mercury) and seasonal low levels of dissolved oxygen. In FY07, all development and research activities at the lake were suspended in order to assess newly initiated research pertaining to water quality thresholds for native fishes and to decide the value of additional proposed limnologic research investigations. It also allowed time to develop a conceptual approach for the lake that would allow for potential mitigation of the challenges previously identified and to provide sustainable management options to benefit native fishes.

In FY15, followup sampling for arsenic, mercury, and selenium was conducted under Work Task C59. Samples of water, substrate, and biota were collected and analyzed to provide better resolution in suggesting the potential of bioaccumulation for native fishes stocked into McAllister Lake. The results were interpreted by the USFWS's Environmental Contaminants Office. Levels of selenium were elevated in mosquito fish tissue and will likely require a plan for long-term selenium monitoring. Concentrations of arsenic, mercury, and selenium in water and substrate were well below the Arizona Water Quality Standards threshold for concern. Concentrations of arsenic and mercury in tissue samples were also well below the Arizona Water Quality Standards threshold for concern.

The LCR MSCP and the USFWS Ecological Services Field Offices agreed that efforts to implement the proposed plan for restoration and management of McAllister Lake should move forward and that Work Task E13 should be reopened. Development will occur in a stepwise fashion in order to adequately consider the potential challenges of this site.

FY15 Accomplishments: This is a new start in FY17.

FY16 Activities: This is a new start in FY17. Preliminary information gathering and pre-design coordination may occur under Work Task E16 in FY16.

Proposed FY17 Activities: A detailed conceptual design for a dewatering system for both solar- and diesel-driven systems will be developed. The options would address both a permanently installed continuous pumping system and a seasonal, removable pumping system. The continuous pumping system would

remove water at a lower rate over a longer period of time, whereas the seasonal pumping system would pump at a higher rate for a shorter period of time. The outcome of discussions with the USFWS, the Imperial NWR, and Refuge Complex Managers, as well as the USFWS Ecological Services Field Office, will inform future actions.

Pertinent Reports: N/A

Work Task E14: Imperial Ponds Conservation Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$800,000	$328,870.83	$9,669,214.32	$1,500,000	$1,450,000	$450,000	$350,000

Contact: Andrea Finnegan, (702) 293-8203, afinnegan@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 National Wildlife Refuge (Imperial NWR), River Mile 59, Arizona

Purpose: To create and manage a mosaic of native land cover types for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Vegetation, species research, and monitoring is being conducted under Work Tasks C25, D9, and F1–F5. Fishery related research was conducted under Work Task C25.

Project Description: The Imperial Ponds Conservation Area is an integrated mosaic of native land cover types, including disconnected backwaters, cottonwood-willow, and marsh. It is situated within the Intensive Management Area of the Imperial NWR, an area of focused management for sensitive wildlife species, including native fishes, marsh birds, neotropical migratory birds, and migratory waterfowl.

Previous Activities:

Backwaters: Six backwaters have been constructed to provide approximately 80 surface acres of habitat for bonytail and razorback suckers. Lower Colorado River water was supplied to the backwaters by a pump fitted with a wedge wire screen system. The screen had a slot size of 0.05 millimeter that was designed to prevent passage of fish eggs and larvae into the backwaters. An in situ evaluation of the screen was completed under Work Task G3. The results indicated that fish eggs and larvae of multiple species were passing through the screen. In response to the results, the pump was shut off in the summer of 2009, and water was

supplied to all the backwaters using a single groundwater well. A water management study was initiated in May 2011 and was completed in 2013 to evaluate the water quality in Pond 1 (where regular water management was continued) and Ponds 2–6 (without a managed water supply). A trends analysis from the physico-chemical profiles indicated that the temperature was increasing over time in all six ponds; however, it appeared to be increasing at a slightly higher rate in Pond 1. The pH levels also appeared to increase over time, with differences being observed among ponds. The values of pH commonly exceeded a set standard of 9.0 in Ponds 2–6 in the summers of 2011 and 2012. The pH levels were lowest in Pond 1. Dissolved oxygen levels did not appear to be a cause for concern in an absence of water management. Specific conductivity levels showed a gradual increase over time in all ponds. A second well was installed onsite to supply water to the ponds in FY14. The new well both increased the volume of water that could be delivered to the ponds and provided redundancy in case one well became inoperable.

Annual maintenance and management of the ponds: From 2011 to 2016, a groundwater well supplied water, free from any life stages of fish, to Pond 1 as discussed in the water management study. Ponds 2–6 did not receive any water from the well. These ponds were sustained by groundwater and their hydrologic connections with the river. Annual costs included those for electricity for the well, maintenance of the pumps and valves to direct water delivery, and boat ramp maintenance.

Riparian: Yellow-billed cuckoos and southwestern willow flycatchers have been sighted adjacent to this conservation area in the cottonwood nursery. Field leveling and irrigation system installation for the area were completed in FY08.

Restoration and planting with native cottonwood and willow is not anticipated until FY17 but would not occur until the canal system has been replaced. In the interim, soil salinity in the fields is managed through irrigation of a cover crop.

Marsh: A 12-acre marsh unit was created at Field 18 in the southeast corner of the Imperial NWR. This field was cleared in the winter of 2007–08 and was converted into a bulrush-dominated marsh managed for rail species. The irrigation cycle is based on an adjacent field, Field 16, which was created and is managed for rail species. The marsh has been managed for LCR MSCP covered species since 2008, and both Yuma clapper rails and California black rails have been detected on Field 18.

Annual maintenance and management of marsh and cottonwood-willow: Irrigation water for both the riparian area, as well as the managed marsh complex, receive water from a pump platform, which is located in the Martinez Lake inlet canal. Annual costs associated with operation and maintenance of these areas

include costs associated with the electrical power utility bill, pump maintenance, invasive and non-native weed control, road maintenance, and the labor to open and close the gates along the canal.

FY15 Accomplishments:

Maintenance/restoration/management: Electrical upgrades to the pumping platforms and wells were completed. A leak in the new well line was repaired. The last major capital improvement, replacement of portions of the concrete-lined canal for the delivery of water into the fields, has been delayed until FY17; therefore, expenditures were less than approved.

Backwaters: Pond 5 was pumped down and held at an elevation of 180 feet for a 2-week period in preparation for a prescribed burn of the marsh area within the pond. All six ponds were renovated. Western mosquitofish were observed in Pond 5, and one was captured in a light trap.

A water management schedule has been established. Each pond will receive about 2.5 million gallons of water from January through June and October through December. The ponds will receive about 5.5 million gallons of water from July through September.

Riparian: Irrigation was supplied from February through September to maintain a cover crop to manage salinity. No additional restoration or monitoring was performed on the 34 acres of the future cottonwood-willow field.

Monitoring:

Backwaters: Bonytail and razorback suckers were removed from Pond 1 in preparation for the renovation efforts in FY15. One-hundred and forty-five bonytail were taken to the Lake Mead Fish Hatchery. None of the bonytail captured had a passive integrated transponder (PIT) tag, but based on their size, they were assumed to be the progeny from one or more recruitment events in Pond 1. Eighty-six razorback suckers were captured; 46 had previously been PIT tagged, and 40 had no tag data. All razorback suckers were stocked into the A-10 backwater in Ehrenberg, Arizona; any razorback suckers that did not have a tag received one prior to stocking.

Marsh: Marsh bird surveys were conducted by the U.S. Fish and Wildlife Service at the ponds and on Field 18. Yuma clapper rails were detected during each survey on Field 18, and western least bitterns were detected on Field 18 during the first survey in April. Black rails were not detected during the surveys. No covered marsh birds were detected at the ponds.

FY16 Activities:

Maintenance/restoration/management: Onsite maintenance, utility payments, and water management for the site will continue. Design and planning for the last major capital improvement, replacement of the entire concrete-lined canal for the delivery of water into the fields, will be drafted. A preliminary cost estimate and timeline to provide electrical power to the ponds is being prepared. The power, if feasible and cost effective, would allow for automation of valves, flow meters, water quality monitoring, and PIT tag scanning.

Backwaters: Water will be supplied to the ponds following the water management schedule. Electric will be run to each pond for the installation of permanent submersible PIT tag antenna. Post-renovation monitoring is being completed under Work Task C25.

Riparian: The fields will be irrigated to manage salinity in the soils. A Restoration, Development, and Monitoring Plan for the 34 acres of riparian habitat will be drafted, and trees will be purchased for planting following replacement of the irrigation canal.

Marsh: The 12-acre marsh created in Field 18 will continue to be managed for marsh covered species.

Monitoring: Monitoring will continue in FY16, similar to previous efforts for fish and marsh birds. MacNeill's sootywing surveys will be conducted in spring and summer if habitat is present.

Vegetation data will be collected in May 2016 using light detection and ranging remote sensing techniques.

Proposed FY17 Activities:

Maintenance/restoration/management: Onsite maintenance, utility payments, and water management for the site will continue. Replacement of the concrete-lined canal for the delivery of water into the riparian fields and marsh complex has been re-scheduled for FY17. Providing electrical power to the ponds, which appears feasible, would be completed.

Backwaters: Boat ramps and riprap shorelines will be maintained. An automated watering schedule for all six ponds will be developed and implemented.

Riparian: The fields will be planted if the irrigation canal is replaced before spring of FY17.

Marsh: The 12-acre marsh created in Field 18 will continue to be managed for marsh covered species.

Monitoring: Monitoring will continue in FY17, similar to previous efforts for fish and marsh birds. MacNeill's sootywing surveys will be conducted in spring and summer if habitat is present and none were detected in FY16.

Information from light detection and ranging vegetation data collected during FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond.

Pertinent Reports: The *2014 Imperial Ponds Conservation Area Annual Report* will be posted on the LCR MSCP Web site once integration of the data collected throughout the calendar year is complete.

Work Task E16: Conservation Area Site Selection

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$500,000	$539,525.37	$2,954,318.83	$1,300,000	$700,000	$500,000	$400,000

Contact: Terry Murphy, (702) 293-8140, tmurphy@usbr.gov

Start Date: FY05

Expected Duration: FY25

Long-Term Goal: Habitat creation

Conservation Measures: CLRA1, WIFL1, BONY2, RASU2, WRBA2, WYBA2, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, FLSU1, MNSW2, CLNB2, and PTBB2

Location: Reaches 1–7, Arizona, California, and Nevada

Purpose: To identify, visit, evaluate, prioritize, and recommend potential conservation areas to the Steering Committee for development under the habitat creation requirements of the LCR MSCP

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 Conservation Area Development and Management (Section E) work tasks.

Project Description: The Bureau of Reclamation (Reclamation) will work with landowners 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 a long-term commitment for the term of the program.

When developing a financial value for subject lands and water, Reclamation must administer a Federal appraisal using the U.S. Department of the Interior's designated Appraisal Services Office. The cost of appraisal services is captured under the Work Task E16 budget.

As new sites are evaluated and prioritized, each new site will be presented to the Steering Committee either through the site selection process or, if acquisition is required, through a Land and Water Resolution or Program Decision Document.

This approval allows Reclamation to move forward with the new site and prepare specific Restoration, Development, and Monitoring Plans that guide implementation of the conservation area.

In FY14, backwater site selection previously tracked under Work Task E15 (closed) was combined with this work task. This reflects the change in the process to select backwaters and allows integration of multiple land cover types on a conservation area in which the primary purpose is the creation of a backwater.

Previous Activities: Guidelines have been developed to describe the process of working with interested parties to identify sites for screening and evaluation as potential conservation areas. Through FY14, 11 conservation areas have been established.

FY15 Accomplishments: Coordination with resource agencies and attendance at planning meetings increased with the inclusion of Work Task E15 (closed). A workshop with representatives of the California parties was held to evaluate the status of establishing new conservation areas within the State of California.

Palo Verde Ecological Reserve-South (PVER-South): Two adjacent landowners expressed an interest in selling small, undeveloped parcels that would expand the footprint of PVER-South. A Federal appraisal was conducted for each property. For the first property, an agreement on the fair market value could not be reached, and negotiations have ended. The second property was sold to another party. No other actions or land and water resolutions are anticipated for these properties.

Parker Dam Camp: An investigation into alternate methods to collect drainage water from upstream reservoirs was conducted, and a summary report titled *30% Design Report – MSCP Native Fish Ponds Project* was completed. The report established design criteria for the creation of small ponds for native fishes, evaluated surface and groundwater information, evaluated and selected a screening method to minimize fish entrainment, and detailed a preliminary cost estimate to create a 6-acre pond. The cost per acre for construction of this pond was higher than for other created ponds due to its small size and limited availability of water, so pond construction could not be recommended for construction at this time. Parker Dam Camp was proposed as a conservation area managed as honey mesquite land cover type, with the caveat that a pond and a riparian component may be added at a future date. Parker Dam Camp is identified as Work Task E36 in FY16.

Three Fingers Lake: A light detection and ranging (LiDAR) survey, which provides topographic information, was completed; however, the data are not expected until the start of FY16.

Davis Lake: LiDAR information (topography) was collected and will be used to calculated earth-moving quantities to generate a restoration concept, if feasible, which would define the restoration effort.

Mohave Valley Conservation Area: This area was evaluated under Work Task E16 and is now being implemented as Work Task E35. It is the 12th conservation area, and when complete, it should provide 50 acres of backwater within the State of California.

Virgin River: The Virgin River lands owned by the Nevada Department of Wildlife on the Overton Wildlife Management Area have been identified for potential restoration. For safety reasons, the data loggers installed in FY13 are no longer monitored. Data collection may resume at a later date, but no data were collected during FY15.

FY16 Activities: Although coordination with resource agencies and attendance at planning meetings is expected to be similar to that of previous years, obligations will be significantly less. It is anticipated that the expenditures will be less than the approved budget due to the lack of backwater areas to be evaluated.

The following potential conservation areas, primarily in California, are being evaluated, and the findings will be brought back to the Steering Committee:

PVER-South: Negotiations for undeveloped lands adjacent to PVER-South have ended. A Restoration, Development, and Monitoring Plan will be drafted and discussed with the landowner (California Department of Fish and Wildlife). The plan, along with the drafting of an amendment to the existing Land Use Agreement, is anticipated in FY16.

Parker Dam Camp: A Restoration, Development, and Monitoring Plan will be drafted. The habitat would be creditable since, without intervention under the LCR MSCP, the lands would have been excessed and likely developed. The plan would identify the conservation area as riparian and honey mesquite and would also allow the testing of a water screening technique, a Coanda screen, to capture drainage from Gene Reservoir, which may be useful in backwaters at this or other conservation areas.

Three Fingers Lake: This lake was identified during a workshop with representatives of the California parties as having the potential to provide both backwater and marsh land cover types for the LCR MSCP. The lake is located on the Cibola National Wildlife Refuge within the State of California on lands owned by the U.S. Fish and Wildlife Service. Multiple options for creation of a conservation area will be discussed with stakeholders. It is anticipated that a

Restoration, Development, and Monitoring Plan will be drafted late in FY16 and submitted to the California Department of Fish and Wildlife for California Endangered Species Act approval.

Davis Lake: This lake was also identified during a workshop with representatives of California parties as having the potential for creation of a shallow marsh similar in size to Hart Mine Marsh. The remnant lake is located on the Cibola National Wildlife Refuge within the State of California on lands owned by the U.S. Fish and Wildlife Service.

Backwaters and Marsh within Reach 4: Reach 4 has the highest potential for establishment of marsh and backwater in California based on the needs of the LCR MSCP. Increased efforts to identify these areas on lands withdrawn by Reclamation, typically between the bank line and levee, are ongoing.

Topock Marsh Inlet Canal: An opportunity may exist to create a connected backwater in Reach 3 using the former Topock Marsh Inlet Canal. However, prior to any technical investigations, land ownership needs to be verified, so a survey will be initiated in FY16.

FY17 Proposed Activities: Coordination with resource agencies will continue. Work Task E36 will be opened to track obligations for the Parker Dam Camp. The following potential sites are likely to be evaluated:

PVER-South: Obligations and expenditures will be tracked under Work Task E37.

Parker Dam Camp: Obligations and expenditures will be tracked under Work Task E36.

Three Fingers Lake: A decision for inclusion as a conservation area is expected by FY17. Inclusion into the LCR MSCP as a conservation area would require opening a new Section E work task.

Davis Lake: Based on the incorporation of LiDAR data and the generation of a restoration concept, Davis Lake may be recommended for inclusion as a marsh complex under the LCR MSCP.

Topock Marsh Inlet Canal: Pending the results of a cadastral survey, a restoration concept and preliminary cost estimate would be prepared.

Backwaters and Marsh within Reach 4: Reach 4 has the highest potential for establishment of marsh and backwater in California based on the needs of the LCR MSCP. Preliminary cost estimates for restoration on sites identified in FY16 are anticipated.

Pertinent Reports: N/A

Work Task E17: Topock Marsh Pumping

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$1,000	$1,450.25	$1,140,618.66	$1,000	$1,000	$1,000	$1,000

Contact: Jeremy Brooks, (702) 293-8257, jjbrooks@usbr.gov

Start Date: FY06

Expected Duration: FY25

Long-Term Goal: Avoid impacts from flow-related covered activities on covered species habitats at Topock Marsh

Conservation Measures: AMM2

Location: Reach 3, Havasu National Wildlife Refuge, River Miles 235–244, Arizona

Purpose: To avoid the impacts of flow-related covered actions on covered species habitats at Topock Marsh by constructing a reliable and manageable water control structure that ensures water delivery off the main stem of the Colorado River by gravitational diversion or pumping

Connections with Other Work Tasks (Past and Future): N/A

Project Description: Topock Marsh has been identified as habitat for Yuma clapper rails and southwestern willow flycatchers. At times, flow-related activities could lower the river stage and reduce gravity diversions of water from the Colorado River to the marsh. The U.S. Fish and Wildlife Service (USFWS) proposed construction of an inlet canal (Fire Break Canal) that diverts water by gravity, combined with pumping, to deliver water to the marsh even when river elevations are low.

Previous Activities: In early 2010, $1 million was committed under the LCR MSCP toward the construction of Firebreak Canal, which improved the delivery of water to Topock Marsh by greatly reducing transmission losses that occurred when using the old, unlined inlet canal. In return for the monetary contribution, the USFWS concurred that the LCR MSCP has met its construction obligations under Avoidance and Minimization Measure AMM2 (AMM2).

At the LCR MSCP Steering Committee meeting held on April 28, 2010, the decision was made to provide the USFWS with all the operation and maintenance funds, also required under AMM2, in a lump sum of $2.55 million during FY12. Lump sum funding was made to the USFWS in March 2012. The final USFWS letter, stating that no further action under the LCR MSCP relating to any further commitments regarding AMM2, was presented to the Steering Committee during the October 2012 meeting.

FY15 Accomplishments: Monitoring of the funds continued. A Value Engineering Study that evaluated options for augmenting flows within the marsh complex was completed.

In FY15, preliminary conversations with the USFWS (Ecological Services Field Office) were held to discuss leveraging remaining AMM2 funds, approximately $2.1 million, and contributions from the Habitat Maintenance Fund (HMF) to complete infrastructure improvements at Topock Marsh. This effort will allow for enhanced management of marsh levels as outlined in AAM2 as well as benefit the HMF target species. The USFWS Ecological Services Field Office was consulted prior to initial discussions and concurred with the use of the HMF for these purposes. The USFWS Ecological Services Field Office concurred with the approach, and both parties committed to formalize the effort in FY16.

Central to this proposal is the premise that the use of the HMF in coordination with this work task would not affect previously fulfilled commitments under AMM2. The USFWS has concurred that AMM2 has been fulfilled, and no further obligations to maintain Topock Marsh are required under the LCR MSCP.

Efforts to formalize an agreement with the USFWS to leverage these two funding sources (initiated in FY15) will continue in FY16. Surveying and engineering analyses to support initial engineering evaluation and design efforts at Topock Marsh will occur in FY16.

FY16 Activities: LCR MSCP staff met with the USFWS (Ecological Services Field Office) to review the framework of the agreement. The USFWS Ecological Services Field Office was consulted prior to that meeting and confirmed that the structure of the framework is acceptable. Key components of the agreement include: all commitments under AMM2 will remain fulfilled; all AMM2 funds will be expended prior to the utilization of the HMF; prior to construction activities, the USFWS and the LCR MSCP will enter into an agreement to use the HMF, which will detail the long-term roles and responsibilities of both agencies and marsh management objectives.

Surveying and engineering analyses to support initial engineering evaluation and design efforts at Topock Marsh will be completed. The LCR MSCP Office will provide coordination and general support of these activities but will not directly implement the project.

Proposed FY17 Activities: Preliminary survey and engineering analyses activities are expected to be completed. Efforts will advance into engineering design stages for the construction of a non-gravity flow water augmentation system. When all remaining AMM2 funds are expended, the work task will be closed. A formal agreement between the LCR MSCP and the USFWS will be developed and executed, outlining the long-term roles and responsibilities of both agencies.

Pertinent Reports: N/A

Work Task E18: Law Enforcement and Fire Suppression

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$200,000	$226,303.00	$1,608,764.76	$250,000	$250,000	$250,000	$250,000

Contact: Jeremy Brooks, (702) 293-8257, jjbrooks@usbr.gov

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: Protect created habitat

Conservation Measures: CMM1

Location: Reaches 1–7

Purpose: To 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 integral management components for all habitats created through Conservation Area Development and Management (Section E) work tasks.

Project Description: A law enforcement and fire protection effort for created habitat is funded under this work task. The Bureau of Land Management (BLM), U.S. Fish and Wildlife Service, Arizona Game and Fish Department, California Department of Fish and Wildlife, Nevada Department of Wildlife, Bureau of Indian Affairs, CAL-Fire, and other agencies conduct law enforcement and firefighting activities on the river. Law enforcement and fire suppression strategies have been developed at the programmatic level for each individual conservation area. As new conservation areas are incorporated into the LCR MSCP, site-specific law, fire, and access plans will be developed to help reduce fire and other risks.

Previous Activities: The BLM, Colorado River District Office based in Lake Havasu, Arizona, has been responsible for handling fire- and law-related activities for conservation areas on both State and Bureau of Reclamation lands. Conservation areas located on Federal refuges are managed for wildland fire and law enforcement by the U.S. Fish and Wildlife Service.

The BLM also conducts planning, coordination, monitoring, outreach, risk assessments, site mapping, and site inspections activities. Inspections are intended to proactively identify and address potential wildland fire management issues, and recommendations are discussed with the landowner and the LCR MSCP Office. These recommendations help identify high risk areas, areas in need of fuel reduction, damage to infrastructure, and management of visitor use areas.

FY15 Accomplishments: Work with local fire and law agencies in support of the law and fire management activities continued in FY15. Activities included patrols, monitoring, site visits, coordination meetings, and attendance at agency staff meetings. Efforts served to protect established habitats from risk factors that could result in lost habitat and costly re-establishment.

In addition, two new Interagency Agreements were signed with the BLM through FY20. One agreement supports law enforcement activities, and the other supports fire suppression activities at LCR MSCP conservation areas. Due to the development of new law and fire Interagency Agreements and discussions related to access with stakeholders at certain conservation areas, law, fire, and access plan updates anticipated to be developed in FY15 were postponed until FY16 and FY17.

FY16 Activities: In support of LCR MSCP conservation areas, coordination with law and fire agencies will continue through the Interagency Agreements with the BLM. Funding will continue to be allocated to the BLM for law enforcement and fire management activities, including patrols, fire prevention, activity reporting, site visits, coordination meetings, and other related activities. Law, fire, and access plans will be developed or updated for the Laguna Division Conservation Area and Planet Ranch.

Proposed FY17 Activities: BLM law and fire personnel will continue with proactive patrols similar to those in FY16. Site-specific fire, law, and access plans will be developed for the Palo Verde Ecological Reserve, the Cibola Valley Conservation Area, the Big Bend Conservation Area, and Hunters Hole.

Pertinent Reports: N/A

Work Task E21: Planet Ranch

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$40,000	$78,302.48	$344,212.22	$10,340,000*	$2,000,000	$3,000,000	$4,000,000

* Includes an $8,300,000 land and water acquisition approved by the Steering Committee.

Contact: Gail Iglitz, (702) 293-8138, giglitz@usbr.gov

Start Date: FY05 (closed in FY05; reopened in FY09)

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: CLRA1, WIFL1, WIFL2, WRBA2, WYBA3, CRCR2, LEB1, YBCU1, YBCU2, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2

Location: Reach 3, Bill Williams River, 11 miles east of River Mile 190, Arizona

Purpose: To create and manage a mosaic of native land cover types for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Costs associated with a Federal land and water appraisal conducted in FY08 were captured under Work Task E16. Work Task E21 was closed at the end of FY05 but was reopened in FY09 to track expenditures during negotiations.

Project Description: Planet Ranch encompasses approximately 8,400 acres, of which approximately 2,400 acres had previously been farmed for alfalfa. In 2008, the LCR MSCP Steering Committee approved a land and water resolution, which authorized the Bureau of Reclamation (Reclamation) to enter into negotiations to secure approximately 3,418 acres of land and 5,549 acre-feet of water per year. The sum of $8,300,000 to secure this land and water was determined through the Federal appraisal process.

The intent of the acquisition from Freeport McMoran is to secure the river corridor and develop the property as a conservation area. Creditable acreage includes: (1) active restoration of all four land cover types within the property boundary, (2) passive restoration within the active Bill Williams River channel on the property, and (3) downstream credit on the Bill Williams River National

Wildlife Refuge (Bill Williams River NWR). The current restoration concept for active restoration includes isolated backwaters for native fishes, including active rearing ponds and disconnected backwaters. The areas will be integrated into a mosaic with cottonwood-willow and honey mesquite. An estimated 550 acres of cottonwood-willow trees are anticipated to be developed on Planet Ranch (both active and passive restoration); another 396 acres of cottonwood-willow trees downstream on the Bill Williams River NWR will also be afforded protection by securing the Planet Ranch property and are also creditable to the LCR MSCP.

The entire ranch west of the river crossing (approximately 1,000 acres) and some acreage east of the river crossing defined as reserved under the Land Use Agreement, would be managed for LCR MSCP covered species. This area, which includes two residences, would be open to pedestrian traffic by 2021.

The entire ranch east of the river crossing road (approximately 2,400 acres) is not scheduled for restoration and would not be managed for LCR MSCP covered species. These lands would be managed by the Arizona Game and Fish Department (AGFD), with the exception of any lands shown as reserved for LCR MSCP purposes in the Land Use Agreement, and would be open to the public by 2021 for uses compatible with the purpose of the LCR MSCP.

A tentative schedule of activities has been presented to the AGFD and includes: (1) farming approximately 1,100 acres to secure water rights in FY16 and FY17, (2) planning for restoration and ground stabilization, including a workshop to incorporate information from native fish experts in FY16, (3) drafting of a Restoration, Development, and Monitoring Plan, permitting, and design in FY17, and (4) pond construction, ground stabilization on farmed areas, and restoration of cottonwood-willow between FY18 and FY20. A formal plan for public access would be agreed to during this period in a signed Land Use Agreement between Reclamation and the AGFD.

Previous Activities: Planet Ranch was evaluated, and a conceptual design was developed, assuming the ranch and water entitlement was secured for the LCR MSCP. This information is posted on the LCR MSCP Web site as *Planet Ranch: Potential Restoration Site, Preliminary Site Analysis and Conceptual Design*.

Regulatory compliance activities required under the National Environmental Policy Act, the Endangered Species Act, and the National Historic Preservation Act were completed for the acquisition of Planet Ranch. Native American consultation and a Class I Cultural Survey as prescribed in Section 106 of the National Historic Preservation Act were completed in FY11.

The Arizona Game and Fish Commission approved the acquisition of Planet Ranch in August 2014.

FY15 Accomplishments: Legislation directing the Secretary of the Interior to enter in an agreement for the acquisition of Planet Ranch was signed in December 2014. The land and water resolution for the acquisition of Planet Ranch was approved by the LCR MSCP Steering Committee on April 22, 2015.

FY16 Activities: On December 15, 2015, escrow closed, land ownership and associated water rights were deeded to the Arizona Game and Fish Commission, and Planet Ranch officially became a conservation area. The purchase price for the lease was $8,300,000 for 3,418 acres of land and 5,549 acre-feet of water per year.

To ensure the viability of water rights associated with the property, approximately 1,200 acres of alfalfa are being grown as pasture from December 16, 2015, through December 15, 2016. Water usage is tracked through totalizing flow meters and, when combined with acreage being farmed, documents the beneficial use of water on the property. Water usage and crop acreage are updated monthly. A contract farmer is providing irrigation, site maintenance, as well as an onsite presence. Significant vandalism has occurred on other ranches within the watershed when no onsite presence has been maintained.

Discussions with the U.S. Fish and Wildlife Service to maintain an onsite presence are underway. The intent is to have a permanent, Federal presence onsite by the close of FY16. Procurement of vehicles, heavy equipment, and supplies would begin.

Planning will be initiated for a Restoration, Development, and Monitoring Plan, which would guide development of the conservation area and likely include a workshop focused on isolated backwater construction and management. The created backwaters would likely be a mix of smaller ponds to support fish augmentation in combination with larger ponds used as long-term refugia.

Reclamation continues to be an active member of the Bill Williams River Corridor Steering Committee. Converting lands from private ownership to a resource agency has provided additional flexibility in the release of water from Alamo Dam. Lands secured within the active flood plain, as well as lands downstream on the Bill Williams River NWR, benefit from both normal and high flow releases from the dam. These releases can be conducted without affecting these former privately owned lands. However, during the period of time when water rights are being secured, December 2016 – December 2017, it was requested that high flow events be held to a minimum. Coordination with both the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers will continue.

Monitoring: Pre-development monitoring will be conducted in FY16.

Proposed FY17 Activities: The alfalfa pasture would be irrigated through December 15, 2017. Water use is tracked through totalizing flow meters and, when combined with acreage being farmed, documents the beneficial use of water on the property. A farmer would provide irrigation, site maintenance, as well as an onsite presence.

Permitting and refinement of the Restoration, Development, and Monitoring Plan, including design work on specific areas of development, would be initiated. Minor construction or upgrading of facilities, such as the maintenance shop, to support development and long-term management are anticipated.

A permanent, Federal onsite presence, using existing housing, is anticipated in FY17. Reclamation participation on the Bill Williams River Corridor Steering Committee would continue.

Monitoring: Pre-development monitoring will continue in FY17.

Pertinent Reports: N/A

Work Task E24: Cibola National Wildlife Refuge Unit #1 Conservation Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$1,000,000	$655,451.78	$4,479,008.26	$700,000	$750,000	$750,000	$800,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@usbr.gov

Start Date: FY07

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: WIFL1, WRBA2, WYBA3, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and CRCR2

Location: Reach 4, Cibola National Wildlife Refuge, 1/2 mile east of River Mile 97, Arizona

Purpose: To 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 incorporated lands under Work Tasks E6–E8 (closed), with additional adjacent acreage at the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1). Operation and maintenance of these work tasks will now be tracked under Work Task E24.

Project Description: The Bureau of Reclamation currently has a number of established projects at Cibola NWR Unit #1, which includes restoration research and demonstration projects that began as a precursor to the LCR MSCP. A 50-year Land Use Agreement with the U.S. Fish and Wildlife Service (USFWS) to restore new areas and maintain created land covers on Cibola NWR Unit #1 has been signed.

Work Task E24 incorporates the existing projects and active agricultural land as well as substantial additional, undeveloped, adjacent acreage into a single conservation area. The land included in Cibola NWR Unit #1 encompasses approximately 950 acres and ranges in cover and use from agricultural fields, to partially improved land, to undeveloped land. The acreage in Cibola NWR

Unit #1 is targeted primarily for the cottonwood-willow land cover type but will also likely include a mosaic of native habitats, including wetland and riparian-upland interface areas.

The acreage in Cibola NWR Unit #1 has been categorized into five areas:

- Area #1 (193 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 338 acres that were cleared as a result of the Hippy Fire. In FY13, 82 acres were planted with cottonwood and willow trees, and the remaining acres were planted with alfalfa and other cover crops.

- Areas #3 (Baseline 90) includes 107 acres of undeveloped and fallowed agricultural land. Undeveloped areas will require clearing, leveling, installation of an irrigation infrastructure, and soil conditioning before development for native riparian species.

- Area #4 (North 160) includes 158 acres and is planted with alfalfa and cover crops until the area is conditioned to improve soil salinity.

- Area #5 (Crane Roost) includes 154 acres that have been planted with cottonwood, willow, and mesquite species.

Annual maintenance and management: A local farmer diverts and irrigates the various phases based on site conditions and species planted. This provides local knowledge of weather and farming practices, which are applied to the management of the conservation area. The farmer and his employees are an onsite presence and provide early recognition of issues or concerns. The farmer is also responsible for assessing the water needs of the trees and, in coordination with the refuge and LCR MSCP staff, orders and delivers the water. Removal of vegetation along the roadside and ditches is typically performed quarterly to reduce the potential of wildfires in conjunction with maintenance of the irrigation canals, gates, and roads.

The annual costs associated with operating within Cibola NWR Unit #1, such as electrical power utility bills, labor to open and close the irrigation gates, invasive and non-native vegetation control, and road maintenance are included in the annual maintenance costs.

Checks, which are small borders placed within a given field, allow for flooding of only a portion of a field. These provide additional flexibility to create and maintain standing water or saturated soil areas for covered species. Irrigation occurs throughout the year and is expected throughout the life of the LCR MSCP.

Previous Activities: Through FY14, 365 acres of cottonwood-willow have been established within the 950-acre site. Native trees have been irrigated and managed since 2007.

FY15 Accomplishments:

Maintenance/restoration/management: Management, maintenance, flood irrigation, and monitoring of the established habitat created continued. No restoration or tree planting occurred in FY15. Plants were ordered and field preparation initiated in accordance with the Restoration, Development, and Monitoring Plan for the lower Hippy Burn area, which will be planted next spring. Approximately 96 acres will be planted with a mix of cottonwood, willow, mesquite, and other riparian shrub and grass species.

The approved budget contained expenditures for partial replacement of the pump stand at Cibola NWR Unit #1. However, the USFWS and the Bureau of Reclamation have entered into an agreement to replace the aging pump stands at both Hart Mine Marsh and Cibola NWR Unit #1. The USFWS has contributed $712,000, as their share, for the replacement of the pump stands and pumps at both areas. The funds to design and implement the replacement are being leveraged under the LCR MSCP. Progress will be tracked under this work task and Work Task E9; however, expenditures will not be shown for the work funded by the USFWS. This agreement reduced expenditures in FY15.

Monitoring: Monitoring was conducted at Cibola NWR Unit #1 for vegetation, birds, bats, and small mammals.

Vegetation data were collected in FY15 using light detection and ranging (LiDAR) remote sensing techniques.

The site was surveyed for riparian birds using the LCR MSCP double sampling protocol. Arizona Bell's vireos and Sonoran yellow warblers were detected breeding. Avian mist netting following the Monitoring Avian Productivity and Survivorship protocol was conducted from early May to early August. A female vermilion flycatcher was banded in late July and was observed with a male, though no breeding evidence was found. Southwestern willow flycatcher surveys were conducted, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted, and breeding was confirmed.

Cibola NWR Unit #1 was mist netted for bats once per month in February and from May to September 2015. Western red bats, western yellow bats, and California leaf-nosed bats were captured. In conjunction with the bat capture surveys, the established long-term acoustic bat station was used to detect LCR MSCP bat species from June – August. Western red bats, western yellow bats, California leaf-nosed bats, and Townsend's big-eared bats were detected.

Small mammal trapping was conducted in fall and spring. Colorado River cotton rats continue to be detected at the site.

FY16 Activities:

Maintenance/restoration/management: Management, maintenance, flood irrigation, and monitoring of the established habitat created will continue. Tree planting will occur in the spring of FY16 on the area known as the lower Hippy Burn area. Approximately 96 acres will be planted with a mix of cottonwood, willow, mesquite, and other riparian shrub and grass species. Some field preparations for the middle Hippy Fire area (149 acres) will be initiated, and plants will be ordered to allow time for propagation before planting next spring.

Monitoring: Vegetation data will be collected in May 2016 using LiDAR remote sensing techniques. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat capture surveys and acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring. MacNeill's sootywing surveys will be conducted in spring and summer.

Proposed FY17 Activities:

Maintenance/restoration/management: Management, maintenance, flood irrigation, and monitoring of the established habitat created will continue. As mentioned above, 149 acres of the middle Hippy Fire area are scheduled for final field preparation and riparian planting in FY17. Final land preparation will take place in the first months of 2017, with planting scheduled for March/April 2017. The area will be planted with a mix of cottonwood-willow, mesquite, and other riparian shrub and grass species.

Monitoring: Information from LiDAR vegetation data collected during FY15 and/or FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat capture surveys and acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring. MacNeill's sootywing surveys will be conducted in spring and summer if none were detected in FY16.

Pertinent Reports: The *2015 Cibola NWR Unit #1 Conservation Area Annual Report*, which summarizes any planting conducted, site management, the results of monitoring, and any recommendations for future adaptive management, will be posted on the LCR MSCP Web site once integration of the data collected throughout the calendar year is complete.

Work Task E25: Big Bend Conservation Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$30,000	$24,878.09	$1,189,268.20	$30,000	$30,000	$30,000	$30,000

Contact: Laken Anderson, (702) 293-8153, landerson@usbr.gov

Start Date: FY09

Expected Duration: FY55

Long-Term Goal: Habitat protection

Conservation Measures: BONY2, RASU2, and FLSU1

Location: Reach 3, Nevada, River Mile 266.5

Purpose: To protect an existing backwater from development

Connections with Other Work Tasks (Past and Future): Marsh bird surveys are conducted under Work Task D1, while fish surveys have been conducted under multiple work tasks in Species Research (Section C) and Work Task F5.

Project Description: The Boy Scout Camp purchased by the Southern Nevada Water Authority (SNWA), combined with the adjacent backwater managed by the State of Nevada, has collectively been identified as the Big Bend Conservation Area (BBCA). The conservation area includes approximately 15 acres of backwater within the Nevada portion of the Colorado River that will be protected and approximately 15 acres of upland area adjacent to the backwater. The dry upland area was enhanced for education and outreach purposes by the SNWA at minimal cost to the LCR MSCP and was completed in concert with protection of the backwater. The properties are adjacent to and buffered by Big Bend State Park.

Past native fish monitoring efforts have indicated the presence of native fishes in and adjacent to the existing backwater. Securing the site has resulted in 15 acres of backwater habitat credit that benefits flannelmouth suckers, razorback suckers, and bonytail in Reach 3 of the LCR MSCP planning area. Reach 3 maintains the only self-sustaining population of flannelmouth suckers and has very few undeveloped backwaters, which made protection of the existing backwater a LCR MSCP priority. The Colorado River and Reach 3, in particular, are experiencing extensive urban development. The BBCA maintains access to the

river via the adjacent backwater and would have been a likely candidate for development. Securing the property for the LCR MSCP ensures the commitment of adjacent landowners and controls future development in the surrounding areas. Long-term security of the property provides protection to the backwater and allows for future restoration activities as warranted.

Previous Activities: In FY10, the Nevada Department of Wildlife received approval from the Nevada Wildlife Commission to install two buoys, which have been placed at the entrance of the backwater. Installation of the buoys fulfilled a commitment to maintain wakeless conditions in the backwater. Prior to FY13, all fisheries activities were restricted to February through May as part of ongoing flannelmouth sucker activities associated with Work Task C15 (closed). Since FY13, routine monitoring of the BBCA has been conducted monthly from February through May and has included electrofishing, trammel netting, remote passive integrated transponder (PIT) scanning, and larval light trapping in areas where there have been historical contacts of native fishes and adequate water levels to permit access for sampling. Water quality profiles were conducted during each monitoring trip and at least quarterly the remainder of the year. Through monitoring, low numbers of razorback and flannelmouth suckers continued to be contacted, including larvae of both species and an occasional flannelmouth sucker subadult. The backwater has a direct surface connection to the lower Colorado River; consequently, water quality parameters mirror that of the river. Marsh bird and small mammal surveys were conducted annually.

FY15 Accomplishments:

Maintenance/restoration/management: Conservation crews were used to clear and chip vegetation to be spread along the upland trails and were funded with outside dollars. Maintenance was conducted in March, 2015 including blading the roads to ensure access and removal of 200 feet of interior chain-link fencing that had been washed over from 2014 flood events. Removal of the section of fencing eliminates future damage to the area during storm events. Clark County cleared the culverts, disposing of the sediment on Big Bend State Park lands. The SNWA repaired the BBCA security fence along Needles Highway in May 2015 after sections of it were damaged in the 2014 storm event.

In August 2015, a large storm event swept debris over Needles Highway and into the BBCA, damaging the SNWA's security fence and refilling the culverts with sediment. This was the second storm event in 11 months. The State of Nevada Department of Transportation/Clark County cleared the highway of sediment and debris but left the culverts full of sediment. Clark County is responsible for clearing the culverts, and the SNWA is responsible for repairing the BBCA fence.

A bathymetric survey, using traditional land surveyors, was conducted in April 2015. The purpose of these surveys will be to provide elevation data, which will be used to monitor sediment deposition within the backwater.

Monitoring: Routine monitoring at the BBCA continued in FY15; native fish contacts included 12 razorback suckers and 3 flannelmouth suckers. All but one of the razorback suckers originated from localized stocking events from the past 3 years. Larval flannelmouth and razorback suckers were captured at rates similar to years past. Multiple telemetered juvenile flannelmouth suckers from Work Task C53 were again contacted in the dense bulrush stands near the center of the backwater. Water quality parameters remained within thresholds for all native fishes.

Vegetation data were collected in FY15 using light detection and ranging (LiDAR) remote sensing techniques.

Marsh bird surveys were conducted on three occasions at the wetland portions of the site. There was one detection of a Yuma clapper rail.

Small mammal trapping was conducted in fall and spring. Colorado River cotton rats and desert pocket mice were captured.

Surveys were conducted for MacNeill's sootywings in 2015. No individuals or eggs were detected.

FY16 Activities:

Maintenance/restoration/management: Routine maintenance activities, including blading roads, will be conducted.

Two bathymetric surveys are scheduled to be conducted in 2016 to continue BBCA backwater management monitoring. The first survey will use traditional land surveying methods. The second bathymetric survey will be conducted using LiDAR remote sensing techniques. The purpose of these surveys is to provide elevation data, which will be used to monitor sediment deposition. The two survey methods will be compared for accuracy and cost.

Monitoring: The BBCA will be monitored at a level similar to that in FY15. Semipermanent remote PIT scanners will be deployed in an effort to increase scanning contacts for all species. Vegetation data will be collected in May 2016 using LiDAR remote sensing techniques. Marsh bird surveys will be conducted during March, April, and May at the four established survey points. Small mammal trapping will be conducted in fall and spring. Surveys for MacNeill's sootywings will also be conducted.

Proposed FY17 Activities:

Maintenance/restoration/management: Youth conservation crews funded with non-cost share dollars may continue to be used to perform trail maintenance and vegetation removal. Routine maintenance activities, including blading roads, will be conducted.

Monitoring: Fisheries monitoring will be conducted at a level and interval similar to previous years. Monitoring trips will include larval light trapping, remote PIT scanning, and trammel netting. Water quality profiles will be performed during each monitoring event and quarterly outside of the monitoring period. Marsh bird surveys will be conducted during March, April, and May at the four established survey points. Small mammal trapping will be conducted in fall and spring. Surveys for MacNeill's sootywings will also be conducted.

Information from the LiDAR vegetation data collected during FY15 and/or FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond.

Pertinent Reports: The *2015 Big Bend Conservation Area Annual Report* will be posted on the LCR MSCP Web site once integration of the data collected throughout the calendar year is complete.

Work Task E27: Laguna Division Conservation Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$3,000,000	$1,759,859.79	$26,254,555.45	$900,000	$200,000	$200,000	$100,000

Contact: Jimmy Knowles, (702) 293-8172, jknowles@usbr.gov

Start Date: FY10

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: WIFL1, YHCR2, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, and SUTA1

Location: Reach 6, Federal lands, River Miles 43–49, California and Arizona

Purpose: To 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 Work Tasks F1–F4 and F7.

Project Description: The Laguna Division, River Miles 43–49, was identified as having the potential for large-scale riparian and marsh restoration and enhancement. In 2007, the Laguna Division Planning Group was formed to identify potential restoration projects within the division.

The Laguna Division Planning Group consists of representatives from the following organizations:

- Arizona Game and Fish Department
- Arizona Department of Water Resources
- California Department of Fish and Wildlife
- Pacific Institute
- U.S. Fish and Wildlife Service
- Bureau of Land Management
- Bureau of Reclamation (Reclamation)

The undeveloped ground, which was shaped to become the Laguna Division Conservation Area (LDCA), was a relatively wide, undeveloped area with a series of low linear depressions, which are remnants of former river meanders. This project was designed to create marsh and riparian land cover types by shaping and

contouring multiple meandering channels. These land cover types would be maintained with a maximum base flow of 100 cubic feet per second (cfs) from the Gila Gravity Canal sluicing gates. Open water areas have been created in the form of linear excavations aligned with historic river meanders east of lands identified as future stockpiling areas for dredged silt removed from the river (Laguna settling basin). To minimize earthwork, cuts and fills follow the existing topography where feasible. Adjacent terraces are graded to allow flooding and promote the establishment of native riparian species. Water control structures have been designed to manage water levels. Native vegetation will receive water by raising and lowering the water surface.

A final design was presented and approved as a new start project by the LCR MSCP Steering Committee in October 2009 with the passing of Resolution 10-002. The final environmental assessment was prepared for the LDCA in February 2011. A Finding of No Significant Impact was determined, which allowed earthwork to commence.

Operation of the LDCA is coordinated through Reclamation's Water Operations Group. The LDCA has been used to store excess flows through this coordinated effort. When excess flows are anticipated, the water control structures at the LDCA can be adjusted in order to accommodate a portion of the excess flow. These flows can be returned back to the Colorado River.

Annual maintenance and management: The LDCA was designed and constructed to minimize annual operation and maintenance costs. Water is diverted at Imperial Dam and delivered by gravity to an inlet structure in Cell 1. Approximately 100 cfs flows through the site 24 hours a day, 7 days a week. There are no pumps used at the LDCA. Annually, the intake structure is closed and inspected. The inspection includes both normal maintenance, a review of the cathodic protection system, and pressure washing of the structure. The water control structures are serviced and inspected twice a year. Water delivery into and out of the LDCA are logged and can be accessed remotely. The annual costs for operation and maintenance of the LDCA include road grading.

Previous Activities:

Maintenance/restoration/management: Inlet modifications to the point of diversion at the Gila Gravity Canal sluicing gates were made to allow for up to a 100-cfs flow capacity. The diversion pipe system has been engineered to allow for maximum management flexibility, including diverting the entire flow to the Mittry Lake Wildlife Area, the LDCA, or the historic river channel. Approximately 4,000 feet of 48-inch high-density polyethylene pipe was installed in 2011–12.

Clearing and contouring of Reach 1 (over 500 acres) began in the fall of 2011 and was completed in 2012. The newly created topography of Reach 1 was verified by using light detection and ranging (LiDAR) remote sensing techniques, which was used to create contour mapping.

Clearing and contouring activities in Reach 2 began in the summer of 2012 and were completed in April 2014 (over 500 acres). Approximately 50,000 cubic yards of soil were moved per shift in order to contour the site according to the grading plan. In all, approximately 3,400,000 cubic yards of earthen material were excavated.

Over 800,000 marsh plants were planted on approximately 150 acres in Reach 1 during August and September 2013. Riparian and mesquite planting of Reach 1 commenced in February 2014 and finished in April 2014. Marsh planting of Reach 2 took place in May 2014. Over 1 million trees and plants were planted in the spring of 2014.

Monitoring: The land adjacent to the LDCA has been surveyed for many years by the Arizona Game and Fish Department for marsh birds, including Yuma clapper rails, California black rails, and western least bitterns, all of which are LCR MSCP covered species. All three of these species are present within the adjacent wetland/marsh area during breeding seasons. Surveying of marsh birds continued until work began at the site. To allow for the completion of construction and planting, no monitoring activities occurred during FY13–14.

FY15 Accomplishments: Obligations in FY15 were less than approved because the obligations for leasing heavy equipment to be used in 2015 were made in FY14.

Maintenance/restoration/management: Gates were constructed at the entrances to the LDCA to control motorized vehicle access and provide a public parking area. The LCR MSCP Office worked with the Bureau of Land Management and Arizona Game and Fish Department to establish access regulations and provide law enforcement and fire suppression support. Informational kiosks describing the LCR MSCP mission, the LDCA, and access regulations were installed at the entrance of the site.

Riparian and mesquite planting of Reach 2 commenced in February 2015 and finished in April 2015. Supplemental planting in Reach 1 was also conducted in spring 2015. A mix of approximately 1 million cottonwood, willow, and other riparian species, and approximately 15,000 mesquite trees, were planted in Reach 2. Cleared and contoured ground within the project footprint was maintained to prevent regrowth of non-native and invasive species. Herbicide application and hand-pulling methods were used to eradicate invasive vegetation. Once native species were planted, herbicide application was suspended throughout the entire site.

Monitoring: Marsh bird survey points were established and surveys conducted on three occasions at the wetland portions of the site. Western least bitterns were detected in March. Yuma clapper rails and California black rails were not detected.

Vegetation data were collected in FY15 using LiDAR remote sensing techniques.

FY16 Activities: A Land Use Agreement, between the Arizona Game and Fish Commission and Reclamation, has been drafted and defines the roles and responsibilities of both parties and clarifies public access.

Maintenance/restoration/management: Post and cable fencing will be installed along the perimeter of Reach 1 in order to protect native vegetation from damage by motorized vehicles. Control of invasive plant species for Reach 1 has been discontinued; however, control of invasive and non-native plant species for Reach 2 will continue. Water control infrastructure will be maintained throughout the year via regular inspections and preventive maintenance.

A final construction report was prepared to document the entire chronology of the project from design to construction completion.

Monitoring: Monitoring for marsh birds will continue in suitable habitat. Riparian habitat planted in 2014 and 2015 may be surveyed if it becomes suitable for LCR MSCP covered species.

Vegetation data will be collected in May 2016 using LiDAR remote sensing techniques.

Proposed FY17 Activities:

Maintenance/restoration/management: Access, law enforcement, and fire suppression for the LDCA will be regulated by the Bureau of Land Management. Control of invasive plant species is not anticipated. Water control infrastructure will be maintained throughout the year via regular inspections and preventive maintenance.

Monitoring: Monitoring for marsh birds will continue in suitable habitat. Riparian habitat planted in 2014 and 2015 may be surveyed if it becomes suitable for LCR MSCP species.

Information from LiDAR vegetation data collected during FY15 and/or FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond.

Pertinent Reports: N/A

Work Task E28: Yuma East Wetlands

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$600,000	$467,563.97	$1,695,711.26	$1,200,000	$450,000	$400,000	$400,000

Contact: Jeremy Brooks, (702) 293-8157, jjbrooks@usbr.gov

Start Date: FY10

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: CLRA1, WIFL1, YHCR2, LEBI1, BLRA1, YBCU1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, and SUTA1

Location: Reach 6, Arizona, River Mile 31

Purpose: To maintain restored land cover types that benefit LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Vegetation and species monitoring are being addressed under Work Tasks F1–F4.

Project Description: In 2000, the city of Yuma and the Quechan Indian Tribe collaborated to analyze the potential of restoring the local wetlands along the Colorado River by removing overgrown non-native species. Approximately 380-acres have been restored to create a mosaic of marsh, mesquite, and cottonwood-willow. The project is located in Yuma, Arizona, on city of Yuma, Quechan Indian Tribe, and Arizona Game and Fish Department lands. In coordination with these partners and the Yuma Crossing National Heritage Area Corporation (YCNHAC), a 501(c)3 non-profit organization responsible for managing day-to-day operations, 70% of the funding will be provided under the LCR MSCP to support the long-term operation and maintenance of created habitats, infrequent but substantial capital improvements, and adaptive management actions that benefit species covered under the LCR MSCP Habitat Conservation Plan.

Yuma East Wetlands (YEW) is fully developed and has transitioned from development to maintenance and monitoring. The 380-acre conservation area, including the open water portions of the Colorado River, is classified as 183 acres of cottonwood-willow, 131 acres of honey mesquite, and 66 acres of marsh.

Annual maintenance and management: The anticipated costs and cost sharing for the annual operation and maintenance of the YEW are documented in a site-specific work plan referred to as the Yuma East Wetlands Annual Work Plan. The plan describes the scope of work, budget, and responsibilities of all parties. Funding for 70% of the annual operation and maintenance budget is provided under the LCR MSCP.

Annual operation and maintenance activities anticipated throughout the life of the program include flood irrigation of the North Channel and AHA fields, pump maintenance and repair, minor repair of infrastructure, removal of invasive and non-native plant species, and general site maintenance such as road grading.

Previous Activities: In FY13, the Quechan Indian Tribe, Arizona Game and Fish Department, city of Yuma, YCNHAC, and the Bureau of Reclamation agreed to the terms and conditions in the multi-party Land Use Agreement. The agreement was signed in late FY13 after review by the Steering Committee.

Following finalization of the Land Use Agreement, a Cooperative Agreement was developed and executed between the Bureau of Reclamation and the YCNHAC. This agreement serves as the funding mechanism to meet the LCR MSCP's commitment to support operation and maintenance activities. As established in the Land Use Agreement, the LCR MSCP Office will fund up to 70% of operation and maintenance activities, while the YCNHAC, city of Yuma, and Quechan Indian Tribe provide the remaining 30%, or 10% each.

FY15 Accomplishments:

Maintenance/restoration/management: The YEW was operated and maintained in accordance with the work identified and the cost-sharing arrangements included in the site-specific FY15 Yuma East Wetlands Annual Work Plan. However, replacement of the North Channel pump has been delayed to identify the cause of its continued failure. The delay in replacement resulted in expenditures being less than anticipated.

In FY15, accomplishments included development of a FY16 Yuma East Wetlands Annual Work Plan, development of standing operating procedures for irrigation system management, the creation of water diversion reporting tools and updates to the water accounting reporting map, preliminary planning for development of a long-term management plan for the site, and preliminary analysis on a concern about providing a reliable water source for the South Channel, which would require a substantial capital expenditure.

Monitoring: Monitoring was conducted at the YEW for vegetation, birds, small mammals, and bats.

Vegetation data were collected in FY15 using light detection and ranging (LiDAR) remote sensing techniques.

Marsh bird surveys were conducted on three occasions at the wetland portions of the site. Western least bitterns and Yuma clapper rails were detected and are presumed to be breeding at the site.

The site was surveyed for riparian birds using the LCR MSCP double sampling protocol. For the first time, yellow warblers and summer tanagers were detected breeding at the site. Southwestern willow flycatcher surveys were conducted, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted, and there were no detections of this subspecies at the site in 2015.

The YEW was mist netted for bats once per month from May to September 2015. Western yellow bats and a California leaf-nosed bat were captured. In conjunction with the bat capture surveys, the established long-term acoustic bat station was used to detect LCR MSCP covered and evaluation bat species. Western red bats, western yellow bats, California leaf-nosed bats, and Townsend's big-eared bats were detected.

Small mammal trapping was conducted in fall and spring. Yuma hispid cotton rats continue to be detected at the site and are the most common subspecies of small mammals captured.

FY16 Activities:

Maintenance/restoration/management: The YEW is expected to be operated and maintained in accordance with the work identified and the cost-sharing arrangements included in the site-specific FY16 Yuma East Wetlands Annual Work Plan.

The 20-cubic-foot-per second pump servicing the North Channel riparian area was replaced in December 2013 after it catastrophically failed. Upon inspection, it was discovered that the pump failure was attributed to cavitation and/or sedimentation from the river. In response, the pump with a loaner rated at 10 cubic feet per second in anticipation that the pump system would need to be redesigned and replaced in FY16. The loaner pump failed catastrophically in January 2016. The stakeholders are working to provide a reliable pumping system to the North Channel.

Installation of flow meters on the AHA and North Channel pumps as required in the Land Use Agreement is being delayed until the pump issues are resolved. In

the interim, discrete flow measurements are taken in the canals with a portable instrument. An Excel spreadsheet was created to simplify tracking of water usage and water accounting. A schedule for removal of a temporary drip system has been requested, which should reduce annual operating costs.

An operation and maintenance review of the site helped to identify four major items that should be addressed to improve long-term site sustainability. The first is to develop a long-term solution for the recurring failures of the North Channel pump; second is the upgrade and replacement of the AHA pump; third is securing a reliable water source for the South Channel; and fourth is the removal of drip irrigation and the two diesel-driven pumps used to operate the drip system. These items are being addressed during the development of the long-term management plan.

The stakeholders are drafting a long-term management plan for the YEW, which will guide future actions. The plan will address both the short- and long-term needs of the infrastructure to manage created habitat.

Monitoring: Vegetation data will be collected in May 2016 using LiDAR remote sensing techniques. Marsh bird surveys will be conducted in March and April. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat acoustic monitoring will be conducted during summer.

Proposed FY17 Activities: The YEW is expected to be operated and maintained in accordance with the work identified and the cost-sharing arrangements included in the site-specific FY17 Yuma East Wetlands Annual Work Plan.

Monitoring: Information from the LiDAR vegetation data collected during FY15 and/or FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond. Marsh bird surveys will be conducted in March and April. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat acoustic monitoring will be conducted during summer.

Pertinent Reports: N/A

Work Task E31: Hunters Hole

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$80,000	$112,273.39	$440,441.26	$65,000	$60,000	$60,000	$60,000

Contact: Jeremy Brooks, (702) 293-8157, jjbrooks@usbr.gov

Start Date: FY11

Expected Duration: FY55

Long-Term Goal: Habitat creation and maintenance

Conservation Measures: WIFL1, YBCU1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, MNSW2, and YHCR2

Location: Reach 7, Arizona, River Mile 2.5

Purpose: To create and maintain land cover types and support site improvements that benefit LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Vegetation and species monitoring are being addressed under Work Tasks F1–F7.

Project Description: Hunters Hole is located within Reach 7 of the LCR MSCP planning area, in Arizona, approximately 3 miles north of the United States and Southerly International Boundary with Mexico. Hunters Hole once consisted of a series of interconnected ponds with adjacent marsh and a few stands of cottonwood-willow. Water levels were maintained by groundwater, irrigation drain flows, and by a groundwater well. Over time, the site degraded, and most of the habitat was lost due to declining water levels, establishment of invasive plant species, and wildfires. Local officials from State, Tribal, and Federal agencies joined together in an effort to restore the area while increasing public safety and border security.

Hunters Hole has been fully developed and increased the acreage of cottonwood-willow in the program by 44 acres. The roads, in addition to being used for LCR MSCP purposes, are also used by the U.S. Border Patrol for patrolling the surrounding area.

Annual Maintenance and Management: Irrigation is provided by a groundwater well through a series of automated gates and delivered to five cells within the conservation area. The entire irrigation cycle can be managed remotely, including operation of the well, typically from February through November. The annual costs associated with operating this conservation area include those for maintenance of the pumps and valves, electrical power utility bills, road grading, invasive and non-native weed control, and periodic inspections.

Previous Activities: This conservation area has been irrigated and managed since 2012.

FY15 Accomplishments:

Maintenance/restoration/management: Hunters Hole is fully developed and was irrigated and managed throughout the year for LCR MSCP covered species.

The plan to remotely irrigate the site was completed in FY15. To complement the new groundwater pump, which can now be remotely operated, additional upgrades were made to automate the irrigation system valves. These upgrades were intended to reduce labor costs and travel times and to increase the safety of onsite personnel. The irrigation cycle was refined to reduce water use (an approximately 40-percent reduction was achieved). The upgrades resulted in increased expenditures in FY15.

In August 2015, an 80-foot section of small willow trees was cut in irrigation Cell 5 (between the irrigation water outlet and the 21-mile spillway outlet of the Main Outlet Drain Extension canal). This cutting was conducted by the U.S. Border Patrol in order to increase visibility of agents tasked with detecting illegal immigrants crossing the U.S./Mexico border through a culvert extending under the Main Outlet Drain Extension canal and the U.S./Mexico border fence. This work was authorized and conducted due to U.S. national security concerns.

Monitoring: Monitoring was conducted at Hunters Hole for birds, bats, small mammals, and MacNeill's sootywings.

Riparian bird surveys were conducted at Hunters Hole from April 15 to June 15, 2015, using the LCR MSCP double sampling protocol. No covered species were detected breeding, but migratory yellow warblers were detected.

Southwestern willow flycatcher surveys were conducted. Migrant flycatchers were detected on the first survey in May, but no breeding or resident birds were detected.

Yellow-billed cuckoo surveys were conducted, and no birds were detected.

The established long-term acoustic bat station was used to detect LCR MSCP bat species. Western red bats, western yellow bats, and Townsend's big-eared bats were detected at Hunters Hole.

Small mammal trapping was conducted in fall and spring. A Yuma hispid cotton rat was captured at the site for the first time in October.

MacNeill's sootywing surveys were conducted at Hunter Hole in May and June. Individuals were detected in both months.

FY16 Activities:

Maintenance/restoration/management: Hunters Hole now uses an automated irrigation system. This conservation area will be irrigated and managed throughout the year for LCR MSCP covered species. No construction, restoration, or changes to management activities are planned.

Monitoring: Vegetation data will be collected in May 2016 using light detection and ranging remote sensing techniques. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Proposed FY17 Activities: Hunters Hole now uses an automated irrigation system. This conservation area is expected to be irrigated and managed throughout the year for LCR MSCP covered species. No construction, restoration, or changes to management activities are planned.

Monitoring: Information from light detection and ranging vegetation data collected during FY16 will be used to determine the schedule for vegetation monitoring data collection for FY17 and beyond. General bird surveys will be conducted from mid-April to mid-June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Bat acoustic monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Pertinent Reports: The *2015 Hunters Hole Conservation Area Annual Report* will be posted on the LCR MSCP Web site once integration of the data collected throughout the calendar year is complete.

Work Task E33: Pretty Water Conservation Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$700,000	$970,299.11	$1,268,018.44	$450,000	$150,000	$50,000	$40,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@usbr.gov

Start Date: FY13

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: VEFL1, WRBA2, WYBA3, ELOW1, and BEVI1

Location: Reach 4, Cibola National Wildlife Refuge (Cibola NWR), River Miles 95–97, California

Purpose: To 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 was identified under Work Task E16.

Project Description: The Pretty Water Conservation Area (PWCA) (previously referred to as the Shark's Tooth Conservation Area) consists of approximately 566 acres on the Cibola NWR, located in California between River Miles 95 and 97. On July 17, 2006, lightning ignited a fire on the Cibola NWR that burned approximately 4,600 acres of salt cedar intermixed with mesquite in both California and Arizona. A burned section will be restored primarily with honey mesquite as described in the *Sharks Tooth Conservation Area Restoration, Development, and Monitoring Plan*. The intent is to create a large honey mesquite bosque, which will be managed for LCR MSCP covered species.

The conservation area is fully developed and contains 566 acres of honey mesquite which will be managed for LCR MSCP covered species throughout the life of the program.

Annual maintenance and management: The PWCA was fully developed in FY15. It was developed to provide a mesquite land cover type while minimizing long-term operational and maintenance costs. Control of invasive and non-native plant species is anticipated during FY16 and FY17. Starting in FY18, the annual

costs associated with operating the PWCA is reduced to that needed for periodic inspections, coordination efforts with the U.S. Fish and Wildlife Service, and addressing any concerns that arise.

Previous Activities: The Restoration, Development, and Monitoring Plan was approved by the California Department of Fish and Wildlife in 2012. The Land Use Agreement was signed in 2013. In FY14, compliance and pre-construction activities were completed, and mesquite trees were ordered.

FY15 Accomplishments: Clearing of the PWCA, including selective clearing of tamarisk from the existing mesquite bosque, was conducted from January to April. After clearing was completed, 22,500 mesquite trees were planted, and irrigation utilizing water trucks continued until the end of September. Public access was restricted during the planting phase but re-established along the main access road after construction was completed in summer. The parking area and primitive boat ramp were regraded to previous conditions. Expenditures were more than approved due to the addition of a second water truck, which was needed in order to keep up with irrigation demands.

Monitoring: No wildlife monitoring was conducted because the trees were not mature enough to provide covered species habitat.

FY16 Activities: The PWCA is fully developed, and measures to control invasive and non-native plant species that re-sprouted after planting and during irrigation are aggressively being implemented. Although it is not anticipated at this time, irrigation utilizing water trucks may continue during FY16 if deemed necessary based on the growth status of the trees and climatic conditions.

Monitoring: A site visit will occur to determine if there is sufficient habitat to survey for MacNeill's sootywings. Surveys will be conducted if there is potential habitat.

Proposed FY17 Activities: The PVCA is fully developed and is being managed for LCR MSCP covered species. Inspections to ensure that the mesquite trees have successfully established and to maintain low numbers of invasive species within this conservation area will continue.

Monitoring: General bird surveys will be conducted from April – June. If there is suitable habitat, surveys for MacNeill's sootywings will also be conducted.

Pertinent Reports: N/A

Work Task E34: Salinity and Soil Moisture Monitoring Network

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$150,000	$51,701.73	$133,159.02	$500,000	$0	$0	$0

Contact: Darrin Miller, (702) 293-8166, dmiller@usbr.gov

Start Date: FY13

Expected Duration: FY16

Long-Term Goal: Restoration research to guide management actions

Conservation Measures: MRM1, MRM2, CLRA1, WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2

Location: Conservation areas and non LCR-MSCP southwestern willow flycatcher-occupied sites (for comparable data)

Purpose: To monitor salinity (soil and groundwater) and soil moisture to facilitate management actions that will allow for the long-term health and survival of established land cover types on LCR MSCP conservation areas

Connections with Other Work Tasks (Past and Future): This work task was initiated with funds from Work Tasks E4, E24, F1, and G3. Data collected under this work task are also used under Work Tasks C60 and F1.

Project Description: Monitoring soil and groundwater conditions provides information about why some restoration sites establish and develop more successfully than others. In addition to guiding decisions for vegetation establishment and health, research results suggest that adequate soil moisture levels are an important habitat requirement for certain covered species. The soil and groundwater monitoring network will be expanded, and monitoring efforts will be standardized across all applicable LCR MSCP conservation areas. The process of determining which phases will be monitored and to what level will occur over a period of years. The information gathered through this effort will facilitate decisions about managing soil moisture levels and saline conditions of soils and groundwater and will also ensure the long-term viability of LCR MSCP conservation areas.

The monitoring network established under this work task will be operated and maintained throughout the life of the LCR MSCP to ensure that data are available to make management decisions for the long term. In addition to providing data for the Restoration Group for the successful management of vegetation, efforts under this work task will result in information being provided for Work Tasks C60 and F1, allowing for a reduction of duplicated data collection efforts and providing necessary data to fulfill the objectives of these other work tasks.

Previous Activities: Research results from previous studies funded by Work Task G3 indicate that riparian obligate trees will use groundwater instead of applied surface water when they have reached sufficient maturity.

An extensive review of the available literature on salinity and sodicity was conducted to summarize what was already known about managing saline soil and groundwater conditions.

Efforts to measure soil moisture for recently planted riparian vegetation were initiated in 2007 by installing soil moisture devices on the Cibola National Wildlife Refuge Unit #1 Conservation Area (Nature Trail and Crane Roost), the Palo Verde Ecological Reserve (PVER) (Phases 1–5), the Cibola Valley Conservation Area (Phases 1–3), and the Beal Lake Conservation Area. These sites were operated and maintained until the vegetation was adequately established. Data collected at these sites will be used to evaluate past irrigation management of constructed restoration sites and may be used during the expansion of the monitoring network.

A soil and groundwater monitoring network was established at portions of three LCR MSCP conservation areas: the Beal Lake Conservation Area, the PVER, and the Cibola National Wildlife Refuge Unit #1 Conservation Area. Using the data collected from the three conservation areas over 2 years, a mass balance model to evaluate salt accretion/loss in soils and groundwater was developed.

A soil moisture monitoring pilot study was completed in Phase 2 of the PVER during 2010–13 under Work Task F1. The results and lessons learned from this study will be used to guide future efforts in monitoring soil moisture at existing and future conservation areas.

FY15 Accomplishments: A preliminary soil moisture monitoring effort was initiated in FY15 as the first step in establishing the larger salinity and soil moisture network. The purpose of this preliminary effort was twofold. The first purpose was to collect data to determine the current level (temporal and spatial distribution) of surface soil moisture present at a non-LCR MSCP southwestern willow flycatcher-occupied site (Rockhouse Riparian Demonstration Project near Roosevelt Lake, Arizona) and at the PVER. The other purpose was to provide the necessary background information needed to draft the scope of work for expanding the network across all LCR MSCP conservation areas. The specific objectives of this secondary purpose included: (1) establish the necessary standards and protocols, (2) identify the equipment and instrument needs for

expanding the network, (3) identify the level of effort needed for expanding the network, and (4) identify potential issues that may arise while expanding the network. The results will be used to make decisions regarding habitat management. Based on the results of this preliminary effort, it was concluded that additional data would assist in further identifying the range of soil moisture and site conditions at other southwestern willow flycatcher-occupied sites. Therefore, future plans for FY16 include adding two new southwestern willow flycatcher-occupied (non-LCR MSCP) sites for monitoring as well as continuing the monitoring of the two sites monitored during FY15.

Expenditures were less than what had been approved, as a preliminary effort was conducted before expanding the salinity and soil moisture network. This was done to better prepare for implementation and expansion of the LCR MSCP-wide network.

FY16 Activities: During FY16, two additional, non-LCR MSCP sites on the Middle Rio Grande in New Mexico will be instrumented as part of the preliminary effort that was initiated in FY15. The purpose of adding these two sites is to include southwestern willow flycatcher-occupied sites that have different vegetation or hydrologic characteristics and to increase the amount of available data. With a wider range of site characteristics and a larger dataset (both spatial and temporal), it is expected that the analyses will provide more information to make informed decisions. The two sites monitored during FY15 will be maintained, and data will be collected for a second season.

The protocols for the salinity and soil moisture monitoring network are expected to be finalized during FY16. The protocols will synthesize input from all the studies mentioned in previous activities, and from the lessons learned during the FY15 preliminary effort, and will lay out a schedule for expanding the salinity and soil moisture network. The schedule will be based on priority, targeting the higher priority (high soil salinity, higher southwestern willow flycatcher potential) areas first. The schedule will also lay out what parameters will be collected at which conservation areas since this will be dictated by site conditions (i.e., salinity will not be monitored if there is low risk for soil salinization).

Proposed FY17 Activities: This work task will be closed in FY16. Future salinity and soil moisture monitoring will be covered under Work Task F1.

Pertinent Reports: The reports titled *Review of Salinity and Sodicity, Monitoring, and Remediation for Riparian Restoration Areas; Groundwater and Soil Salinity Monitoring Network in Support of Long-term Irrigation and Salt Management of MSCP Restoration Areas;* and *Soil Moisture Monitoring Pilot Study at Palo Verde Ecological Reserve Phase 2* have been posted on the LCR MSCP Web site. Once a final review has been completed, the report titled *Soil and Groundwater Salinity Conditions for Lower Colorado River Multi-Species Conservation Program Habitat Creation Sites* will also be posted.

Work Task E35: Mohave Valley Conservation Area

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$500,000	$460,588.99	$324,968.99	$1,250,000	$5,500,000	$500,000	$160,000

Contact: Laken Anderson, (702) 293-8153, landerson@usbr.gov

Start Date: FY15

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: BONY2, RASU2, and FLSU1

Location: Reach 3, River Miles 237–238, Park Moabi Regional Park, California

Purpose: The purpose of this work task is to create and manage a mosaic of land cover types to provide habitat for LCR MSCP covered species. Approximately 50 acres of backwater habitat for native fishes will be provided and will incorporate marsh, riparian, and mesquite cover types where appropriate.

Connections with Other Work Tasks (Past and Future): This project was identified under Work Task E16, and the design of the conservation area will also be conducted under that work task. Vegetation and species monitoring will be conducted under Work Tasks F1–F7.

Project Description: In the Mohave Valley Conservation Area (MVCA), a connected backwater will be created that diverts water off the main stem of the Colorado River just below River Mile 237. Diverted flows will run through an excavated channel, enter the existing Park Moabi backwater, and converge with the river 2 miles downstream from the new point of diversion. Excavating the channel will create approximately 50 acres of backwater habitat. The footprint of this conservation area is projected at approximately 90 acres, with native land cover types lining the banks and upland slopes of the backwater accounting for the additional 40 acres. Actual acreages by land cover type will be recalculated after construction and planting are complete.

The MVCA is located 13 miles south of Needles, California, along the Colorado River. The 149-acre property resides within the boundary of Park Moabi Regional Park. The land is owned by the California State Lands Commission (Commission) and leased to San Bernardino County (County). Prior to

approaching the Commission and County about the backwater project, the 149-acre parcel was used as an off-highway vehicle recreational area; however, once the backwater project was presented, the County was willing to divide the property to accommodate both uses.

The project's area of impact will involve the entire 149 acres (includes areas of fill) as well as lands at the top and bottom of the parcel to connect the backwater to the main stem of the Colorado River and the Park Moabi channel. Excavated material will be used throughout the site to create the desired contour elevations, but the majority of the excavated material will be used to create terrain within the county's off-highway vehicle area.

Previous Activities: The California State Lands Commission (the landowner) and San Bernardino County (the lessee) were approached about the project in 2012. Basic, conceptual ideas about the project were presented to the commission and the county, and discussions and lease agreement negotiations continued, but they could not move forward toward a final agreement without an official design proposal for the project.

The Bureau of Reclamation worked with the California State Lands Commission to ensure National Environmental Policy Act/California Environmental Quality Act permitting requirements are met. Both the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service were notified about the project.

A survey of the 149-acre parcel was conducted to establish new control points and develop elevation contours. Additionally, a temporary gauging station was installed directly across the river from the proposed inlet location so the river stage could be monitored. The data, in conjunction with the site elevation data, will be used to determine the volume of material that will need to be excavated to achieve the desired depth of the backwater.

The permits necessary to perform a geotechnical survey were acquired, and a survey was conducted in June 2014.

FY15 Accomplishments: Design review meetings were held by the project team at the completion of the 30-, 60-, and 90-percent designs. The design included a grading plan with cut and fill estimates, water control structure specifications, a backwater access point, and a three-dimensional model of the site. A hydraulic model was completed in order to determine water velocities and potential sediment transport.

Environmental compliance activities, which include a National Environmental Policy Act environmental assessment, a California Environmental Quality Act initial study, and 404 and 401 permitting, commenced in early 2015.

Monitoring: Riparian bird surveys were conducted at the MVCA from April 15 to June 15, 2015, using the LCR MSCP double sampling protocol to document covered species presence before restoration development. No LCR MSCP covered species were found on the plots. No fisheries monitoring will be conducted until the backwater had been completed.

FY16 Activities: The design for the MVCA was completed in December 2015. The California State Lands Commission approved the project, and the modification to the lease agreement, at the December commission meeting. Approvals from the U.S. Army Corps of Engineers and the California Water Board were received in early 2016.

Construction activities will begin in September 2016 and are expected to last until early 2018. Obligations in FY16 will increase significantly due to the beginning of construction. The acceleration of obligations will allow for a seamless construction period. The acceleration of funds does not change the overall project costs, just the fiscal year in which funds are obligated, and will significantly decrease the budget in the future.

Monitoring: No wildlife monitoring will be conducted. It will begin after restoration is complete and the marsh and trees are mature enough to provide habitat. No fisheries monitoring will be conducted until the backwater had been completed.

Proposed FY17 Activities: Construction activities will continue through FY17. Plants will be ordered in spring for planting in March 2018.

Monitoring: No wildlife monitoring will be conducted. It will begin after restoration is complete and the marsh and trees are mature enough to provide habitat. No fisheries monitoring will be conducted until the backwater had been completed.

Pertinent Reports: N/A

Work Task E36: Parker Dam Camp

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$0	$0	$0	$0	$100,000	$50,000	$20,000

Contact: John Swatzell (702) 293-8165, jswatzell@usbr.gov

Start Date: FY17

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: VEFL1, WRBA2, WYBA3, ELOW1, and BEVI1

Location: Reach 4, Bureau of Reclamation (Reclamation) withdrawn lands, River Miles 191–192, California

Purpose: To 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 was identified and evaluated under Work Task E16.

Project Description: The Parker Dam Camp property resides just south of Parker Dam on the California side of the Colorado River between River Miles 191 and 192. The site is located approximately 25 miles southeast of Lake Havasu City, Arizona, and 17 miles upstream of Parker, Arizona.

Originally developed as employee housing for dam workers, the construction of the Parker Dam Government Camp began in 1934 to facilitate construction of Parker Dam. Once established, the property consisted of numerous residences and other buildings. Many decades after completion of the dam, in the 1990s, Reclamation determined that the facility was no longer required for project activities and began the process of disposing of the houses and other buildings offsite. Asphalt roads, concrete sidewalks, and sparse landscaping are all that remain of the Government town. The property is fenced off to public access on the north and east sides and is bordered by the Whipple Mountains to the south and west. The site is owned and managed by Reclamation.

Parker Dam Camp has been identified as excess property since it is no longer required for river or dam operations. Unless the site will be managed under the

LCR MSCP as a conservation area, the property will be made available for development for recreational purposes similar to other lands within the Parker Strip. Honey mesquite is becoming established on the property and has matured to be classified as a land cover type under the LCR MSCP. No additional honey mesquite planting is planned at this time. Additional land cover types may be added at a later date if necessary.

Previous Activities: A geohydrologic assessment of the property was completed in 2012 along with the *30% Design Report – MSCP Parker Dam Camp Native Fish Ponds Project*, which provided details of construction of a potential isolated backwater in 2015 under Work Task E16. During investigations of the camp as a potential LCR MSCP conservation area, the focus was originally on the creation of isolated backwaters for native fishes. Due to a number of preliminary technical and cost-benefit assessments, the site is not recommended for construction of ponds at this time.

FY15 Accomplishments: New start in FY17.

FY16 Activities: New start in FY17.

Proposed FY17 Activities: An agreement between the LCR MSCP Office and the administrators of Parker Dam will be drafted and signed, outlining the responsibilities of each party. Remaining manmade structures will be removed from the site. Selective removal of non-native vegetation would be removed during general cleanup of the site.

A small stream, less than 0.5 cubic foot per second, exists on the southern portion of the property and is fed by seepage from reservoirs located upstream. A plan for exotic plant removal and replacement with native vegetation will be discussed and, if appropriate, implemented in following years.

The small stream affords an opportunity to demonstrate a cost-effective technology for screening water that may be applicable to the LCR MSCP at this or other conservation areas dedicated to native fishes. This location is ideal for field testing the performance and maintenance requirements of small-slot-size (0.01-millimeter) screening technology. Coanda screens are specifically designed for filtering surface water from a flowing water source. In FY17, a small-scale demonstration of this screening technology will be implemented. Operating and documenting the performance of the screens and their maintenance requirements would be beneficial on either this conservation area at a later date or on other conservation areas being developed as isolated backwaters.

Monitoring: No wildlife pre-development monitoring will be conducted in FY17.

Pertinent Reports: Two reports, *Parker Dam Camp Geohydrologic Assessment, April 2013*, and *30% Design Report – MSCP Parker Dam Camp Native Fish Ponds Project*, have been completed and will be posted on the LCR MSCP Web site.

Work Task E37: Palo Verde Ecological Reserve-South

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$0	$0	$0	$0	$200,000	$1,000,000	$1,000,000

Contact: Darrin Miller, (702) 293-8166, dmiller@usbr.gov

Start Date: FY17

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: WIFL1, WRBA2, WYBA3, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW2

Location: Reach 4, River Miles 123–125, California

Purpose: To create and manage a mosaic of native land cover types for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Vegetation monitoring is conducted under Work Tasks F1; wildlife monitoring under Work Tasks F2, F3, F4, and F7; and fisheries monitoring under Work Task F5.

Project Description: Palo Verde Ecological Reserve-South, located within the Palo Verde Irrigation District, is a 350-acre property with a mix of active agricultural fields, undeveloped ground, and portions of an old river meander. This property has been made available for LCR MSCP habitat restoration activities by the California Department of Fish and Wildlife. Development of the project is intended to satisfy both the LCR MSCP and a portion of California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

The eastern boundary of the property is adjacent to the Colorado River; the western boundary is adjacent to active agricultural fields and a main irrigation canal for the Palo Verde Irrigation District. Existing infrastructure, which includes lined canals, can deliver water to approximately 200 acres of active agricultural lands.

The intent is to develop the property in a mosaic of land cover types, using the active agricultural lands, undeveloped lands, and the former river meander. A Restoration, Development, and Monitoring Plan will be drafted to guide the development and monitoring of the property for LCR MSCP covered species.

Previous Activities: Identification of the property and evaluation for inclusion into the LCR MSCP were conducted under Work Task E16.

FY15 Accomplishments: This is a new start in FY17.

FY16 Activities: This is a new start in FY17.

Proposed FY17 Activities:

Maintenance/Restoration/Management: The Restoration, Development, and Monitoring Plan is expected to be finalized in coordination with the California Department of Fish and Wildlife. Based on the requirements of the plan, design, permitting, and compliance will be initiated.

Monitoring: Pre-development monitoring will be conducted in FY17.

Pertinent Reports: N/A

Work Task E38: Three Fingers Lake

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$0	$0	$0	$0	$200,000	$4,000,000	$3,000,000

Contact: John Swatzell, (702) 293-8165, jswatzell@usbr.gov

Start Date: FY17

Expected Duration: FY55

Long-Term Goal: Habitat creation

Conservation Measures: BONY2, RASU2, CLRA1, LEBI1, BLRA1, and CRCR2

Location: Reach 4, Cibola National Wildlife Refuge, California, River Mile 90

Purpose: To create and manage a mosaic of native land cover types for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Vegetation monitoring is conducted under Work Tasks F1; wildlife monitoring under Work Tasks F2, F3, F4, and F7; and fisheries monitoring under Work Task F5.

Project Description: Three Fingers Lake, located within the Cibola National Wildlife Refuge, is a 500-acre conservation area being restored to create a mosaic of backwater, marsh, honey mesquite, and cottonwood-willow within the State of California. Development of the project is intended to satisfy both the LCR MSCP Habitat Conservation Plan requirements and a portion of California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

Three Fingers Lake was dredged in the late 1990s and established 24 acres of open water with a small fringe of cattail. The surrounding landscape is dominated with invasive salt cedar. The backwater is bounded by the old river channel to the east and Milpitas Wash to the west. It is disconnected from the old river channel by an earthen structure and a sheet pile structure. Discussions with both the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife have resulted in a restoration concept that would open 12 acres of the backwater to the river channel and maintain 12 acres of disconnected backwater.

Three Fingers Lake is being developed as a marsh and backwater complex. Honey mesquite and cottonwood-willow would be included on the fringes but not in substantial quantities. The portion of the backwater to be opened to the old river channel requires the removal of the sheet pile structure. No other improvements or restoration is planned for this portion.

The portion of the lake that will remain disconnected from the old river channel is the focus of the restoration efforts. The restoration concept includes reshaping and contouring of the acreage surrounding the dredged channel in combination with the creation of new channels. The new channels would be shallower, but deep enough to remain open water, and would provide avenues of fish passage into the marsh complex. To circulate water and allow for management of water surface elevations for rail species, multiple infrastructure improvements are envisioned. First, new water control structures would be built to regulate surface water flows into and out of the lake. Second, a pump would transfer water from the disconnected backwater into the connected portion of the backwater on the western edge of the property. Removal of water from the lake is the primary water circulation method. Groundwater and recharge through the water control structures would maintain the water surface. A surface water pump would be capable of bringing water from the old river channel into the disconnected backwater. Water delivered from the old river channel would be filtered to reduce entrainment of non-native fishes and would be supplemental.

The grading and contouring, lowering of the ground surface to allow for groundwater to maintain water surface elevations, will have to be completed. Between 1 and 1.5 million cubic yards are expected to be moved. This value will be refined through modeling prior to construction. The goal is to create approximately 48 acres of backwater and over 150 acres of marsh.

A Restoration, Development, and Monitoring Plan will be drafted to guide the development and monitoring of the property for LCR MSCP covered species.

Previous Activities: Identification of the property and evaluation for inclusion into the LCR MSCP were conducted under Work Task E16.

FY15 Accomplishments: This is a new start in FY17.

FY16 Activities: This is a new start in FY17.

Monitoring: Pre-development monitoring will be conducted in FY16 funded under Post Development work tasks (Section F).

Proposed FY17 Activities:

Maintenance/restoration/management: A conceptual design will be prepared, discussed, and finalized. The Restoration, Development, and Monitoring Plan will expand upon the restoration concept in coordination with both the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife and be finalized. Based on the requirements of the plan, design, permitting, and compliance will be initiated.

Monitoring: Pre-development monitoring will continue.

Pertinent Reports: N/A

WORK TASKS – SECTION F

Post-Development Monitoring

Work Task F1: Habitat Monitoring at Conservation Areas

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$650,000	$490,889.62	$4,279,379.33	$450,000	$950,000	$850,000	$850,000

Contact: John Swett, (702) 293-8555, jswett@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Pre- and post-development monitoring

Conservation Measures: MRM2, CLRA1, WIFL1, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, and MNSW1

Location: Beal Lake, Havasu National Wildlife Refuge, Arizona; the Palo Verde Ecological Reserve (PVER), California; the Cibola Valley Conservation Area, Arizona; the Cibola National Wildlife Refuge Unit #1 Conservation Area, Cibola National Wildlife Refuge, Cibola, Arizona; Yuma East Wetlands, Yuma, Arizona

Purpose: The purpose of this work task is to provide post-development monitoring that is necessary to assess the effectiveness of each habitat creation and restoration site. Monitoring will include biotic and abiotic components and will inform management decisions throughout the life of the LCR MSCP.

Connections with Other Work Tasks (Past and Future): Post-development habitat monitoring will be conducted at habitat creation sites detailed in the Conservation Area Development and Management (Section E) work tasks. Soil moisture data collected under Work Task E34 was used for analyses performed under this work task. All salinity and soil moisture monitoring performed under Work Task E34 will be performed under Work Task F1 starting in FY17. Data collected under this work task is also used under Work Task C60.

Project Description: Using post-development monitoring, species habitat characteristics will be evaluated. Monitoring data will be used to document progress toward achieving program goals and to provide habitat data for covered species to inform management decisions.

Previous Activities: Five habitat creation sites were monitored in FY10 using different monitoring protocols. In FY11, new protocols were developed and tested in a pilot year study. The protocols included measuring variables such as density, species richness, vegetation structure, ground cover, canopy closure, distance to nearest standing water, and distance to nearest open space. Temperature and relative humidity data were also collected.

An external program review of the vegetation monitoring protocol was conducted in FY12 under Work Task G4 to evaluate if data being collected could be used to assess conservation measure accomplishment. It was found that, under the vegetation monitoring protocol developed over several years, the variability that was known to occur on the sites at various spatial scales was not able to be detected. Recommendations were provided for adjusting the current vegetation monitoring sample design and protocols, including the method chosen for randomization of monitoring plots, the collection of various data that were not tied to management questions, and measurements that were too subjective for inclusion into decisionmaking.

In FY14, the adaptive management recommendations for vegetation monitoring were implemented. Vegetation monitoring was conducted in a spatially randomized approach, targeting areas where the vegetation structure and soils were more consistent with southwestern willow flycatcher and yellow-billed cuckoo habitat characteristics. The Beal Lake Conservation Area, the Cibola National Wildlife Refuge Unit #1 Conservation Area, the Cibola Valley Conservation Area, the PVER, and Yuma East Wetlands were monitored, collecting data on density, vegetation structure, canopy closure, and canopy height.

FY15 Accomplishments: In recent years, light detection and ranging (LiDAR) remote sensing technologies have proven to provide more accurate representations of vegetation in forests; it can be collected quickly during the breeding season without disturbing the covered species, and it is expected to provide higher-quality data at a reduced cost. The study design (developed during FY14) for the inclusion of soil moisture monitoring with the vegetation monitoring strategy was drafted (C60) and implemented. The study plan proposed to evaluate vegetation structures using LiDAR remote sensing techniques combined with soil moisture dynamics monitoring, and a pilot study was conducted in spring and summer in one area known to be occupied by southwestern willow flycatchers (Rockhouse Riparian Demonstration Project near Roosevelt Lake, Arizona) and one area within the PVER with similar habitat characteristics.

Instrumentation was installed at the same sites where LiDAR data were collected to evaluate the soil moisture conditions at both sites. Soil moisture data were analyzed to assess site conditions at both the PVER and the occupied southwestern willow flycatcher location. The analysis concluded that the PVER had similar soil moisture conditions as the occupied southwestern willow flycatcher locations; therefore, the data were used to credit acreage targeted to meet Conservation Measure WIFL1 at the PVER.

FY15 obligations were less than approved due to adaptive management changes to incorporate stratification of monitoring within conservation areas that support the habitat characteristics suitable for southwestern willow flycatchers. Additionally, the costs of acquiring airborne LiDAR remote sensing data have decreased as the technology matures.

FY16 Activities: Long-term habitat monitoring will continue in FY16. LiDAR data will be acquired to assess vegetation characteristics and develop analysis tools (C60). Soil moisture monitoring will continue under Work Task E34 during FY16, but data will be used under this work task to further identify the range of habitat characteristics (vegetation and soil moisture) present at areas occupied by breeding southwestern willow flycatchers.

Proposed FY17 Activities: Incorporating the results from FY16, habitat monitoring will continue in FY17. All salinity and soil moisture monitoring previously covered under Work Task E34 will be performed under this work task starting in FY17.

Pertinent Reports: All prepared Work Task F1 reports are posted on the LCR MSCP Web site. During the development of remote sensing vegetation monitoring techniques, annual reports for FY15–17 will not be prepared. Once remote sensing monitoring techniques are finalized, the reports will then be prepared annually.

Work Task F2: Avian Use of Conservation Areas

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$220,000	$134,175.16	$1,647,971.06	$220,000	$350,000	$350,000	$350,000

Contact: Beth Sabin, (702) 293-8435, lsabin@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Conduct pre- and post-development monitoring for avian species at habitat conservation areas

Conservation Measures: MRM1 and MRM2 (ELOW, GIFL, GIWO, VEFL, BEVI, YWAR, and SUTA)

Location: Beal Lake Conservation Area (BLCA), Havasu National Wildlife Refuge, Arizona; Cibola Valley Conservation Area (CVCA), Arizona; the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1), Cibola National Wildlife Refuge, Cibola, Arizona; Hunters Hole, Arizona; Laguna Division Conservation Area (LDCA), Arizona; Mohave Valley Conservation Area and Yuma East Wetlands, Arizona; Palo Verde Ecological Reserve (PVER), California; and the Pretty Water Conservation Area, California

Purpose: To monitor Arizona Bell's vireo, elf owl, gilded flicker, Gila woodpecker, Sonoran yellow warbler, vermillion flycatcher, and western summer tanager use of habitat conservation areas

Connections with Other Work Tasks (Past and Future): Pre- and post-development avian monitoring will be conducted at habitat conservation areas listed in Conservation Area Development and Management (Section E). In addition, information obtained from this work task may be used to provide data for avian system monitoring by using the same protocols established in system monitoring (D6).

Project Description: The creation of riparian habitat will benefit LCR MSCP covered avian species (Arizona Bell's vireo, elf owl, Gila woodpecker, gilded flicker, Sonoran yellow warbler, vermillion flycatcher, and western summer tanager). Conservation areas will be monitored for bird activity using the double sampling area search method, which involves intensive and rapid area searches.

Data gathered will be used to document the presence of covered species at the conservation areas to inform habitat management and the creation of future habitat conservation areas.

Previous Activities: Pre- and post-development monitoring for avian covered species has been conducted at habitat conservation areas since FY05. Avian pre-development monitoring was conducted at the CVCA, Cibola NWR Unit #1, the Imperial Ponds Conservation Area, Hart Mine Marsh, the PVER, the Pretty Water Conservation Area, and the LDCA. Post-development monitoring for avian covered species was conducted at the BLCA, Cibola NWR Unit #1, the CVCA, the PVER, and Yuma East Wetlands. The double sampling rapid and intensive area search survey protocol has been used since 2008 for pre- and post-development monitoring. From FY08 to FY10, all plots were surveyed using intensive area search surveys due to the small acreage of habitat in the conservation areas. In FY11 and FY12, all plots were surveyed with rapid area search protocols, and a subset of those plots was surveyed using intensive area search protocols. In FY13, three additional plots were established at Yuma East Wetlands and were surveyed with intensive area search surveys. In FY14, the plots were randomly selected because existing habitat at the habitat conservation areas exceeded the amount of habitat that could be covered within 80 area search plots for the first time. Each year, avian use was evaluated at each conservation area and compared among conservation areas.

FY15 Accomplishments: Avian post-development monitoring was conducted at existing habitat conservation areas in FY15. The following conservation areas were surveyed: the BLCA, Cibola NWR Unit #1, the CVCA, the PVER, Yuma East Wetlands, and Hunters Hole. Eighty plots on the conservation areas were surveyed using the double sampling protocol. Rapid area search surveys were conducted on all plots, and intensive area search surveys were conducted on a random subsample of four of those plots. In FY15, the plots were randomly selected because existing habitat at the habitat conservation areas exceeded the amount of habitat that could be covered within 80 area search plots.

LCR MSCP covered bird species and other territorial breeding birds were documented at each conservation area:

- BLCA – There were 121 pairs of territorial breeding birds comprising 18 species detected. These included 13 pairs of Sonoran yellow warblers, 20 pairs of Arizona Bell's vireos, and 4 pairs of summer tanagers.

- Cibola NWR Unit #1 – There were 213 pairs of territorial breeding birds comprising 22 species detected. These included four pairs of Arizona Bell's vireos and two pairs of Sonoran yellow warblers.

- CVCA – There were 261 pairs of territorial breeding birds comprising 22 species detected. This included one pair of summer tanagers.

- PVER – There were 565 pairs of territorial breeding birds comprising 25 species detected. These included seven pairs of Sonoran yellow warblers and one pair of Gila woodpeckers.

- Yuma East Wetlands – There were 190 pairs of territorial breeding birds comprising 29 species detected. These included one pair of Gila woodpeckers, one pair of summer tanagers, and one pair of Sonoran yellow warblers.

- Hunters Hole –There were nine pairs of territorial breeding birds comprising nine species detected. No LCR MSCP covered species were detected breeding here.

All the habitat conservation areas had numerous pairs of non-territorial breeders as well. Many species of migrants and non-breeders were detected at all habitat conservation areas.

Avian pre-development monitoring was conducted at the Mohave Valley Conservation Area. Fifteen species were detected; none were LCR MSCP covered species.

FY16 Activities: Avian post-development monitoring will be conducted at conservation areas, including the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the LDCA, the PVER, and Yuma East Wetlands. Surveys will be conducted using the double sampling method. Eighty plots will be randomly selected from all possible plots within the habitat conservation areas. All plots will be surveyed with rapid surveys, and a subset of eight plots will be randomly selected to be surveyed with intensive surveys.

An evaluation of the study design for post-development (F2) and avian monitoring system wide (D6) will be conducted. The results of this evaluation may be incorporated into future protocols, and a 10-year monitoring plan will be developed.

Proposed FY17 Activities: Avian post-development monitoring for LCR MSCP covered species will be conducted at conservation areas supporting riparian vegetation, including the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the Pretty Water Conservation Area, the LDCA, the PVER, and Yuma East Wetlands. The protocols will be updated, as needed, following the evaluation in FY16.

The project budget increases in FY17. Pre-construction surveys at Planet Ranch will require additional funds. Surveys conducted under Work Task D6 will be shifted to Work Task F2 to more accurately track efforts at conservation areas.

Pertinent Reports: The report titled *Lower Colorado River Riparian Bird Surveys, 2013* is posted on the LCR MSCP Web site.

Work Task F3: Small Mammal Colonization of Conservation Areas

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$55,000	$52,897.74	$425,887.03	$65,000	$65,000	$65,000	$65,000

Contact: Allen Calvert, (702) 293-8311, acalvert@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Conduct pre- and post-development monitoring for small mammal species

Conservation Measures: YHCR1, CRCR1, DPMO1, and MRM2 (DPMO, CRCR, and YHCR)

Location: Reaches 3–6; Beal Lake Conservation Area (BLCA), Havasu National Wildlife Refuge; Palo Verde Ecological Reserve (PVER), California; Cibola Valley Conservation Area (CVCA), the Cibola National Wildlife Refuge Unit #1 Nature Trail, Laguna Division Conservation Area, and Yuma East Wetlands (YEW), Arizona

Purpose: To monitor small mammal presence within habitat creation sites

Connections with Other Work Tasks (Past and Future): Post-development small mammal monitoring will be conducted at habitat creation sites listed in Conservation Area Development and Management (Section E). In addition, presence information obtained from this work task will be used under Work Task C27 to document habitat characteristics and improve small mammal monitoring methods. Protocol improvements developed under Work Task C27 will be incorporated under this work task.

Project Description: Small mammal live trapping will be conducted in conservation areas to document the presence of Colorado River cotton rats, Yuma hispid cotton rats, and desert pocket mice.

Previous Activities: Presence live trapping surveys were conducted at habitat creation sites from FY06–14. Trapping occurred for 1–3 nights at the sites sampled each year and was conducted in vegetation anticipated to provide the best habitat to get detections of cotton rat species. As of FY14, cotton rats

were captured within or adjacent to all developed conservation areas except Hunters Hole. Cotton rats captured at the Big Bend Conservation Area (BBCA), the BLCA, the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1), the CVCA, and the PVER were Colorado River cotton rats. All cotton rats captured at Yuma East Wetlands and the Imperial National Wildlife Refuge were Yuma hispid cotton rats. Desert pocket mice were detected at many conservation areas, but the subspecies cannot be determined.

FY15 Accomplishments: Small mammal live trapping surveys were conducted at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, the BBCA, YEW, and Hunters Hole to detect presence of cotton rats. Colorado River cotton rats were captured at the PVER, the CVCA, Cibola NWR Unit #1, and the BBCA. Yuma hispid cotton rats were captured at YEW.

FY16 Activities: Small mammal live trapping surveys will continue as part of the post-development monitoring efforts at the BBCA, the BLCA, Cibola NWR Unit #1, Hunters Hole, the PVER, and YEW to detect the presence of cotton rats. In November 2015, the first Yuma hispid cotton rat at Hunters Hole was detected. The Laguna Division Conservation Area will be surveyed for the first time in FY16.

Proposed FY17 Activities: Live trapping surveys will continue as part of the post-development monitoring efforts at the BBCA, the BLCA, Cibola NWR Unit #1, Hunters Hole, the LDCA, the PVER, and YEW.

Pertinent Reports: The 2012–14 combined report will be posted on the LCR MSCP Web site upon completion.

Work Task F4: Covered Bat Species Monitoring at Conservation Areas

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$135,000	$141,235.70	$1,053,800.76	$150,000	$150,000	$150,000	$150,000

Contact: Allen Calvert, (702) 293-8311, acalvert@usbr.gov

Start Date: FY07

Expected Duration: FY55

Long-Term Goal: Pre- and post-development monitoring of covered bat species

Conservation Measures: MRM1, MRM2 (WRBA, WYBA, CLNB, and PTBB), WRBA1, and WYBA1

Location: Reaches 3–5; Beal Lake Conservation Area (BLCA), Havasu National Wildlife Refuge; Palo Verde Ecological Reserve (PVER), California; Cibola Valley Conservation Area (CVCA), the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1), Cibola, Arizona; and the Imperial Ponds Conservation Area, Imperial National Wildlife Refuge, Arizona. Additional conservation areas will be surveyed to document presence as needed.

Purpose: The purpose of this work task is to assess use of the conservation areas by the two LCR MSCP covered bat species (western red bat and western yellow bat) and the two evaluation species (Townsend's big-eared bat and California leaf-nosed bat). Pre- and post-development monitoring for the presence/absence of covered bat species will be conducted following a study design developed in 2008. Information obtained through this work task, in conjunction with Work Task D9, will provide data on the distribution of these species.

Connections with Other Work Tasks (Past and Future): Pre- and post-development avian monitoring will be conducted at habitat conservation areas listed in Conservation Area Development and Management (Section E). Information obtained through this work task, in conjunction with Work Task D9, will help determine the distribution of these species.

Project Description: Post-development monitoring for the two covered bat species (western red bat and western yellow bat) and the two evaluation species (Townsend's big-eared bat and California leaf-nosed bat) at conservation areas

includes both acoustic and mist netting capture methods. Acoustic monitoring will be conducted at conservation areas, including the CVCA, the PVER, Cibola NWR Unit #1, the BLCA, and the Imperial Ponds Conservation Area. These surveys utilize either active or passive acoustic detection systems to record bat echolocation calls for presence. Bats will also be captured with mist nets at these sites to acquire reference acoustic calls and determine age, sex, and reproductive status of covered and evaluation bat species.

Previous Activities: Conservation areas were monitored from FY07 to FY14 using acoustic and/or capture techniques.

FY15 Accomplishments: Acoustic monitoring consisted of using long-term bat detector stations to record echolocation calls of bats every night from June – August. Data collection was reduced from all year to the peak activity period during summer, as an analysis in FY14 showed that species presence could be detected then sufficiently. The stations were used to collect data at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, Yuma East Wetlands (YEW), and Hunters Hole. At the PVER and CVCA, two stations were used to cover these large conservation areas. Data will be analyzed in FY16.

Capture surveys were conducted at five LCR MSCP conservation areas (BLCA, PVER, CVCA, Cibola NWR Unit #1, and YEW) once a month from May – September. In addition, the PVER, the CVCA, and Cibola NWR Unit #1 were each surveyed one time in February in an attempt to capture California leaf-nosed bats for the foraging distance study (D9). One western red bat was captured at Cibola NWR Unit #1 during the February survey. Western red bats were captured at the CVCA during the February, May, and June surveys. A western red bat captured at the CVCA in February 2014 was recaptured during the February 2015 survey. Western yellow bats were captured at the PVER, the CVCA, Cibola NWR Unit #1, and YEW. All western red and western yellow bats were passive integrated transponder tagged to identify individuals if recaptured. California leaf-nosed bats were captured at all five sites. Two Townsend's big-eared bats were captured at the BLCA (one in June and one in September). This was the third year in a row that Townsend's big-eared bats have been captured at this site.

FY16 Activities: Bat presence will continue to be monitored by using eight acoustic monitoring stations. The stations will continue to operate, and data will be analyzed, presence documented, and activity level rates calculated. Capture surveys will continue at the BLCA, the PVER, the CVCA, and Cibola NWR Unit #1. Capture surveys will be reduced in FY 16 to the peak activity period of June – August to correlate with acoustic monitoring and will be limited to Reaches 3–5 where conservation area habitat for the species is being created and maintained.

Proposed 17 Activities: Bat presence at the conservation areas will continue to be monitored with the use of acoustic stations and capture surveys from June – August. Data will be analyzed, presence documented, and activity level rates calculated.

Pertinent Reports: Annual reports will be posted on the LCR MSCP Web site.

Work Task F5: Post-Development Monitoring of Fish at Conservation Areas

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$265,000	$235,350.31	$1,521,894.58	$250,000	$250,000	$350,000	$350,000

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

Start Date: FY07

Expected Duration: FY55

Long-Term Goal: Post-development monitoring

Conservation Measures: RASU6 and BONY5

Location: Backwater habitats (Reaches 3–6)

Purpose: To monitor fish use of habitat creation sites in order to provide data for the adaptive management process and to develop management guidelines for created backwater habitats

Connections with Other Work Tasks (Past and Future): Post-development monitoring will be conducted at all backwaters created under Conservation Area Development and Management (Section E) work tasks and Work Tasks C23 (closed), C31, C33 (closed), C34 (closed), C40, and C41 (closed).

Project Description: Fish and fish habitat will be monitored at conservation areas. It is anticipated that these areas will play various roles in the 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 components in developed or restored habitats will be required. Fish monitoring will include trapping (hoop, fyke, and minnow traps), trammel netting, electrofishing, larvae light trapping, and ocular surveys (including scuba and snorkeling where necessary and practical). Water quality assessments will require annual measurements of temperature, oxygen, pH, and conductivity (salinity) as well as periodic monitoring of chemical makeup and selenium.

Previous Activities: Since 2006, Beal Lake has been renovated and stocked with more than 6,000 razorback suckers and 2,000 large bonytail (an additional 27,000 young-of-the-year bonytail have also been released); a limited portion of each of these stockings was marked with passive integrated transponder (PIT) tags. Non-natives were identified shortly after the renovation efforts. Through annual surveys, subsets of each of these stockings have been contacted, but long-term survival has been low. A more intensive monitoring effort using remote sensing was initiated in FY09 and continued through FY11. Populations of stocked razorback suckers declined rapidly within the first several months post-release and eventually leveled off near 100 individuals. Water quality has been monitored constantly with multi-parameter water quality loggers, and all parameters have remained within the known ranges of acceptability for native fishes.

In 2012, stockings were discontinued at Beal Lake, and fisheries surveys were reduced to a relative abundance and biomass estimate for all species within the backwater. Results of this survey indicated that the backwater contained at least six different species but, relative to the size of the backwater, had low overall numbers of fishes (approximately 4,000). Non-native fishes were the dominant species in the lake, accounting for almost 90 percent of the total fishes.

A large fishkill was observed in February 2013; water samples confirmed a golden algae bloom. Monthly golden algae monitoring was initiated immediately following its detection. No fishes were observed for several months after the event. By mid-summer, young-of-year largemouth bass were observed in the backwater. Golden algae have not been detected in the backwater since May 2013, and the non-native fish community has rebounded since the fishkill. The backwater was isolated from Topock Marsh following the detection of golden algae in 2013; this closure resulted in a rapid increase in specific conductivity, which approached 11,000 microsiemens per centimeter in FY14.

Routine monitoring of the Big Bend Conservation Area (BBCA) has been conducted monthly from February through May and has included electrofishing, trammel netting, remote PIT scanning, and larval light trapping in areas where there have been historical contacts of native fishes and adequate water levels to permit access for sampling. Water quality profiles were conducted during each monitoring trip and at least quarterly the remainder of the year. Through monitoring, low numbers of razorback and flannelmouth suckers continued to be contacted, including larvae of both species and an occasional flannelmouth sucker subadult. The backwater has a direct surface connection to the lower Colorado River; consequently, water quality parameters mirror that of the river.

FY15 Accomplishments: The water quality at Beal Lake was monitored throughout the backwater using permanently deployed multi-parameter instruments. Low levels of dissolved oxygen and high temperatures were observed locally but not lake-wide. Conductivity has decreased to nearly

6,000 microsiemens per centimeter following some inlet canal maintenance and the opening of valves that reconnected the backwater to Topock Marsh. Zooplankton and phytoplankton results continue to show relatively low levels of plankton biomass. No golden algae have been detected in Beal Lake since May 2013.

Routine monitoring at the BBCA continued in FY15; native fish contacts included 12 razorback suckers and 3 flannelmouth suckers. All but one of the razorback suckers originated from localized stocking events from the past 3 years. Larval flannelmouth and razorback suckers were captured at rates similar to previous years. Multiple telemetered juvenile flannelmouth suckers (Work Task C53) were again contacted in the dense bulrush stands near the center of the backwater. Water quality parameters remained within thresholds for all native fishes.

FY16 Activities: Monitoring activities at Beal Lake will be focused on water quality and plankton, with limited fish monitoring. Monthly golden algae sampling will continue throughout the year. Research projects will be outlined for the next few years, and study plans will be completed in FY16.

The BBCA will be monitored at a level similar to FY15. Semipermanent remote PIT scanners will be deployed in an effort to increase scanning contacts for all species.

Proposed FY17 Activities: The activities from FY16 will continue into this year. Native fish research projects at Beal Lake will be initiated under Section C work tasks. Research will focus on fish use of cover (C63) and the impact of piscivorous bird predation (C65) in the lake.

BBCA activities will be similar to those of the previous year and will include trammel netting, remote PIT scanning, larval surveys, and water quality monitoring.

Pertinent Reports: A report titled *Beal Lake Species Abundance and Biomass* is complete and will be posted on the LCR MSCP Web site upon completion.

Work Task F6: Post-Development Monitoring of MacNeill's Sootywings at Conservation Areas

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$80,000	$71,572.40	$447,717.42	$80,000	$80,000	$80,000	$80,000

Contact: Carrie Ronning, (702) 293-8106, cronning@usbr.gov

Start Date: FY09

Expected Duration: FY55

Long-Term Goal: Post-development monitoring for MacNeill's sootywings (hereafter, sootywing)

Conservation Measures: MNSW2

Location: Habitat conservation areas, Reaches 3–5

Purpose: To monitor vegetation, plant quality, and populations of MacNeill's sootywings in habitat created for this species

Connections with Other Work Tasks (Past and Future): Habitat requirements were studied under Work Task C7 (closed)

Project Description: To monitor the presence and habitat use of MacNeill's sootywings in conservation areas that have the appropriate land cover type available

Previous Activities: Habitat created for MacNeill's sootywings at the Cibola Valley Conservation Area (CVCA) and the Palo Verde Ecological Reserve (PVER) was surveyed for adults from FY09 to FY11. In FY09 and FY10, sootywings were most abundant at CVCA Phase 4W along the road edge, (> 200 adults counted) and at a separate patch in the same phase. Sootywings were rare (< 5 adults per date) or absent at other CVCA plots and at all of the PVER plots. In FY11, most observations were at PVER Phase 4 (< 5 adults per date), and none were observed in CVCA Phase 4W. Sootywing populations at the remaining CVCA and PVER plots were low or absent.

Monitoring methods were modified in FY12 and FY13. One random transect was walked in each check monthly in FY12 from April through August at CVCA Phases 2 and 3, CVCA Phase 4, CVCA Phase 5, and PVER Phases 4 and 5. In

FY13, planted quailbush (*Atriplex lentiformis*) (sootywing larval host plant) habitat was surveyed for adult sootywings during June – September in plots at the CVCA and PVER. Sootywings were detected at the CVCA (7 in FY12 and 6 in FY13) and the PVER (13 in FY12 and 98 in FY13). They were not detected consistently throughout the season. Vegetation was monitored in FY13 to document the characteristics of host and nectar plants, including species, plant height, and width.

Methods were refined further for surveys in FY14 and provided potential habitat measurements and estimated survey time length to be considered in future protocols. Sootywing presence surveys were conducted at PVER Phases 4 and 6, the CVCA, and Hart Mine Marsh, and sootywings were detected at all sites. Habitat measurements included those of quailbush, nectar plant metrics, information on soil moisture, and air temperature and relative humidity. Data indicated that 1 hour of survey time at the appropriate time of day could be used to detect adult sootywings in 90 percent of sampled intervals.

FY15 Accomplishments: Conservation areas were surveyed for sootywing presence in April, June and July using the same methods as in FY14. Surveys occurred at the Big Bend Conservation Area, the Beal Lake Conservation Area, the CVCA, the PVER (Phases 1, 4, and 6), Hart Mine Marsh, and Hunter's Hole. Sootywings were detected at the Beal Lake Conservation Area, the CVCA, the PVER (Phases 1, 4, and 6), Hart Mine Marsh, and Hunter's Hole. The detection of sootywings in Reach 7 at Hunter's Hole indicates that the species' current occupied range is greater than that known in FY05, when the LCR MSCP was initiated.

FY16 Activities: Conservation areas where no sootywings have been detected (the Big Bend Conservation Area, Cibola National Wildlife Refuge Unit #1 Conservation Area and the Imperial Ponds Conservation Area) will be surveyed for presence of quailbush to identify if there is potential habitat. Presence surveys for sootywings will be conducted in April, June, and July in each of these conservation areas in potential habitat. If sootywings are detected before the July survey, surveys in the remaining months will not be conducted.

Proposed FY17 Activities: Conservation areas where no sootywings have been detected will be surveyed for presence of quailbush to locate potential habitat. Presence surveys for sootywings will be conducted in potential habitat during April, June, and July. If sootywings are detected before the July survey, surveys in the remaining months will not be conducted. In addition, in FY17, LCR MSCP legacy data for sootywings will be migrated into the LCR MSCP database.

Pertinent Reports: Annual reports will be posted on the LCR MSCP Web site.

Work Task F7: Marsh Bird Monitoring at Conservation Areas

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$30,000	$29,091.63	$78,366.68	$30,000	$40,000	$40,000	$40,000

Contact: Joe Kahl, (702) 293-8568, jkahl@usbr.gov

Start Date: FY11

Expected Duration: FY55

Long-Term Goal: Post-development monitoring for California black rails, Yuma clapper rails, and western least bitterns

Conservation Measures: MRM1, MRM2 (CLRA, BLRA, and LEBI), LEBI1, BLRA1, and CLRA1

Location: Presence surveys will be conducted at newly developed marsh habitat sites, including Hart Mine Marsh, Cibola National Wildlife Refuge (Cibola NWR); Imperial Ponds Conservation Area (IPCA), Imperial National Wildlife Refuge (Imperial NWR); Beal Lake and Willow Marsh, Havasu National Wildlife Refuge (Havasu NWR); Big Bend Conservation Area (BBCA), Nevada; and Yuma East Wetlands and the Laguna Division Conservation Area, Arizona.

Purpose: To monitor the use of created marsh habitat by covered marsh bird species

Connections with Other Work Tasks (Past and Future): System-wide marsh bird surveys have been conducted by the Bureau of Reclamation (Reclamation) on existing marsh habitat since 1996 under Work Task D1.

Project Description: Marsh bird surveys will be conducted at LCR MSCP conservation areas. The National Marsh Bird Monitoring Program protocol will be used, which involves surveying for several species, including the LCR MSCP covered marsh species, using taped recordings of the species' calls.

Previous Activities: Hart Mine Marsh and the IPCA were surveyed for marsh birds prior to development. Marsh bird surveys were conducted at the BBCA, Hart Mine Marsh on the Cibola NWR, and Field 18 and the Imperial ponds of the

IPCA on the Imperial NWR after inclusion into the LCR MSCP. From FY05 to FY14, Reclamation partnered with U.S. Fish and Wildlife Service (USFWS) to share the costs and labor needed to conduct the surveys.

FY15 Accomplishments: Marsh bird surveys were conducted during March, April, and May at Hart Mine Marsh and at the IPCA (Field 18 and the Imperial ponds). At the Beal Lake Conservation Area, surveys were conducted at Beal Lake once in March and at Beal Lake and Willow Marsh twice in April. Surveys at the BBCA, Yuma East Wetlands, and Hunters Hole were conducted once in March and twice in April. This was the first year that Reclamation conducted marsh bird surveys at the Laguna Division Conservation Area (LDCA). This was the first year that a Yuma clapper rail was detected at the BBCA. No California black rails were detected at conservation areas in FY15.

Western Least Bittern Detections

Conservation Area	Survey 1 (March)	Survey 2 (April)	Survey 3 (April – May)
Beal Lake Conservation Area			
Beal Lake	1	1	2
Willow Marsh	0	0	0
Big Bend Conservation Area	0	0	0
Hart Mine Marsh	5	7	9
Imperial Ponds Conservation Area			
Field 18	0	0	0
Imperial Ponds	0	0	0
Laguna Division Conservation Area	3	0	0
Yuma East Wetlands	3	0	2

Yuma Clapper Rail Detections

Conservation Area	Survey 1 (March)	Survey 2 (April)	Survey 3 (April – May)
Beal Lake Conservation Area			
Beal Lake	1	1	0
Willow Marsh	0	1	0
Big Bend Conservation Area	0	0	1
Hart Mine Marsh	5	14	7
Imperial Ponds Conservation Area			
Field 18	4	2	1
Imperial Ponds	0	0	0
Laguna Division Conservation Area	0	0	0
Yuma East Wetlands	0	2	2

FY16 Activities: Marsh bird surveys on conservation areas will be conducted in cooperation with the USFWS. These sites will include Beal Lake and Willow Marsh (Havasu NWR), Hart Mine Marsh (Cibola NWR), Field 18 and the Imperial ponds (Imperial NWR), the BBCA, Yuma East Wetlands, and the LDCA. Data will be entered into the LCR MSCP database and analyzed, comparing pre- and post-development.

Proposed FY17 Activities: Marsh bird surveys on conservation areas will be conducted in cooperation with the USFWS. They will be conducted on conservation areas that have a marsh habitat component in sufficient acreage, vegetation type, and suitability. These sites will include Beal Lake and Willow Marsh (Havasu NWR), Hart Mine Marsh (Cibola NWR), Field 18 and the Imperial ponds (Imperial NWR), the BBCA, Yuma East Wetlands, and the LDCA. Data will be entered into the LCR MSCP database and analyzed, comparing pre- and post-development.

The budget increases in FY17 due to additional effort to survey the expanded wetlands at the LDCA and to survey Beal Lake and Willow Marsh (Havasu NWR), Hart Mine Marsh (Cibola NWR), Field 18 and the Imperial ponds (Imperial NWR).

Pertinent Reports: Results of the surveys will be reported in the annual reports for each associated restoration site as well as one report for all conservation areas.

WORK TASKS – SECTION G

Adaptive Management Program

Work Task G1: Data Management

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$850,000	$572,953.39	$4,560,746.11	$1,000,000	$1,000,000	$1,000,000	$1,000,000

Contact: Michelle Reilly, (702) 293-8497, mreilly@usbr.gov

Start Date: FY07

Expected Duration: FY55

Long-Term Goal: Data management will be an ongoing task for species research, system monitoring, habitat creation, post-development monitoring, and habitat maintenance programs.

Conservation Measures: All

Location: Program-wide

Purpose: To 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 for the successful completion of the work tasks undertaken: Fish Augmentation (Section B), Species Research (Section C), System Monitoring (Section D), Conservation Area Development and Management (Section E), Post-Development Monitoring (Section F), Adaptive Management Program (Section G), and Funding Accounts (Section H).

Project Description: Under this work task, the data management team manages all aspects of the LCR MSCP that are related to the database, data collection, applications development, and software management. To fully implement the program, a database management system is being developed to handle the data collected through the species research, system monitoring, habitat creation, post-development monitoring, adaptive management, and habitat maintenance programs. Database design, initial implementation, and maintenance are funded under this work task.

Previous Activities: Hardware was purchased to increase data storage for the implementation of the centralized database. The Intranet/document/calendar management system was upgraded and modified to accommodate the future needs

of the LCR MSCP. Implementation of remote data collection from field data loggers began at Beal Lake for the fish program. The Native Fish Augmentation Database was maintained.

Database design and implementation of the LCR MSCP database management system was completed. Data modules for the database were acquired and phased in according to priority for implementation of the Habitat Conservation Plan. The modules consist of an application for data entry that is standardized for input into the database. On an annual phased approach, all standardized projects will be incorporated into the database.

The Minckley Library project was completed in March 2012. The library is now available as a searchable database that houses over 11,000 total documents, including a variety of literature types, which were digitized and organized using bibliographic software.

It was determined in FY12 that the entire planning area needed to be delineated to standardize site naming conventions for locations where data collection would be conducted. This delineation will be updated as needed throughout the LCR MSCP term.

Mobile data loggers and software for collection of data in the field were acquired. These units standardize all data collection across LCR MSCP projects. Mobile electronic field forms (MEFFs)/data dictionaries for data collection were developed and are now used for all field data collection.

FY15 Accomplishments: The Native Fish Augmentation Database continued to be maintained. Maintenance and updates to the LCR MSCP Web site continued. Field data collection devices and supporting software were purchased to support data collection activities.

Data collection processes were reviewed, updated, and maintained. MEFFs were also created (or updated) and tested for the following projects: southwestern willow flycatcher (D2, D3 [closed], and F2), lowland leopard frog (C62 and D12), Colorado River toad (C62 and D12), Colorado River/Yuma hispid cotton rats (D10 and F3), small mammal demographic studies (C27), bat surveys and research (C35 [closed], D9, and F4), and yellow-billed cuckoo (D7 and F2). Documentation for all MEFFs was created so that end-users had the necessary reference materials for proper MEFF use. Additionally, LCR MSCP staff trained end-users in how to use the MEFFs for field data collection.

The LCR MSCP database continued to be maintained and upgraded for location, species, project-related reference tables, and utility procedures to centralize processing of project data, with emphasis on the support of MEFF needs (e.g., MEFF locations, codes, etc.). Database schemas and data/photo import/conversion codes were designed, built, and tested in support of the MEFFs for wildlife monitoring. Support continued to be offered for users of

desktop computer-based data entry forms, including form and code updates, data merging, internal quality queries, and assistance in the design and creation of contractor-required queries for avian system-wide surveys. Quality assurance measures for field data collection processes were developed, with full audit trails from raw field data to final production data. MEFF data viewers were also developed during FY15 in support of projects for the southwestern willow flycatcher (D2, D3 [closed], and F2) and yellow-billed cuckoo (D7 and F2). The data viewers allow field surveyors to view collected data in tables shortly after field collection as part of the quality assurance process.

The use of remote and continuous data collection from data loggers continued to be developed and supported. The external data upload site was updated and maintained in order to improve data flow.

Efforts to restructure and more effectively maintain the LCR MSCP spatial database began in FY15.

A project management software plug-in was purchased to help track and implement project objectives.

FY16 Activities: The LCR MSCP Web site continues to be maintained and updated. Light detection and ranging data and aerial image acquisition for selected conservation areas is being supported under Work Tasks C60 and F1 for the current year's acquisition while the management of this data is being handled under this work task.

The data collection processes continue to be updated and/or maintained, and MEFFs are being evaluated, developed, updated (and/or maintained), and tested for the following projects: elf owl (C24), MacNeill's sootywing (F6), fish augmentation (B1), fish monitoring (F5), southwestern willow flycatcher (D2 and F2), lowland leopard frog (C62 and D12), Colorado River toad (C62 and D12), Colorado River/Yuma hispid cotton rats (D10 and F3), small mammal demographic studies (C27), bat surveys and research (C35 [closed], D9, and F4), and yellow-billed cuckoo (D7 and F2). Support for the purchase of MEFF development tools, Global Positioning System devices, and supporting software continues.

Under the LCR MSCP, the following continues to be reviewed and developed: (1) program-wide standards for data collection, (2) documentation for data collection processes in the field, and (3) automated data collection requirements when using mobile devices, which helps to ensure that data collection is consistent.

Development of database schema, data mapping, and coding continues in order to support importation of collected MEFF data into the standardized LCR MSCP database for all projects. This effort includes the creation of new and/or evaluation of existing queries to support each project. Accompanying process

flow documentation is also being created or updated for overall database maintenance and project-specific operations. Upgrades to the LCR MSCP database were performed early in FY16. As part of this upgrade, all data collected in the previous few years using the standard LCR MSCP Access forms/MEFFs are being imported into the upgraded LCR MSCP database.

Maintenance of the Native Fish Augmentation Database continues, and preliminary efforts to incorporate this into the LCR MSCP database have begun.

The project management software plug-in purchased in FY15 is being configured to help track and implement project objectives. It is expected that this plug-in be fully operational by the end of FY16.

An evaluation of technologies, processes, and methods to incorporate all legacy data into the LCR MSCP database will begin during FY16. The efforts that began in FY15 to restructure and maintain the LCR MSCP spatial database is ongoing.

Proposed FY17 Activities: Existing MEFFS will continue to be updated, and new MEFFs will continue to be developed or tested for all projects that involve data collection. Support for the purchase of MEFFs, Global Positioning System devices, and supporting software will continue. Additionally, the search for and testing of more advanced and efficient methods of electronic field data collection methods will continue.

The LCR MSCP database will continue to be maintained and upgraded as needed. Light detection and ranging data acquisition will continue to be supported under Work Task F1, but the raw data will be managed and maintained under this work task.

Database schemas and data import/conversion codes will continue to be designed or updated in support of the MEFFs for projects as appropriate. All related database documentation (e.g., schema design, MEFF to Structured Query Language data mapping, processing work flows, standard naming conventions, etc.) will be maintained or created as required. Efforts to provision software that will enable project coordinators to access LCR MSCP database tables will continue. Importation of all data into the database will continue.

Legacy data will begin to be imported into the LCR MSCP database using the technologies and methods identified during FY16. The inclusion of legacy data and the business intelligence and data mining tools available in the upgraded database version will allow all of the data collected during the life of the LCR MSCP to be leveraged, enabling more informed management decisions.

The Native Fish Augmentation Database will continue to be maintained, with other fish project data modules being constructed following standardization of

individual projects. Once the fisheries projects have been standardized, consolidation of the Native Fish Augmentation Database with the LCR MSCP database will begin using LCR MSCP standards.

LCR MSCP staff will continue to refine the quality assurance procedures already in place. This effort includes the use of the external SharePoint site to upload all raw data for tracking and quality assurance.

Project management software will be used to track and implement project objectives to assist with timely project completion.

Pertinent Reports: N/A

Work Task G3: Adaptive Management Research Projects

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$300,000	$133,374.64	$2,469,533.27	$300,000	$300,000	$300,000	$300,000

Contact: Jimmy Knowles, (702) 293-8172, jknowles@usbr.gov

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: Effective conservation of native species and their habitats

Conservation Measures: All conservation measures relating to habitat creation, species research, system monitoring, and fish augmentation

Location: System-wide

Purpose: To develop tools to effectively evaluate conservation actions

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 Augmentation (Section B), System Monitoring (Section D), Conservation Area Development and Management (Section E), Post-Development Monitoring (Section F), or Funding Accounts (Section H) work tasks.

Project Description: The adaptive management process is an assurance that the conservation actions presented in the Habitat Conservation Plan are effectively accomplished. Tools by which the conservation actions can be measured will be developed and evaluated, and data to improve the efficacy of techniques to successfully create habitat will be provided.

LCR MSCP staff will initiate priority research projects in a timely manner. For example, opportunistic research proposals (e.g., time sensitive, such as spawning or breeding-season dependent) can be considered and initiated during the funding year and then be elevated to full research or monitoring status (Section C, D, or F work tasks) the following year. Also, experimental techniques can be evaluated through research to assess their utility, and if found to be useful, they would be incorporated into monitoring activities.

Previous Activities: All previous activities were moved to other work tasks after the initial year of funding.

FY15 Accomplishments:

Assessment of avian predation on native fishes: A literature review was completed in FY15, and cursory techniques for assessing predation were initiated. Radio tags are now being used in conjunction with sonic telemetry research in Reach 3. Radio tags are capable of being detected even if they are removed from the river, and this will provide additional opportunity to identify the fate of some stocked fishes. Remote passive integrated transponder scanning of known bird roosts in Laughlin Lagoon accompanied releases of razorback suckers and bonytail. Initial scanning efforts were on a trial basis to determine their efficacy in detecting passive integrated transponder tags in avian predators. This method proved effective and will be incorporated into additional releases in order to quantify this predation pressure. All future work relative to avian predation will be incorporated into Work Task C65.

Marsh bird water depth analyses: The Habitat Conservation Plan requires the creation of a minimum of 512 acres of marsh habitat for three LCR MSCP covered marsh bird species. Marsh habitat is created in a mosaic of water depths and vegetation complexity to meet habitat requirements for these species. This study will help define possible water depth fluctuations to better inform marsh management. Existing marsh bird and river depth data for marshes along the lower Colorado River was compiled to assess if sufficient data exist to evaluate water depth fluctuations in California black rail, western least bittern, and Yuma clapper rail existing breeding sites along the river. Data were sufficient, and an analysis was conducted to identify ranges of daily, monthly, and annual water depth variability in occupied Yuma clapper rail breeding sites in Topock Gorge. This will continue under Work Task C66 in FY16.

FY16 Activities: Research questions identified during fish augmentation, species research, system-wide monitoring, habitat creation, and post-development monitoring will be evaluated for development into adaptive management research projects under this work task.

Razorback sucker species status assessment (SSA): Funds will be contributed under the LCR MSCP for a cooperative adaptive management effort with the Upper Colorado River Basin recovery programs (Upper Colorado River Endangered Fish Recovery Program, San Juan River Basin Recovery Implementation Program, and Glen Canyon Dam Adaptive Management Program) to develop an SSA for razorback suckers. The purpose of the SSA is to characterize the species' current status, future condition, and long-term viability to the extent possible using existing data, expert, and currently available information under various scenarios and timeframes. The SSA will provide

key information that can be used to help generate a 5-year status review (or other documents) by the U.S. Fish and Wildlife Service for assessing the species' status with respect to the Endangered Species Act.

Proposed FY17 Activities: Research questions identified during fish augmentation, species research, system-wide monitoring, habitat creation, and post-development monitoring will be evaluated for development into adaptive management research projects under this work task.

Pertinent Reports: The report titled *Development and Characterization of Microsatellite PCR Primers for Bonytail Chub for use in Assessing Relatedness of Fishes Produced in Off-Channel Habitats* is posted on the LCR MSCP Web site.

Work Task G4: Science/Adaptive Management Strategy

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$400,000	$212,457.02	$1,137,386.64	$600,000	$400,000	$400,000	$400,000

Contact: Jimmy Knowles, (702) 293-8172, jknowles@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 related to habitat creation, species research, system monitoring, and fish augmentation

Location: LCR MSCP planning area

Purpose: To define the procedure 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: The Habitat Conservation Plan conservation measures were designed to meet the biological needs of 26 covered species and to benefit 5 evaluation species. A science strategy, developed in FY06, defined the processes for ensuring implementation of the LCR MSCP using the best available science, and it described a two-tier planning process to ensure effective implementation of research and monitoring actions: first, a 5-year planning cycle and, second, annual work plans covering a 3-year cycle.

Every 5 years, a plan will be developed that describes the current knowledge of covered species, establishes the monitoring and research priorities for that 5-year period, and describes potential challenges that may inhibit successful implementation of the conservation measures. During each 5-year cycle, the accumulated data from ongoing research and monitoring will be reviewed along with existing species accounts.

Additional work may be generated from the evaluation of research conducted under Work Task G3.

LCR MSCP staff will participate in interagency meetings and workshops held to discuss natural resource conservation along the lower Colorado River. These meetings bring together scientists, managers, and resource users interested in the lower Colorado River ecosystem. Additional special topic workshops will be held for covered species or their habitats as needed to revisit the status of one or more of these species within the LCR MSCP area.

Recently completed, ongoing, and proposed research and monitoring activities will be reviewed to ensure they meet the goals and objectives of the Habitat Conservation Plan.

Previous Activities: The Science Strategy was developed in FY06–07. Colorado River Terrestrial and Riparian Group and Colorado River Aquatic Biologists meetings were attended. The *Habitat Creation Conservation Measure Accomplishment Tracking Process* was developed for tracking conservation measure accomplishment pertaining to the habitat creation conservation measures and approved by the Steering Committee in FY12. The *LCR MSCP Five-Year Monitoring and Research Priorities: 2008–2012* was completed in FY13.

On October 27, 2011, the Steering Committee approved minor modifications to five conservation measures (RASU3, BONY3, BLRA1, STBU1, and THMI1) reported in the FY11 Accomplishments Report. Reported in FY14, three minor modifications to conservation measures were approved by the Steering Committee on April 23. Research and monitoring activities provided habitat information to adjust Conservation Measures WRBA1, BEVI1, and CRCR2.

Independent program reviews were completed on the bat and vegetation monitoring projects.

FY15 Accomplishments: To accommodate the need to centralize adaptive management and data management activities, the LCR MSCP Office was reorganized to include a stand-alone Adaptive Management Group, which is responsible for ensuring projects meet the strategic goal of the LCR MSCP, such as standardization of data collection and management activities, evaluation of conservation areas in terms of conservation measure accomplishment, and development of conservation area management plans.

A habitat creation accomplishment analysis was conducted to show acreage totals for each species at each conservation area where applicable. These totals can be found in table 1-9 in the “Overview” section of this document.

Conceptual ecological models (CEMs) were completed during this fiscal year for the following species: bonytail, flannelmouth sucker, gilded flicker, western least bittern, western red bat, and western yellow bat. Development of CEMs for the following species began: Arizona Bell's vireo, California black rail, Colorado River cotton rat, elf owl, Gila woodpecker, MacNeill's sootywing, summer tanager, vermilion flycatcher, Yuma clapper rail, and Yuma hispid cotton rat. New CEMs for additional species or maintenance of existing CEMs will be covered under Work Task G6 after FY15.

Through recommendations from the independent program review of the bat research and monitoring program, it was decided to adjust system-wide acoustic monitoring to collect data seasonally when covered bats are most active as opposed to year round. An independent review was completed for the Elf Owl Home Range, Habitat Use, and Detectability Study (C24), with the recommendation to use a multi-scale occupancy approach to increase statistical power when detections are low.

A study designed to compare population estimates of razorback suckers using data from traditional trammel netting versus remote passive integrated transponder (PIT) tag scanners was implemented in Lake Mohave in 2015. This study was identified and initiated under Work Task G4; however, field sampling (scanner deployment and retrieval, data downloads, and netting efforts) are being covered under Work Task D8. This field work was conducted as part of the annual multi-agency razorback sucker roundup in March. Population estimates have historically required mark-recapture data from trammel netting during the March roundup, but these are imprecise due to low recapture rates, and they require handling fish during the spawning season. Remote PIT scanning started in 2010 and has provided more precise estimates due to higher contact rates. However, the accuracy of these estimates is uncertain because scanners have not yet been deployed at all sites targeted by netting at the same time of year. Over at least the next 3 years, the area sampled with scanning will be expanded to more closely match that of netting for the same time period used for developing population estimates. Scanning will also be done for a longer period of time to determine how population estimates vary with scanning effort and to track trends in fish activity on the spawning beds. Information from this study will be used to determine whether and how the frequency of trammel netting can be reduced to help avoid disturbing razorback sucker spawning activity. Data collected under Work Task D8 will be analyzed and evaluated under Work Task G4. A report will be completed at the end of the study and will include management recommendations.

Expenditures were less than the approved amount due to a delay in the completion of CEMs. Analyses scheduled for FY15 were not able to be conducted since the necessary information from the CEMs was not available.

FY16 Activities: Research and monitoring activities will continue to be reviewed and evaluated internally as well as through independent reviewers.

The comparison of population estimates of razorback suckers using data from traditional trammel netting versus remote PIT tag scanners will be continued in Lake Mohave in FY16. This effort is part of a multi-year study and is expected to continue for at least 3 years.

As part of the adaptive management process, an independent review of the genetic research was initiated to help identify the appropriate level of effort and long-term needs for monitoring fish genetics. The evaluation of the current monitoring methods and recommendations for future monitoring of razorback sucker genetics in Lake Mohave is expected to be completed in FY16.

Following the completion of all species-specific CEMs, analyses will be conducted to better understand the impacts of management actions on habitat created under the LCR MSCP and the relationship between these actions and their effect on covered species. Development of decision support tools will also be initiated. These tools will help model the impacts that management actions have on created habitat and the covered species. These analyses and decision support tools will first be developed for select conservation areas using all relative data to assess proposed management actions. Once the analyses are complete, development of conservation area management plans will begin.

Coordination with landowners and agency partners for development of conservation area management plans will continue based on the results from the analyses described above.

Work will begin on drafting the Five-Year Monitoring and Research Priorities Report, which will describe the current knowledge of covered species, establish the monitoring and research priorities for the next 5-year period (2018–22), and describe potential challenges that may inhibit successful implementation of the conservation measures.

Proposed FY17 Activities: Research and monitoring activities will be reviewed and evaluated internally as well as through independent reviewers. Specific programs may include: avian, small mammal, insect, fisheries, and habitat monitoring programs.

Based on the results from the independent review of genetic research (to be completed in FY16), a pilot study may be conducted to assess the feasibility of expanding genetic sampling of razorback suckers to all fishes at the time of tagging. Some additional limitations must also be overcome before this is possible, including securing the appropriate off-the-shelf technology needed for rapid and accurate sampling as well as storage of genetic material. The change in collection protocols, combined with the expanded use of remote PIT

scanners, may greatly increase the precision of the genetic stock assessment of Lake Mohave by determining the parents of all larvae collected for hatcheries. This additional information is intended to assist the adaptive management process by measuring the percentage of released fish that contribute to the population each year.

Information from CEMs will continue to be used for analyses of current and proposed management actions. Further development of decision support tools will also continue. Information from these analyses and tools will be used to develop additional conservation area management plans. Following the concurrence of management guidelines, each conservation area management plan will be developed and implemented accordingly.

The Five-Year Monitoring and Research Priorities Report will be finalized during FY17. This report will describe the current knowledge of covered species, establish the monitoring and research priorities for the next 5-year period (2018–22), and describe potential challenges that may inhibit successful implementation of the conservation measures.

Pertinent Reports: The reports titled *Final Science Strategy; LCR MSCP Five-Year Monitoring and Research Priorities—2008-2012, LCR MSCP Five-Year Monitoring and Research Priorities—2013-2017,* and *Final Habitat Creation Conservation Measure Accomplishment Tracking Process* are posted on the LCR MSCP Web site.

Work Task G6*: Conceptual Ecological Models

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$0	$0	$0	$40,000	$40,000	$40,000	$40,000

* Work task changed from G5 due to previous use of G5 in 2006–08.

Contact: Jimmy Knowles, (702) 293-8172, jknowles@usbr.gov

Start Date: FY16

Expected Duration: FY55

Long-Term Goal: Species research and monitoring

Conservation Measures: MRM1, MRM2, MRM3, CLRA1, CLRA2, WIFL1, WIFL2, BONY2, RASU2, WRBA1, WRBA2, WYBA1, WYBA3, DPMO1, CRCR1, CRCR2, YHCR1, YHCR2, LEBI1, BLRA1, BLRA2, YBCU1, YBCU2, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, FLSU1, MNSW1, MNSW2, CLNB1, CLNB2, PTBB1, PTBB2, CRTO1, CRTO2, CRTO3, LLFR1, LLFR2, and LLFR3

Location: System-wide, Arizona, California, Nevada

Purpose: To assess and organize existing knowledge on each LCR MSCP covered and evaluation species to determine research, monitoring, and habitat requirements for current and future research, monitoring, habitat creation, and fish augmentation projects

Connections with Other Work Tasks (Past and Future): Previous work was done through Work Tasks C3, G3, and G4. Information collected under this work task is currently being used to develop future work tasks and research projects, design monitoring programs and habitat creation projects, and to implement the adaptive management process. Information from this work task will be used under Fish Augmentation (Section B), Species Research (Section C), System Monitoring (Section D), Conservation Area Development and Management (Section E), and Post-Development Monitoring (Section F).

Project Description: To successfully create and manage habitats for LCR MSCP covered species, conceptual ecological models (CEMs) are being developed to better direct research and monitoring efforts as well as management.

CEMs are widely recognized and utilized in natural resource management and structured decisionmaking, as they provide a clear framework for guiding management actions.

CEMs integrate and organize existing knowledge concerning: (1) what is known about an ecological resource, with what certainty, and the sources of this information, (2) critical areas of uncertain or conflicting science that demand resolution to better guide management planning and action, (3) crucial attributes to use while monitoring system conditions and predicting the effects of experiments, management actions, and other potential agents of change, and (4) how the characteristics of the resource are expected to change as a result of altering its shaping/controlling factors, including those resulting from management actions.

Previous Activities: New start in FY16.

FY15 Accomplishments: New start in FY16.

FY16 Activities: CEMs for the following species will be finalized: Arizona Bell's vireo, bonytail, California black rail, Colorado River cotton rat, elf owl, , flannelmouth sucker, Gila woodpecker, gilded flicker, MacNeill's sootywing, southwestern willow flycatcher, Sonoran yellow warbler, summer tanager, vermilion flycatcher, western least bittern, western red bat, western yellow bat, yellow-billed cuckoo, Yuma clapper rail, and Yuma hispid cotton rat.

The species accounts updated in FY14 under Work Task C3 will be finalized and published during FY16. Initial work to incorporate all information from these species accounts into the CEMs will begin in FY16.

Proposed FY17 Activities: Updates to CEMs will be done every 5 years, with literature being gathered annually. Development of CEMs for the five evaluation species will begin in FY17.

Pertinent Reports: All CEMS will be posted on the LCR MSCP Web site in FY16.

WORK TASKS – SECTION H

Funding Accounts

Work Task H1: Habitat Maintenance Fund

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15*	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$4,848,060	$5,480,049.36	$32,466,770.00	$0	$0	$0	$0

* Cumulative expenditures reflect total required contributions to develop the fund.

Contact: Jeremy Brooks, (702) 293-8157, jjbrooks@usbr.gov

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: Maintenance of existing habitat

Conservation Measures: CLRA2, BLRA2, WIFL2, and YBCU2

Location: Lower Colorado River (Reaches 1–7)

Purpose: To maintain existing habitat areas, excluding newly created habitat within conservation areas, by implementing actions that will prevent the further degradation or loss of habitat for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): These are stand-alone conservation measures as described in the LCR MSCP Habitat Conservation Plan.

Project Description: The development of a $25 million interest-bearing fund, called the Habitat Maintenance Fund (HMF), was completed over a 10-year period. The HMF will be used for maintaining habitats, which existed at the time of the signing of the Record of Decision (2005) and were suitable for LCR MSCP covered species, and which have since degraded after the LCR MSCP was initiated.

The HMF has been established during the first 10 years of the LCR MSCP by the States of California, Arizona, and Nevada. Funding contributions during the initial 5 years were established at $500,000 per year, with funding contributions in years 6–10 established at $5,000,000 per year. Values are indexed to 2003 dollars and adjusted annually for inflation. All required contributions to the HMF are retained in interest-bearing accounts managed by the States of California, Arizona, and Nevada until required for use under the LCR MSCP. Current fund balance and project expenditures are detailed in attachment D-3a.

For HMF projects, the LCR MSCP serves as the funding source but does not serve as the implementer of specific projects. The lead agencies and planning participants are expected to use their own funds in the development of proposals and for participation in planning teams. Funds required to administer the HMF under the LCR MSCP will be tracked under Work Task A1.

The Habitat Conservation Plan specifies a priority for habitat and species types benefiting from projects funded through the HMF. Priority 1 for use of the fund is the protection of marsh, and specifically marsh complexes, occupied by LCR MSCP covered rail species that serve as key source populations. The four key source population areas are Topock Marsh and Topock Gorge within the Havasu National Wildlife Refuge (Reach 3), Reach 5 primarily within the Imperial National Wildlife Refuge, and Mittry Lake (Reach 6), which is located on Bureau of Reclamation (Reclamation) withdrawn lands. The focus of the first 10 years of expenditures from the HMF (FY16–25) is the: (1) evaluation of infrastructure changes to manage water levels for rail species at both Topock Marsh and Mittry Lake and (2) identification of riverine portions of Topock Gorge and Reach 5, both of which are becoming degraded, and development of proposals to provide maintenance of these areas.

Previous Activities: Required annual contributions were made through FY14.

FY15 Accomplishments: A total of $5,480,049.36 was deposited into interest-bearing accounts among the Arizona, California, and Nevada partners – completing the funding requirement of the HMF. Contributions consisted of $4,826,034.36 of funding from Arizona, Nevada, and California, and $654,015.00 in underfunding payments from California. Required funding in FY15 was $4,848,060.00. However, Arizona used $11,012.82 of their funding credits, and Nevada used $11,012.82 of their funding credits toward their contribution (attachment D-3a). Required funding for the HMF is now complete.

In FY15, no funds were expended from the HMF for project purposes. In coordination with the U.S. Fish and Wildlife Service (USFWS) Ecological Services Field Office, planning teams, comprised of representatives of appropriate resource agencies and landowners, were assembled to investigate the use of the HMF to maintain Yuma clapper rail and California black rail key population centers at both Topock Marsh and Mittry Lake. Agency representatives from both sites have expressed a strong interest in partnering with the LCR MSCP on use of the HMF.

FY16 Activities: Project expenditures are not anticipated to occur in FY16. In coordination with the USFWS Ecological Services Field Office and planning teams, the LCR MSCP will continue to work with landowners and representatives of appropriate resource agencies to investigate use of the HMF to maintain key population centers at both Topock Marsh and Mittry Lake.

In 2016, LCR MSCP staff met with the USFWS (Ecological Services Field Office) to review a draft agreement regarding leveraging remaining Avoidance and Minimization Measure AMM2 (AMM2) funds of approximately $2.1 million and contributions from the HMF to complete infrastructure improvements at Topock Marsh. These efforts will allow for enhanced management of marsh levels for target species. The USFWS Ecological Services Field Office was consulted prior to that meeting and concurred with the structure of the agreement and use of the HMF for these purposes. A service agreement will be developed and executed under the LCR MSCP for surveying and engineering analyses to support initial engineering evaluation and design efforts at Topock Marsh. Reclamation's Yuma Area Office will be the lead for all efforts at Topock Marsh.

At Mittry Lake, partner meetings are anticipated to continue in order to develop the preliminary scope and parameters of an agreement for use of the HMF. If a project is ultimately defined and agreed upon, Reclamation's Yuma Area Office will be the lead for all efforts at Mittry Lake.

Proposed FY17 Activities: Planning and coordination efforts are anticipated to continue at both Topock Marsh and Mittry Lake.

At Topock Marsh, preliminary project activities are expected to be completed, and efforts will advance into engineering design stages, which will be funded via remaining AMM2 funding. HMF funding will not be used until all AMM2 funds are exhausted. Prior to use of the HMF, a formal agreement between the LCR MSCP and the USFWS will be developed and executed, outlining long-term roles and responsibilities.

An agreement for Mittry Lake among the partners will be developed and executed to support preliminary surveying of the site and engineering analyses of proposed improvements.

Pertinent Reports: N/A

Work Task H2: Remedial Measures Fund

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15*	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$361,228	$1,562,029.94	$3,994,595.38	$1,104,052	$1,108,828	$1,108,828	$1,108,828

* Cumulative expenditures reflect total required contributions to develop the fund.

Contact: John Swett, (702) 293-8555, jswett@usbr.gov

Start Date: FY13

Expected Duration: FY55

Long-Term Goal: Remedial measures for changed circumstances

Conservation Measures: CLRA1, WIFL1, BONY2, BONY3, RASU2, RASU3, WRBA2, WYBA3, CRCR2, YHCR2, LEBI1, BLRA1, YBCU1, ELOW1, GIFL1, GIWO1, VEFL1, BEVI1, YWAR1, SUTA1, FLSU1, and MNSW2

Location: LCR (Reaches 1–7)

Purpose: To implement remedial measures to respond to changed circumstances as necessary

Connections with Other Work Tasks (Past and Future): Any Fish Augmentation (Section B) and Conservation Area Development and Management (Section E) work tasks that may be affected by changed circumstances

Project Description: To address the potential for changed circumstances, a contingency fund was established to implement remedial measures identified in the Habitat Conservation Plan. On April 25, 2012, the Steering Committee passed Program Decision Document 12-001, which approved establishment of State interest-bearing Remedial Measure Funds. The total funds allocated to remedial measures was $13,270,000 (in 2003 dollars and indexed to inflation). Current fund balances are detailed in attachment D-3b.

In the event that changed circumstances occur, the Program Manager will implement remedial measures identified in the Habitat Conservation Plan. The measures will be implemented within the available LCR MSCP budget, including contingency funds allocated through this work task. The Program Manager will administer the Remedial Measures Fund.

Previous Activities: A Remedial Measures Fund process was established and approved by the Steering Committee in FY12.

FY15 Accomplishments: A total of $1,562,029.94 was deposited into three non-Federal interest-bearing accounts among Arizona, California, and Nevada. It consisted of $322,595.56 of funding from Arizona, Nevada, and California and $1,239,434.38 in underfunding payments from California. Required funding in FY15 was $361,228.00. However, Arizona used $9,206.54 of their funding credit, and Nevada used $29,425.90 of their funding credit toward their contribution.

FY16 Activities: A total of $1,104,052 will be deposited into three non-Federal interest-bearing accounts among Arizona, California, and Nevada.

Proposed FY17 Activities: A total of $1,108,828 is expected to be deposited into three non-Federal interest-bearing accounts among Arizona, California, and Nevada.

Pertinent Reports: N/A

WORK TASKS – SECTION I

Public Outreach

Work Task I1: Public Outreach

FY15 Estimate	FY15 Actual Obligations	Cumulative Expenditures Through FY15	FY16 Approved Estimate	FY17 Proposed Estimate	FY18 Proposed Estimate	FY19 Proposed Estimate
$100,000	$98,604.57	$509,004.93	$100,000	$125,000	$125,000	$125,000

Contact: Nathan Lenon, (702) 293-8015, nlenon@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 communicate, coordinate, and educate LCR MSCP Steering Committee members, internal and external stakeholders, and the general public about LCR MSCP implementation activities

Connections with Other Work Tasks (Past and Future): All LCR MSCP work tasks

Project Description: Under this work task, an outreach program for the LCR MSCP will be implemented. Activities are widely varied and include the creation of educational materials, participation at conferences and other public events, interaction with some school events, and coordination with youth conservation corps groups. Outreach may be specific to a project but more typically addresses the overall focus of the LCR MSCP and general conservation issues.

Previous Activities: LCR MSCP staff hosted the Colorado River Terrestrial and Riparian annual meeting and participated in the Colorado River Aquatic Biologists annual meeting. These meetings provide centralized forums for scientists and resource managers to discuss current research and monitoring projects taking place on the lower Colorado River. Space is devoted within the LCR MSCP Web site to highlight both of these meetings.

A wide range of printed materials, videos, and reports has been created to explain various program features in both summary (factsheet) format as well as more

lengthy reports. Several banner displays have been created; these materials have been used extensively to promote the LCR MSCP at conferences, conservation area dedications, and other events.

FY15 Accomplishments: The LCR MSCP Office commemorated the first 10 years of implementation by hosting a 3-day tour of the conservation areas, accented by the dedication of the Laguna Division Conservation Area in April. In support of this event, additional indoor displays were created, which included informational banners, posters, factsheets, and a custom-printed table wrap. A detailed, 3-full-day itinerary was developed to provide tour participants with an indepth understanding of the conservation areas and the accomplishments achieved under the program.

LCR MSCP staff provided additional tours of conservation areas for the Water Education Foundation, Red Rock Audubon Society, and Yuma Audubon Society and partnered with the National Park Service and Clark County Wetlands Park on events such as "National Public Lands Day," "International Migratory Bird Day," and "BioBlitz" (a citizen science wildlife observation event).

LCR MSCP information was exhibited at numerous science education events throughout Las Vegas and Laughlin, which included the fifth annual Las Vegas Science and Technology Festival. LCR MSCP staff participated in educational events at schools in Henderson, Las Vegas, and Boulder City. Staff hosted an exhibit booth at the Colorado River Water Users Association annual conference and the Colorado River Terrestrial and Riparian annual meeting.

The LCR MSCP Office increased its involvement with volunteers from 88 hours of volunteer labor in the previous year to 254 hours during FY15. These volunteers included students from Arizona State University in Lake Havasu City, Northern Arizona University (Yuma campus), and others. Volunteers participated in post-development monitoring at some sites, including bat mist netting, small mammal trapping, Monitoring Avian Productivity and Survivorship bird banding, and razorback sucker monitoring. The LCR MSCP Office also worked with two youth conservation corps groups during FY15 on two projects (Bubbling Ponds Fish Hatchery and the Cibola Valley Conservation Area), which included 13 youths contributing a total of 1,040 labor hours. These volunteer and youth conservation corps projects helped to provide some labor for the LCR MSCP, engaged youths in conservation work, and fostered relationships among them, the community, and the program.

FY16 Activities: The LCR MSCP Office is cost sharing with the Boulder Canyon Operations Office to enter into an agreement with the National Park Service (Lake Mead) to support Project WET (Water Education for Teachers) continuing education workshops. These workshops focus on explaining water science and related issues to Nevada teachers and provide information to be used in classrooms. Through this partnership and the focus on teacher education, the

LCR MSCP Office will be able to individualize the curriculum to include information about the lower Colorado River and the LCR MSCP and also reach a larger number of students than could be reached by individual staff efforts. The agreement is written for up to a 5-year period.

The LCR MSCP Office is planning to complete at least one youth conservation corps project while leveraging non-LCR MSCP funds. Proposals for corps projects typically involve control of invasive weeds or labor-intensive maintenance projects performed at conservation areas or partnering facilities (such as hatcheries). These projects employ a crew of approximately 8 young people (16–25) over an 80-hour duration.

The LCR MSCP Office will continue to participate in annual Colorado River Water Users Association, Colorado River Aquatic Biologists, and Colorado River Terrestrial and Riparian meetings. The LCR MSCP Office will continue to work with partner agencies, participating in National Public Lands Day, International Migratory Bird Day (Clark County Wetlands Park), Las Vegas Science and Technology Festival, and other science and conservation-themed community events.

Proposed FY17 Activities: Emphasis for outreach will continue to focus on LCR MSCP stakeholder education, with interaction in local communities. LCR MSCP staff will continue to support one to three large events per year, such as the Colorado River Water Users Association and the Las Vegas Science and Technology Festival. These activities provide opportunities to expand stakeholder and public knowledge of the LCR MSCP. Outreach to local community schools and colleges will continue, with a focus on providing volunteer opportunities when appropriate.

The LCR MSCP Office will to continue to work with the National Park Service and the Boulder Canyon Operations Office to promote the Project WET (Water Education for Teachers) workshops. The LCR MSCP Office will expand outreach as additional conservation areas are completed. This increased public awareness will help resolve potential issues over conflicting use of conservation areas.

Pertinent Reports: The 2015 annual report will be posted on the LCR MSCP Web site upon completion.

ATTACHMENTS

A Letter from Central Arizona Water Conservation District

B Description of Take

B-1: Federal Flow-Related Covered Actions and Accomplishments, Calendar Year 2015

B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2015

B-3: LCR MSCP Non-Federal Covered Activities and Incidental Take Summary, Fiscal Year 2015

C Recommendations from Resource Agencies

D Financial Statement

D-1: Required Contributions
- D-1a: Underfunding and Makeup Strategy – Current Year Dollars

D-2: Funding Credits
- D-2a: San Diego County Water Authority
- D-2b: The Metropolitan Water District of Southern California
- D-2c: Nevada
- D-2d: Arizona
- D-2e: Bureau of Reclamation

D-3: Funding Accounts
- D-3a: Habitat Maintenance Fund
- D-3b: Remedial Measures Fund
- D-3c: Land and Water Fund

D-4: Cumulative Program Accomplishment

E Reports Published in Fiscal Year 2015

Attachment A – Letter from Central Arizona Water Conservation District

CAP
CENTRAL ARIZONA PROJECT

May 26, 2016

Joseph A. Vanderhorst
Deputy General Counsel
Metropolitan Water District of Southern California
P.O. Box 54153
Los Angeles, CA 90054-0153

Christopher S. Harris
Deputy Executive Director
Colorado River Board of California
770 Fairmont Avenue, Suite 100
Glendale, CA 91203-1068

Lisa M. Ray
Assistant Hydropower Program Manager
Colorado River Commission of Nevada
555 E. Washington Ave., Suite 3100
Las Vegas, NV 89101

The Multi-Species Conservation Program (MSCP) Non-Federal share for the Federal Fiscal Year 2017, both annually and quarterly, are shown by state below. The inflation index used is 1.393.

FY17 is year 12 of the program and the second year of Arizona's 20 year payback period.

FY 2017 Non-Federal Share (2003 $)	$11,082,000
FY 2017 Inflation Index	1.393
FY 2017 Non-Federal Share (Escalated $)	$15,437,226

FY 2017 Non-Fed	Arizona Payback	Other Work Tasks	Remedial Measures	Total Non-Fed Payment Due
Arizona	$ 733,383.16	$3,582,099.50	$ 277,207.00	$ 4,592,689.66
Nevada	(366,691.58)	3,582,099.50	277,207.00	3,492,614.92
California	(366,691.58)	7,164,199.00	554,414.00	7,351,921.42
Totals	$ 0.0	$14,328,398.00	$1,108,828.00	$15,437,226.00

P.O. Box 43020 – Phoenix, AZ 85080-3020 • 23636 North Seventh Street – Phoenix, AZ 85024 • 623-869-2333 • www.cap-az.com

FY 2017 Quarterly Payments		Arizona Payback	Other Work Tasks	Remedial Measures	Total Non-Fed Payment Due
Arizona	Q1	$ 183,345.79	$ 895,524.88	$ 69,301.75	$1,148,172.42
	Q2	183,345.79	895,524.88	69,301.75	1,148,172.42
	Q3	183,345.79	895,524.88	69,301.75	1,148,172.42
	Q4	183,345.79	895,524.86	69,301.75	1,148,172.40
	FY Totals	$ 733,383.16	$3,582,099.50	$277,207.00	$4,592,689.66
Nevada	Q1	$ (91,672.90)	$ 895,524.88	$ 69,301.75	$ 873,153.73
	Q2	(91,672.90)	895,524.88	69,301.75	873,153.73
	Q3	(91,672.90)	895,524.88	69,301.75	873,153.73
	Q4	(91,672.88)	895,524.86	69,301.75	873,153.73
	FY Totals	$ (366,691.58)	$3,582,099.50	$277,207.00	$3,492,614.92
California	Q1	$ (91,672.90)	$1,791,049.75	$138,603.50	$1,837,980.35
	Q2	(91,672.90)	1,791,049.75	138,603.50	1,837,980.35
	Q3	(91,672.90)	1,791,049.75	138,603.50	1,837,980.35
	Q4	(91,672.88)	1,791,049.75	138,603.50	1,837,980.37
	FY Totals	$ (366,691.58)	$7,164,199.00	$554,414.00	$7,351,921.42

If you have any questions, please call or e-mail either Dana Sedig, 623-869-2148 (dsedig@cap-az.com) or myself, 623-869-2167 (tcooke@cap-az.com).

Sincerely,

Theodore Cooke
General Manager
Central Arizona Project

Attachments

Cc John Swett, MSCP Program Manager, Bureau of Reclamation
Laura Vecerina, MSCP Program Deputy Manager, Bureau of Reclamation
Linda Carbone, MSCP Management & Program Analyst
Douglas Dunlap, Manager-Finance and Accounting, CAP
Dana Sedig, Supervisor-Financial Operations, CAP

Section 8.1.1 - Fiscal Year 2017 Inflation Calculation for Lower Colorado River Multi-Species Conservation Program (Actual Indices through September 2015)

Item		Description / Formula		Values		Result
FY	=	Federal Fiscal Year Being Adjusted for Inflation		2017		2017
FY-2	=	Federal Fiscal Year for 2 years prior to Federal Fiscal Year Being Adjusted for Inflation		2015		2015
PPI Inflation Index for FY	=	Producer Price Index for Materials and Components for Const Sept FY-2 / Producer Price Index for Materials and Components for Const Sept 2002	=	227.5/ 152.1	=	1.496
Base Year for PPI	=	*Validate or change base year for PPI Index (Original index year = 1982)*	=	1982		
		Validate or change PPI index value for September 2002 according to the validated base year	=	152.1		
		Save a copy of the PPI index				
GDPIP Inflation Index for FY	=	Gross Domestic Product Implicit Price Deflator September 30, FY-2 / Gross Domestic Product Implicit Price Deflator September 30, 2002		**134.367** / 104.243	=	**1.289**
Base Year for GDPIP	=	*Validate base year of GDPIP (Original index year = 2000)*	=	2009		
		Adjust published numbers for 2015 of 110.029 to match base of 2000. Divide 110.029 by the 4 quarter avg for 2000 of 81.887. Then multiply the result by 100 to equal 134.367		110.029	=	134.367
		Save a copy of the GDPIP index and calcuations to adjust published numbers				
Inflation Index for FY	=	(PPI Inflation Index for FY + GDPIP inflation Index for FY)/2		(1.496+1.289)/2	=	**1.393**
Non-Federal Funding Obligation for FY	=	(5 - year Amount from Table 7-1 of HCP 2003 dollars adjusted to yearly amount)/2	=	$110,820 / 5 = $22,164 $22,164 / 2	=	$11,082
Federal Funding Obligation for FY	=	(5 - year Amount from Table 7-1 of HCP 2003 dollars adjusted to yearly amount)/2	=	$110,820 / 5 / 2	=	$11,082
Non-Federal Indexed Funding Obligation for FY	=	(Non-Federal Funding Obligation for FY) X (Inflation Index for FY)		$11,082 X 1.393	=	$15,437.226
Federal Indexed Funding Obligation for FY	=	(Federal Funding Obligation for FY) X (Inflation Index for FY)		$11,082 X 1.393	=	$15,437.226

All $ are in thousands

Individual State's share in $			
California Share - 50%		50%	$ 7,718,613.00
Arizona Share - 25%		25%	$ 3,859,306.50
Nevada Share - 25%		25%	$ 3,859,306.50
Total Non-Federal Share			$ 15,437,226.00

Arizona Payback ($10,529,550/20yrs = $526,477.50 X 1.393 =	$ 733,383.16
California	$ (366,691.58)
Nevada	$ (366,691.58)

Total Non-Federal Share for FY17	
California Share	$ 7,351,921.42
Arizona Share	$ 4,592,689.66
Nevada Share	$ 3,492,614.92
Total Non-Federal Share	$ 15,437,226.00

Bureau of Economic Analysis

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product

[Index numbers, 2009=100] Seasonally adjusted

Last Revised on: April 28, 2016 - Next Release Date May 27, 2016

Line		2014 I	2014 II	2014 III	2014 IV	2015 I	2015 II	2015 III	2015 IV	2016 I
1	**Gross domestic product**	**108.009**	**108.606**	**109.044**	**109.067**	**109.099**	**109.674**	**110.029**	**110.286**	**110.479**
2	**Personal consumption expenditures**	**108.537**	**109.114**	**109.438**	**109.318**	**108.792**	**109.388**	**109.737**	**109.831**	**109.908**
3	Goods	105.915	106.280	106.184	104.928	102.571	103.195	103.129	102.389	101.318
4	Durable goods	93.240	92.874	92.347	91.574	91.009	90.955	90.413	90.067	89.825
5	Nondurable goods	112.401	113.188	113.347	111.820	108.419	109.443	109.665	108.693	107.131
6	Services	109.905	110.593	111.137	111.614	112.045	112.626	113.194	113.731	114.411
7	**Gross private domestic investment**	**104.586**	**104.874**	**105.513**	**105.939**	**105.852**	**105.609**	**105.975**	**106.235**	**106.269**
8	Fixed investment	105.044	105.327	105.944	106.305	106.192	105.938	106.323	106.532	106.675
9	Nonresidential	103.563	103.845	104.166	104.317	104.207	103.949	104.247	104.360	104.402
10	Structures	108.664	108.873	109.336	109.603	108.957	108.293	108.630	108.615	108.182
11	Equipment	100.565	100.935	101.161	101.435	101.677	101.687	101.767	101.773	101.863
12	Intellectual property products	104.307	104.509	104.881	104.761	104.474	104.084	104.685	105.044	105.316
13	Residential	111.394	111.667	113.581	114.863	114.739	114.504	115.252	115.854	116.394
14	Change in private inventories	---	---	---	---	---	---	---	---	---
15	**Net exports of goods and services**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**
16	Exports	112.892	112.905	112.626	110.620	107.936	107.673	106.540	105.039	103.540
17	Goods	113.376	113.121	112.450	109.645	106.170	105.756	104.145	102.021	99.346
18	Services	111.901	112.502	113.107	112.921	111.989	112.054	111.954	111.777	112.744
19	Imports	114.485	114.106	113.864	111.869	106.702	105.551	104.612	102.582	100.596
20	Goods	116.145	115.655	115.362	113.007	106.969	105.578	104.549	102.137	99.740
21	Services	107.241	107.375	107.360	107.018	105.837	105.792	105.261	104.960	104.811
22	**Government consumption expenditures and gross investment**	**110.390**	**110.921**	**111.519**	**111.394**	**110.956**	**111.281**	**111.544**	**111.609**	**111.635**
23	Federal	108.674	109.180	109.646	109.596	109.619	109.846	110.104	110.457	110.895
24	National defense	108.132	108.503	108.917	108.786	108.633	108.716	108.825	109.167	109.456
25	Nondefense	109.607	110.329	110.879	110.956	111.259	111.713	112.206	112.576	113.247
26	State and local	111.575	112.123	112.807	112.635	111.899	112.288	112.554	112.435	112.200
	Addendum:									
27	Gross national product	108.127	108.722	109.158	109.177	109.195	109.768	110.122	110.376	---

Databases, Tables & Calculators by Subject

FONT SIZE:

Change Output Options: From: 2006 To: 2016 GO

☐ include graphs ☐ include annual averages

More Formatting Options

Data extracted on: May 26, 2016 (2:22:54 PM)

Producer Price Index-Commodities

Series Id: WPUID612
Not Seasonally Adjusted
Group: Intermediate demand by commodity type
Item: Materials and components for construction
Base Date: 198200

Download: xlsx

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	184.2	185.0	185.5	186.7	188.2	189.2	190.2	190.7	191.0	190.4	189.6	189.6
2007	190.3	190.6	191.2	192.1	192.8	193.1	193.5	193.5	193.2	193.2	193.2	193.4
2008	194.4	195.7	197.3	200.2	203.3	206.5	209.8	212.9	214.0	212.2	210.2	207.9
2009	207.0	204.8	204.2	203.2	202.8	202.0	201.9	201.5	202.0	201.9	201.7	202.0
2010	202.3	203.5	204.6	206.1	207.4	206.6	206.3	206.2	205.9	205.9	206.3	207.0
2011	208.3	209.5	210.9	212.1	212.8	213.7	214.7	214.6	214.5	214.4	214.2	214.2
2012	215.3	216.9	217.4	218.3	219.1	219.2	218.5	218.7	219.2	219.1	219.5	219.9
2013	221.2	222.2	222.7	223.4	222.9	222.6	222.4	223.0	222.9	222.9	223.0	223.1
2014	224.8	225.8	226.6	226.9	227.4	227.4	227.7	228.2	228.5	228.6	228.5	228.4
2015	229.0	229.1	229.1	229.4	229.1	229.0	228.8	228.0	227.5	227.7	227.6	227.2
2016	227.5(P)	227.3(P)	227.5(P)	228.3(P)								

P : Preliminary. All indexes are subject to revision four months after original publication.

Attachment B – Acronyms and Abbreviations

AOP	Annual Operating Plan
BCPA	Boulder Canyon Project Act
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CFR	Code of Federal Regulations
cfs	cubic feet per second
CVWD	Coachella Valley Water District
Decree	Supreme Court Consolidated Decree of 2006 in *Arizona* v. *California*, 547 U.S. 150
EIA	Ehrenberg Improvement Association
FWID	Flowing Wells Irrigation District
FY	fiscal year
IBWC	International Boundary and Water Commission
ICS	intentionally created surplus
IID	Imperial Irrigation District
Interim Guidelines	Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead
IOPP	Inadvertent Overrun and Payback Policy
kWh	kilowatt hours
LCWSP	Lower Colorado Water Supply Project
LROC	Long-Range Operation of Colorado River Reservoirs
maf	million acre-feet
mi	mile(s)
MODE	Main Outlet Drain Extension
MWD	Metropolitan Water District of Southern California
NIB	Northerly International Boundary
NMIDD	New Magma Irrigation and Drainage District
Reclamation	Bureau of Reclamation
RRA	Reclamation Reform Act
SDCWA	San Diego County Water Authority
SIB	Southerly International Boundary
yd^2	square yards
YMC	Yuma Mesa conduit
YMIDD	Yuma Mesa Irrigation and Drainage District

Attachment B – Description of Take

B-1: Federal Flow-Related Covered Actions and Accomplishments, Calendar Year 2015

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
2.2 BUREAU OF RECLAMATION				
2.2.1 Ongoing Flow-Related Actions				
2.2.1.1 Flood Control (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 • Anticipatory flood control releases • Available flood control space in Lake Mead can be reduced to 1.5 million acre-feet (maf) August 1 to January 1 if prescribed space is available in upstream reservoirs • Management of target elevations for Lake Mohave (Davis Dam) and Lake Havasu (Parker Dam)	• None	No flood control releases were made from Lake Mead. The hourly elevation of Lake Mead provided for flood control space, which was well above the space required. In 2015, the Lake Mead elevation varied between 1074.71 and 1089.32 feet above mean sea level. Elevations at Lake Mohave and Lake Havasu were managed to target elevations.
2.2.1.2 State Apportionment and Water Contracts (page 2-5; Table 2-2, page 2-6)	• Delivery of water to water users in the United States pursuant to applicable Federal law, including the Boulder Canyon Project Act (BCPA) and the Supreme Court Consolidated Decree of 2006 in *Arizona* v. *California*, 547 U.S. 150 (Decree) • 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 States' basic entitlements for delivery of Colorado River water. In 2015, Nevada and Arizona did not use their entire apportionments. Arizona used 2,604,732 acre-feet, and Nevada used 222,729 acre-feet. Unused entitlement water within California was delivered to the junior priority holder in that State. Unused entitlement water within Arizona and Nevada was made available to the junior priority holders: 177,843 acre-feet of Arizona's unused entitlement and 2,271 acre-feet of Nevada's unused entitlement water was left in Lake Mead Pursuant to Article II(B)(6) of the Decree and the Storage and Interstate Release Agreement (SIRA) dated October 27, 2004, 150,000 acre-feet of Nevada's unused apportionment was delivered to California.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
2.2.1.3 Annual Operations Normal, Surplus, Shortage, and Unused Apportionment (page 2-6; Table 2-3, page 2-9)	• Issuance of an Annual Operating Plan (AOP) • Delivery of water to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree • Delivery of water to Mexico pursuant to the 1944 Water Treaty • Determination of shortage conditions based on the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (Interim Guidelines) • Determination of surplus conditions based on the Interim Guidelines	• Revision of annual operations through the AOP, pursuant to the Long-Range Operation of Colorado River Reservoirs (LROC) within the year to reflect current hydrologic conditions • Determinations and delivery of post-2016 unused apportionment water from one State to another within the Lower Basin on an annual basis • Execution of agreements and the delivery of surplus water pursuant to the Reclamation Reform Act (RRA) and the Reclamation States Emergency Drought Relief Act • Periodic review of the 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 2015, which documented the operating tier for Lake Mead under the Interim Guidelines, was issued on December 24, 2014. Annual operations were revised through the AOP pursuant to the LROC and the Interim Guidelines to reflect current hydrologic conditions. An intentionally created surplus (ICS) surplus condition was determined for 2015. The ICS was created and delivered in 2015. Water was delivered to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree. Water was delivered to Mexico pursuant to the 1944 Water Treaty. No review of the LROC was conducted in 2015. Pursuant to Article II(B)(6) of the Decree and the SIRA dated October 27, 2004, 150,000 acre-feet of Nevada's unused apportionment was delivered to California.
2.2.1.4 Daily Hoover Dam Operations (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 to Mexico, 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 fishes 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 to Mexico, and to generate hydropower with these water releases. 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 (if needed) to meet changing water demands and other operational constraints.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
2.2.1.4 Daily Davis Dam Operations (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 to Mexico, 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 to Mexico, and generate hydropower with these water releases. 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 (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 to Mexico, 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 operational constraints immediately downstream from 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, deliver 1944 Water Treaty water to Mexico, and generate hydropower with these water releases. The timing of releases was varied based on available downstream water requirements, hydropower needs, and other operational constraints immediately downstream from Parker Dam.
2.2.1.4 Daily Senator Wash, Imperial Dam, Laguna Dam, and Warren H. Brock Reservoir Operations (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 to Mexico, and generate hydropower with water releases for Senator Wash	• Senator Wash, Imperial Dam, and Laguna Dam operations to prevent over-deliveries, 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 release operations from Senator Wash, Imperial and Laguna Dams, and Brock Reservoir were made to satisfy beneficial use requirements of entitlement holders in the United States and deliver 1944 Water Treaty water to Mexico. Water releases from Senator Wash and Imperial and Laguna Dams were made to prevent water passing to Mexico in excess of treaty requirements, to release water to entitlement holders, for sluicing operations, and to deliver a portion of the 1944 Water Treaty water deliveries to Mexico.
2.2.1.5 Electric Power Generation (page 2-11) **43 CFR Part 431 (page 2-14)**	• Operational requirements to satisfy 43 Code of Federal Regulations (CFR) Part 431 requirements	—	—	Hydroelectric power generated: • Hoover Dam: 3,666,040,669 kilowatt hours (kWh) • Davis Dam: 1,142,295,000 kWh • Parker Dam: 441,258,000 kWh Operations met the requirements to satisfy 43 CFR Part 431.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
2.2.1.6 Lower Colorado Water Supply Project – California (page 2-15; Table 2-8, page 2-16)	• Delivery of water under executed Lower Colorado Water Supply Project (LCWSP) contracts	• The Bureau of Reclamation's (Reclamation) execution and administration of individual LCWSP contracts	• Participate in the development of, and consult in the execution of, individual contracts under the LCWSP	In 2015, 7,219 acre-feet of water was pumped by the LCWSP well field. Imperial Irrigation District reduced its consumptive use of Colorado River water by this amount, and the water was made available for use by the LCWSP contractors, including MWD, pursuant to LCWSP Contract No. 06-XX-30-W0452, as amended, dated March 26, 2007.
2.2.1.7 1944 Water Treaty Deliveries (page 2-17; Table 2-9, page 2-20)	• Delivery of Mexico allotment (1.5 maf) pursuant to the 1944 Water Treaty and related minutes • 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 • Delivery of Mexico allotment pursuant to the 1944 Water Treaty and related Minutes under extraordinary drought conditions • Compliance with the salinity requirements of Minute No. 242 of the 1944 Water Treaty • Delivery of emergency water to Tijuana pursuant to Minutes of the 1944 Water Treaty and contract	• Routing of water through the Yuma Division for delivery to Northerly International Boundary (NIB) • Determination of quantity of water delivered at Southerly International Boundary (SIB), up to 140,000 acre-feet per year • Drainage pumping and delivery of drainage return flows at NIB and SIB • Operation of variable-speed pumps and diversion canal at SIB to reduce salinity • Execution of contracts to deliver a portion of Mexico's allotment to Tijuana pursuant to Minutes of the 1944 Water Treaty • Routing of water through the Yuma Division during flood control conditions	• Delivery of emergency water to Tijuana pursuant to Minutes of the 1944 Water Treaty and contract • Retention of a portion of the Metropolitan Water District of Southern California's (MWD) entitlement in Lake Mead to accommodate delivery of water pursuant to Minutes of the 1944 Water Treaty	A total of 1.50 maf was delivered to Mexico pursuant to the 1944 Water Treaty and related Minutes as follows: Delivery at the Limitrophe = 2,957 acre-feet Delivery at SIB = 148,061 acre-feet Diversion channel discharge = 334 acre-feet Delivery at NIB = 1,363,477 acre-feet A total of 14,829 acre-feet of water passed to Mexico in excess of treaty requirements. Reclamation complied with the salinity requirements of International Boundary and Water Commission (IBWC) Minute No. 242. A total of 151,991 acre-feet of agricultural drainage return flow was bypassed pursuant to IBWC Minute No. 242. Drainage pumping and delivery of drainage return flows were made at NIB and SIB.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
2.2.1.8 Decree Accounting (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 Decree	• None	• Report data for Decree accounting records	The *Colorado River Accounting and Water Use Report, Arizona, California, Nevada for Calendar Year 2015*, was published on May 13, 2016. A summary of diversions, return flows, and consumptive use is provided below. The final report is available at http://www.usbr.gov/lc/region/g4000/wtracct.html. **Arizona**: Diversions = 3,428,596 acre-feet Measured returns = 647,845 acre-feet Unmeasured returns = 176,019 acre-feet Consumptive use = 2,604,732 acre-feet **California**: Diversions = 5,158,521 acre-feet Measured returns = 601,950 acre-feet Unmeasured returns = 79,118 acre-feet Consumptive use = 4,620,756 acre-feet* *includes 143,303 acre-feet delivered from William H. Brock Reservoir **Nevada**: Diversions = 445,245 acre-feet Measured returns = 220,970 acre-feet Unmeasured returns = 1,546 acre-feet Consumptive use = 222,729 acre-feet
2.2.2 Future Flow-Related Covered Actions				
2.2.2.1 Specific Surplus and Shortage Guidelines (page 2-22; Table 2-11, page 2-24)	• Delivery of surplus water pursuant to Article II(B)(2) of the Decree • Delivery of water pursuant to the Article II(B)(3) of the Decree (shortage) • Determination of shortage conditions based on criteria developed in the Interim Guidelines • Determination of surplus conditions based on criteria listed in the Interim Guidelines	• Adoption of specific post-2026 surplus guidelines • Adoption of specific post-2026 shortage guidelines	• Consult with States on development of specific post-2026 surplus guidelines or specific post-2026 shortage guidelines • Delivery of water to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree	No surplus water was delivered pursuant to Article II(B)(2) of the Decree. The MWD took delivery of 70,756 acre-feet of ICS pursuant to the criteria listed in the Interim Guidelines. The Southern Nevada Water Authority took delivery of 75,000 acre-feet of ICS pursuant to the criteria listed in the Interim Guidelines. There were no reductions in deliveries pursuant to Article II(B)(3) of the Decree.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
2.2.2.2 Flood Release Contracts (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 (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 (Table 2-14, after page 2-26)	—	—	—	Consumptive uses by the Cocopah Indian Tribe and Beattie Farms Southwest were reduced 97 acre-feet and 68 acre-feet, respectively, for repayment of overruns in accordance with the Inadvertent Overrun and Payback Policy (IOPP). The Central Arizona Water Conservation District (CAWCD) did not divert 7,180 acre-feet of Colorado River water conserved by the Yuma Mesa Irrigation and Drainage District (YMIDD)/ CAWCD Pilot Fallowing Program. Additionally, CAWCD intentionally did not divert 177,843 acre-feet of unused Arizona apportionment. In total, CAWCD left 185,023 acre-feet in Lake Mead to benefit system storage as part of its commitment under the Memorandum of Understanding for Pilot Drought Response Actions dated December 10, 2014 (MOU). Under the Pilot System Conservation Program, the Tohono O'odham Nation did not take delivery of 10,080 acre-feet of its Central Arizona Project (CAP) water entitlement to create System Conservation Water. This water remained in Lake Mead to benefit system storage. MWD took delivery of 70,756 acre-feet of ICS and 150,000 acre-feet of Nevada unused apportionment. Collectively, these actions resulted in a net increase in flow below Hoover Dam of 25,488 acre-feet. All values are provided on a consumptive use basis.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
Flow Changes Below Davis Dam to Parker Dam (Table 2-15, after page 2-26)	—	—	—	
Flow Changes Below Parker Dam to Imperial Dam (Table 2-16, after page 2-26)	—	—	—	The Imperial Irrigation District (IID) conserved the following amounts, which were diverted by the MWD at Lake Havasu: 101,105 acre-feet under the amended 1988 IID/MWD Conservation Agreement; 100,000 acre-feet under the IID/San Diego County Water Authority (SDCWA) transfer agreement; 67,700 acre-feet from the All-American Canal Lining Project; and 38,313 acre-feet of additional conservation delivered to the MWD's system pursuant to the California Agreement for the Creation and Delivery of Extraordinary Conservation Intentionally Created Surplus. Coachella Valley Water District (CVWD) conserved 27,647 acre-feet from the Coachella Canal Lining Project, which was diverted by the MWD at Lake Havasu. The CVWD conserved 27,647 acre-feet from the Coachella Canal Lining Project, which was diverted by the MWD at Lake Havasu. Consumptive uses by the Cocopah Indian Tribe and Beattie Farms Southwest were reduced by 97 acre-feet, and 68 acre-feet, respectively, for repayment of overruns pursuant to the IOPP. The CAWCD did not divert 7,180 acre-feet of Colorado River water conserved by the YMIDD/CAWCD Pilot Fallowing Program and left this volume in Lake Mead to benefit system storage as part of its commitment under the MOU. Collectively, these actions resulted in a net reduction in flow below Parker Dam of 342,110 acre-feet. (All values in terms of consumptive use.)

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
Water Conservation Field Services Program (page 2-27; Table 2-17, page 2-28)	• Develop water conservation program pursuant to RRA Section 210(a)	• Implementation of the Field Services Program	• Consult in the development of conservation plans pursuant to RRA Section 210(a)	All water conservation plans for the Lower Colorado Region are complete.
Unlawful Use (page 2-28; Table 2-18, page 2-30)	• BCPA requires all Colorado River water users to have a contract with the Secretary of the Interior	• Implementation of appropriate policy or rule to address unlawful use of Colorado River water • Execution of water delivery contracts with entities or individuals identified as unlawful users	• Consult with States in the development of policies or rules to address unlawful use of Colorado River water • Consult with the States on the execution of water delivery contracts with entities or individuals identified as unlawful users	A proposed guidance document is currently under development.
Unallocated Colorado River Water in Arizona, Exclusive of Central Arizona Project (CAP) (page 2-30; Table 2-19, page 2-31) **Note: Changed title from "Unallocated or Noncontract Water in Arizona, Exclusive of CAP"**	• 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 the CAWCD as allowed under the CAWCD's contract with the United States. This water is unallocated because it has not yet been placed under permanent contract. Arizona Department of Water Resources will recommend to the Secretary of the Interior the entities with which the Secretary should contract for the unallocated Arizona water upon completion of the well inventory. The well inventory is being performed for Reclamation by the U.S. Geological Survey to identify wells that draw water directly from the lower Colorado River or pump water that would be replaced by water drawn from the lower Colorado River.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
Central Arizona Project Contract Actions (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 water 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: in the amount of 1,518,022 acre-feet. On January 2, 2015, the San Carlos Apache Tribe and the Pascua Yaqui Tribe entered into a lease for the delivery of up to 2,000 acre-feet of San Carlos Apache Tribe CAP water to the Pascua Yaqui Tribe during calendar year 2015. On September 29, 2015, H2O Water Company, Inc. (H2O), assigned, transferred, and conveyed to the town of Queen Creek all of its rights, title, and interest in 147 acre-feet per year of CAP municipal and industrial water to which H2O was entitled under the terms of H2O Subcontract No. 07-XX-30-W0467, as amended. The assignment and transfer will: (1) increase the town's entitlement by 147 acre-feet from 348 acre-feet per year to 495 acre-feet per year and (2) terminate H2O Subcontract No. 07-XX-30-W0467, as amended. On July 20, 2015, the Flowing Wells Irrigation District (FWID) assigned 19 acre-feet per year of its CAP entitlement to the city of Tucson. The FWID's annual entitlement was reduced by 19 acre-feet from 2,873 acre-feet to 2,854 acre-feet, and the city's annual entitlement was increased by 19 acre-feet from 144,172 acre-feet to 144,191 acre-feet. On May 12, 2015, the New Magma Irrigation and Drainage District (NMIDD) and the Tohono O'odham Nation entered into an agreement to provide for the delivery of the Tohono O'odham Nation's CAP water for water storage at a groundwater savings facility. The Tohono O'odham Nation desires to deliver up to 25,000 acre-feet per year of their CAP water to NMIDD in consideration for all long-term storage credits created in lieu of pumping groundwater.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
Changes in Delivery Related to Water Transfers (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	The following conservation and transfers were made pursuant to the Colorado River Water Delivery Agreement. They represent changes in delivery amounts and points of diversion required to implement the Quantification Settlement Agreement. The IID conserved 100,000 acre-feet of water for transfer to the SDCWA via exchange with the MWD. The IID conserved 107,820 acre-feet under the amended 1988 IID/MWD Conservation Agreement, of which 101,105 acre-feet were diverted by the MWD and 6,715 acre-feet were diverted by the CVWD. The IID conserved 67,700 acre-feet from the All-American Canal Lining Project; of this amount, 56,200 acre-feet were transferred to the SDCWA via exchange with the MWD, and 11,500 acre-feet were made available to the MWD. The IID conserved, and the CVWD diverted, 36,000 acre-feet to meet the Intra-priority 3 Transfer. The CVWD conserved 30,850 acre-feet from the Coachella Canal Lining Project; of this amount, 23,147 acre-feet were transferred to the SDCWA via exchange with the MWD, 4,500 acre-feet were made available to the MWD, and 3,203 acre-feet were used for environmental mitigation purposes.
Changes in Delivery Related to Off-Stream Storage (page 2-32; Table 2-22, page 2-33)	• Delivery of water under executed off-stream storage agreements pursuant to 43 CFR Part 414	• Execution of a Storage and Interstate Release Agreements pursuant to 43 CFR Part 414	• Delivery of water under executed off-stream storage agreements pursuant to 43 CFR Part 414	The MWD diverted 150,000 acre-feet of Nevada's unused apportionment pursuant to a Storage and Interstate Release Agreement executed on October 27, 2004,under 43 CFR Part 414.
Changes in Amount of Delivery (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	On December 22, 2015, a Partial Assignment from La Paz County to the Ehrenberg Improvement Association (EIA) was executed, which assigned 150 acre-feet of La Paz County's Arizona fourth-priority Colorado River water entitlement to EIA. La Paz County's annual entitlement was reduced from 500 acre-feet to 350 acre-feet, and EIA's annual entitlement was increased by 150 acre-feet from 500 acre-feet to 650 acre-feet.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
Changes in Type of Water Use (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 changes.
Inclusions and Exclusions to Service Areas (page 2-34; Table 2-25, page 2-35)	• Delivery of water pursuant to executed contract amendments or new contracts that include or exclude lands in service areas	• Execution of contract amendments or new contracts that include or exclude lands in service areas	• Review of contracts and consultation on new or amended contracts	
Contract Terminations (page 2-35; Table 2-26, page 2-36)	• None	• Termination of water contract due to abandonment • 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 water contracts were terminated.
2.3 WESTERN AREA POWER ADMINISTRATION	—	—	—	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 (page 2-77)	—	• Conduct conservation measures for efficient water use	—	Existing practices were continued.
2.5.2.6 Flow-Related Actions (page 2-82)	—	—	• Water entitlement holder	See section 2.2.1.8 accomplishments in this table.
2.5.3.2 Future Water Conservation Practices (page 2-77)	—	• Institute new conservation measures for efficient water use	—	No implementation in 2015.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2015 Accomplishments[2, 3]
2.5.3.5 Headgate Rock Dam Operation and Maintenance (page 2-88)	—	• Water releases and generate hydropower with these water releases	—	Existing practices were continued.
2.6 U.S. 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.

[1] See the *Lower Colorado River Multi-Species Conservation Program Final Habitat Conservation Plan*, *Volume II*, "Section 2.1.1, Relationship of Non-Federal Covered Activities to Federal Nondiscretionary Actions." This can be accessed at http://www.lcrmscp.gov/publications/hcp_volii_dec04.pdf.

[2] Reporting for the non-Federal flow-related covered activities (attachment 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 2015.

B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2015

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 • Construct, maintain, and improve drainage works for water projects • Maintain floodway to accommodate floodflows for 100-year event or 40,000 cubic feet per second (cfs), whichever is greater • Measure diversions and return flows to and from the main stem 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)	—	—	—							
Wash Fans (page 2-40; Table 2-30, page 2-42)	—	• Wash fan removal	—							No implementation in FY15.
Protected Bankline Maintenance and Care of Unprotected Banklines (page 2-43)	—	• Protected bankline location and maintenance	—							No implementation in FY15.

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	
Levee Maintenance (page 2-44)	—	• Levee location and maintenance	—							No implementation in FY15.
Desilting Basins (page 2-46; Table 2-32, page 2-46)	—	• Sediment dredging upstream of principal canal diversions and disposal sites • Maintenance of settling basins to remove sediment and maintain flows; four principal basins	—							No implementation in FY15.
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 FY15.
Stockpiles (page 2-49; Table 2-37, page 2-49)	—	• Location of three future stockpiles	—							No implementation in FY15.
Riprap Placement and Haul Roads (page 2-50)	—	• Haul roads and riprap storage location and maintenance	—	7 6 6 6 4 4 4 3	Limitrophe Yuma Laguna Gila Area Cibola Palo Verde Parker Mohave Valley	0 to 24 24 to 50 24 to 50 24 to 50 87 to 193 87 to 193 87 to 193 193 to 276	None None None None None None Arrowweed Salt cedar Arundo Mesquite None	0 0 0 0 0 0 0 0	1, 3, and 6 1, 3, and 6 1, 3, and 6 1, 3, and 6 1, 3, and 6 1, 3, and 6 1, 3, and 6 1, 3, and 6	Limitrophe: 59.2 miles (mi) Yuma: 158.1 mi Laguna: 3 mi Gila River: 19.4 mi Cibola: 67.6 mi Palo Verde: 0.0 mi Parker: 67.8 mi Mohave Valley: 38.1 mi

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	
2.2.3.2 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	—	7	Main Outlet Drain Extension MODE Wasteway	30	None	0	1, 3, and 6	MODE – Replace headwalls at the Fortuna Siphon Project and replaced 1,500 feet ofconcrete downstream from Drain Pump Outlet Channel 1.
		• Maintenance of open channel drains and outfall channels		7	Yuma Mesa conduit (YMC)	27	None	0	1, 3, and 6	YMC Meterin Flume Project completed in FY15 and re-drilling of Yuma Mesa well Nos. 8 and SG-10. Redrilled wells 242-18, 20, and 22.
		• Maintenance and replacement of gaging stations, survey line markers, and boat ramps		7	Drain Pump Outlet Channel 2	32	None	0	1, 3, and 6	
Maintenance Activities at the Southerly International Boundary (page 2-52)	—									No implementation in FY15.
2.2.3.3 Backwater Maintenance (page 2-53; Table 2-37, page 2-54)	—	• Backwater maintenance	—							No implementation FY15.
Mohave Division (page 2-55; Table 2-38, page 2-56)	—	• Backwater maintenance	—							No implementation in FY15.
Parker Division (page 2-57; Table 2-39, page 2-57)	—	• Backwater maintenance	—							No implementation in FY15.
Palo Verde Division (page 2-58; Table 2-40, page 2-58)	—	• Backwater maintenance	—							No implementation in FY15.
Cibola Division (page 2-58; Table 2-41, page 2-59)	—	• Backwater maintenance	—							No implementation in FY15.

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	
Imperial Division (page 2-59; Table 2-42, page 2-59)	—	• Backwater maintenance	—							No implementation in FY15.
Laguna Division (page 2-60; Table 2-43, page 2-60)	—	• Backwater maintenance	—							No implementation in FY15.
Yuma Division (page 2-60; Table 2-44, page 2-61)	—	• Backwater maintenance	—							No implementation in FY15.
Limitrophe Division Mitigation Obligations (page 2-61; Table 2-45, page 2-62)	—	—	—							No implementation in FY15.
2.2.3.4 Limitrophe Division Maintenance (page 2-62)	—	—	—							No implementation in FY15.
2.2.4 Future Non-Flow-Related Actions (page 2-63)	—	—	—							
2.2.4.1 Topock Marsh (page 2-63)	—	—	—							No implementation in FY15.
2.2.4.2 Laguna Reservoir (page 2-63)	—	—	—	6	Laguna Dam	49.0	Cattails	7	1, 3, and 6	Laguna Reservoir Restoration Project. Ongoing dredging activities above Laguna Dam.
2.2.4.3 Bankline Maintenance – Unprotected Banklines (page 2-65; Table 2-46, page 2-66)	—	—	—							No implementation in FY15.
2.2.4.4 Proposed Jetties (page 2-67; Table 2-48, page 2-67)	—	—	—							No implementation in FY15.
2.3 WESTERN AREA POWER ADMINISTRATION										No implementation in FY15.

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	
2.4 NATIONAL PARK SERVICE										
2.4.2 Riparian Habitat Restoration (page 2-70)		• Riparian habitat restoration on Lake Mead and Lake Mohave			Lake Mead Lake Mohave		Sarah mustard Tree tobacco Sahara mustard Fountain grass Athel Buffelgrass Oleander Mexican Palo verde Date palm Shattercane California fan palm, saltcedar Cattail Bermuda grass Silk dalea	20 acres 0.01 acre 11 acres 0.16 acre 0.14 acre Individual		Habitat restoration through removal of exotic plants (gross infested acres).

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	
2.4.3 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			Lake Mohave			0.06 acre		Creation of fish habitat at Shoshone, Solicitor, Prospect, Bass, and Princess Coves in partnership with the Nevada Division of Wildlife.
2.4.4 Boating Access (page 2-72)		• Maintenance and enhancement of boating access on Lake Mead and Lake Mohave			Lake Mead Echo Bay Callville Bay Hemenway Harbor Temple Bar South Cover			 413 square yards (yd^2) 591 yd^2 1,725 yd^2 340 yd^2 650 yd^2		Extension of existing launch ramps.
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 3 4 6 7	Fort Mohave Chemehuevi Colorado River Indian Tribe Fort Yuma Cocopah	— — — — —	None None None None None	0 0 0 0 0	1 and 3 1 and 3 1 and 3 1 and 3 1 and 3	Continued existing practices. Continued existing practices. Continued existing practices. Continued existing practices. Continued existing practices.

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	
2.5.2.2 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 fuel management projects								No implementation in FY15.
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 FY15.
2.5.3.2 Future Water Conservation Practices (page 2-85)		• Installation, operation, and maintenance of new equipment								No implementation in FY15.
2.5.3.3 Future Farmland Development (page 2-85)		• Develop additional agricultural acreage, including construction of irrigation systems								No Implementation in FY15.
2.5.3.6 Future Wildland Fire Management (page 2-88)		• Implementation of new fuel management projects								No implementation in FY15.
2.6 U.S. FISH AND WILDLIFE SERVICE										No non-flow-related actions are covered under the LCR MSCP.
2.7 BUREAU OF LAND MANAGEMENT										No non-flow-related actions are covered under the LCR MSCP.

B-3: LCR MSCP Non-Federal Covered Activities and Incidental Take Summary, Fiscal Year 2015

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 million acre-feet (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 • Generation and transmission of hydroelectric power • Power contracting							Non-Federal flow-related covered activities are included in the Federal flow-related covered actions and accomplishments (see attachment B, table B-1).
2.2.2 Future Flow-Related Covered Activities[1] (page 2-6)	Future Arizona water contract holder activities may include: • Diversions, discharges, and return flows through existing facilities • Changes to points of diversion • New points of diversion • Interstate water banking • Water marketing • Water transfers • 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) Future Arizona hydroelectric power contract holder activities may include: • 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 attachment B, table B-1).

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	
2.2.3 Ongoing Non-Flow-Related Covered Activities (page 2-7)	Operation, maintenance, and replacement of: • The facilities and equipment through which water is diverted and conveyed • The facilities through which return flows are returned to the river • Drainage wells in the Yuma area • The facilities and equipment through which electric power is generated and transmitted • 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	195 miles of canal maintenance and 60 miles of open 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 FY15.
Fish Surveys (page 2-8)	• Surveys for non-native fish species							**Kingman Region:** Lake Mead: 2 nights gillnets, 4 nights electrofishing Lake Mohave: 2 nights gillnets, 2 nights electrofishing Topock Marsh: 3 days/2 nights gillnets **Yuma Region:** 11 nights electrofishing, 8 days electrofishing surveys, and no trammel netting or stocking in the LCR MSCP action area.

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	
Fish Stocking (page 2-9)	• Stocking of trout							No fish stocking activity.
Maintenance of Aids to Navigation and Boating Access (page 2-9)	• Place and maintain aids to navigation							Maintained 132 buoys, 1 boat dock, and 1 boat ramp.
Law Enforcement Patrol Activities (page 2-9)	• Administer law enforcement and boating safety program using watercraft patrols							An estimated 2,825 hours of watercraft law enforcement. Includes all Arizona Game and Fish Department Regions III and IV watercraft law enforcement patrols. Changes in State of Arizona financial accounting system no longer allow for calculations of patrol hours as has been done in the past.
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 • Generation and transmission of hydroelectric power • Power contracting							Non-Federal flow-related covered activities are included in the Federal flow-related covered actions and accomplishments (see attachment B, table B-1).

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	
2.3.2 Future Flow-Related Covered Activities[1] (page 2-13)	Future California water contract holder activities may include: • Diversions, discharges, and return flows through existing facilities • Changes to points of diversion • New points of diversion • Interstate water banking • Water marketing • Water transfers • 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) Future California hydroelectric power contract holder activities may include: • 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 attachment B, table B-1).

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	
2.3.3 Ongoing Non-Flow-Related Activities	Operation, maintenance, and replacement of: • The facilities and equipment through which water is diverted and conveyed • The facilities through which return flows are returned to the river • The facilities and equipment through which electric power is generated and transmitted • 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 6	Palo Verde Irrigation District Bard Water District	—	—	—	1 and 3 1 and 3	8.24 acres 6.04 acres Only emergency work during marsh bird breeding season 3/15 – 7/31.
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 • Generation and transmission of hydroelectric power • Power contracting							Non-Federal flow-related covered activities are included in the Federal flow-related covered actions and accomplishments (see attachment B, table B-1).

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	
2.4.2 Future Flow-Related Covered Activities (page 2-17)	Future Nevada water contract holder activities may include: • Diversions, discharges, and return flows through existing facilities • Changes to points of diversion • New points of diversion • Interstate water banking • Water marketing • Water transfers • 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) Future Nevada hydroelectric power contract holder activities may include: • 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 attachment B, table B-1).

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	
2.4.3 Ongoing Non-Flow-Related Activities (page 2-18)	Operation, maintenance, and replacement of: • The facilities and equipment through which water is diverted and conveyed • The facilities through which return flows are returned to the river • The facilities and equipment through which electric power is generated and transmitted • 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 FY15.
2.4.3.1 Nevada Department of Wildlife Programs and Activities (page 2-18)	Implementation of select federally funded:							
	• Aquatic, wetland, and riparian habitat maintenance and restoration activities	—	—	—	—	—	—	A total of 84 habitat modules were placed on approximately 0.1 acre at Princess, Prospect, Shoshone, and Solicitor Coves on Lake Mohave. Cooperative project with the National Park Service and the Arizona Game and Fish Department.
	• Aquatic, wetland, and riparian revegetation enhancement activities	—	—	—	—	—	—	No implementation in FY14.
	• Place and maintain aids to navigation and boating access	3	Clark County, downstream from 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, main stem of the lower Colorado River below Davis Dam, and limited patrol activities in Laughlin Lagoon.

[1] See the *Lower Colorado River Multi-Species Conservation Program Final Habitat Conservation Plan*, *Volume II*, "Section 2.1.1, Relationship of Non-Federal Covered Activities to Federal Nondiscretionary Actions." This can be accessed at http://www.lcrmscp.gov/publications/hcp_volii_dec04.pdf

Attachment C – Recommendations from Resource Agencies

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services 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
22410-2004-F-0161

July 28, 2015

Memorandum

To: Program Manager, Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada (LC-8000)

From: Field Supervisor

Subject: Acceptance of Lower Colorado River Multi-Species Conservation Program Fiscal Year 2014 Accomplishment Report and Consistency Review of Fiscal Year 2016 Work Plan and Budget

This responds to your memorandum of July 9, 2015, requesting review by the Fish and Wildlife Service (FWS) of the combined document containing the Fiscal Year 2014 Accomplishment Report and the Fiscal Year 2016 Work Plan and Budget for the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). This combined document encompasses the reporting requirements of the LCR MSCP section 10(a)(1)(A) permit dated April 4, 2005, (TE-086834-0) and the biological and conference opinion dated March 4, 2005, and requirements of the Funding and Management Agreement sections 7.4.2. and 7.4.3.

The Fiscal Year 2014 Accomplishment Report details the activities undertaken by the Bureau of Reclamation (Reclamation) to implement the LCR MSCP in accordance with the section 10 permit and biological opinion. The report also lists the Federal actions and non-Federal activities included in the LCR MSCP as covered actions that were implemented during Fiscal Year 2014 covered by the LCR MSCP (October 1, 2013-September 31, 2014), including the measurement of incidental take that occurred during this period.

We have reviewed the information provided and conclude that the document meets the requirements for the annual report for the LCR MSCP under the section 10(a)(1)(A) permit and the incidental take section of the biological and conference opinion. All covered actions and activities and implementation of the Conservation Plan are suitably described and documented.

The Fiscal Year 2016 Work Plan and Budget contains the work tasks and estimated costs for LCR MSCP implementation during Fiscal Year 2016 beginning on October 1, 2015. We have reviewed the Work Plan and determined that its implementation is directly applicable to meet the conservation requirements and is consistent with the LCR MSCP section 10(a)(1)(A) permit and biological opinion.

We appreciate the positive working relationship between the FWS and Reclamation on the implementation of the LCR MSCP. The opportunity to review and contribute to the development of the Accomplishment Report and Work Plan is greatly appreciated. Thank you for your significant efforts to conserve listed and special-status species through the LCR MSCP.

If there are any questions or concerns about this response, please contact Lesley Fitzpatrick at (x236), Jessica Gwinn (x249) or me (x244) at (602) 242-0210.

Steven L. Spangle

cc (electronic):
Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES: Marty Tuegel)

W:\Jessica Gwinn\Final Docs\LCR MSCP 14-16 Concurrence.docx:cgg

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services 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
22410-2004-F-0161

June 30, 2015

Memorandum

To: Program Manager, Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada (LC-8461, ENV-7.00

From: Field Supervisor

Subject: Documentation of Northern Mexican Gartersnake (*Thamnophis eques megalops*) within the Planning Area of the Lower Colorado River Multi-Species Conservation Program in Mohave County, Arizona

At the May 6-7, 2015, Lower Colorado River Multi-Species Conservation Program (LCR MSCP) Technical Work Group Meeting, we heard reports of what could be a northern Mexican gartersnake (*Thamnophis eques megalops*) (recently listed as Threatened under the Endangered Species Act of 1973, as amended) had been photographed near Beal Lake on the Havasu National Wildlife Refuge in April 2015. The preliminary expert opinion was that the specimen (which was not captured or handled) was a northern Mexican gartersnake. The Fish and Wildlife Service (FWS) representative at the meeting agreed that the FWS would follow up on this report and provide an update to the LCR MSCP.

A second set of photographs (forwarded to you via email on June 1, 2015) were used by Taylor Cotten and Tom Jones of Arizona Game and Fish Department and Jeff Servoss of FWS to confirm that the specimen from Beal Lake is indeed a northern Mexican gartersnake. We have notified the Havasu National Wildlife Refuge staff of this confirmation of the species.

At the time the LCR MSCP program was established in 2005, the northern Mexican gartersnake was considered extirpated from the area surrounding the mainstem of the lower Colorado River and had not been considered as a potential covered species[a]. The species was re-documented in 2012 below Alamo Dam on the Bill Williams River outside the Planning Area of the LCR MSCP.

Under the Implementation Agreement, there are two sections that address the listing of non-covered species within the LCR MSCP project area. Section 10.4 (Future Listings of Other Species) has the FWS informing the Program Manager of our considerations for listing a species which may, from time to time, be present in the Planning Area. The documentation of the

[a] The last record from the mainstem lower Colorado River was in 1904, with another one in Clark County, Nevada near Ft. Mohave in 1911. In the Final Rule listing the species as threatened, the Colorado River population was considered likely extirpated.

gartersnake in 2012 was outside of the Planning Area, and there was discussion between the Program Manager and FWS on this news, and subsequently on the proposed critical habitat designation.

Section 10.3: Additions to the Covered Species List, describes the process for a new species to be added to the section 10(a)(1)(B) permit. The LCR MSCP is not required to add a new species, and the evaluation of the potential effects of the covered actions and conservation measures should assist in making that decision. The FWS will work with the LCR MSCP in accordance with the intent of sections 10.3 and 10.4 in any and all efforts taken to consider the northern Mexican gartersnake as a now extant species on the lower Colorado River.

We are in receipt of your separate request for formal section 7 consultation on the gartersnake for work to be done at the Beal Lake Conservation Area. We will be responding to that request in a separate memorandum.

Thank you for your continued dedication to successfully implementing the LCR MSCP. If there are any questions concerning this response, please contact Lesley Fitzpatrick at (602) 242-0210 (x236) or me.

Steven L. Spangle

Cc (electronic):
Assistant Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
(Attn: Marty Tuegel)
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ (Attn.: Jeff Servoss)

W:\Lesley Fitzpatrick\LCR MSCP FY 11 &12\NMGS Havasu NWR to LCR MSCP.docx:cgg

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services 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
22410-2004-F-0161

July 29, 2015

Memorandum

To: Program Manager, Lower Colorado River Multi-Species Conservation Plan, Bureau of Reclamation, Boulder City, Nevada (LC-8315)

From: Field Supervisor

Subject: Completion of Conservation Measure FLSU2-Provide Funding to Support Existing Flannelmouth Sucker Conservation Programs

This memorandum responds to your July 23, 2014, request for Fish and Wildlife Service (FWS) concurrence with the completion of the requirement under FLSU2 to provide $80,000 per year for five years ($400,000 total) to support flannelmouth sucker (*Catostomus latipinnis)* research efforts in Reach 3, below Davis Dam, in the Lower Colorado River. This research focused on determining habitat use, habitat preference, and recruitment to support decisions on habitat management activities for river channel and backwater habitats to offset the effects of proposed actions covered under the Lower Colorado River Multi-Species Conservation Program (LCR MSCP).

The materials provided with your request outline the process and completion of this requirement, and includes; a Memorandum, Work Task C15 Report, and the research report titled "Investigations of Flannelmouth Sucker Habitat Use, Preference, and Recruitment Downstream of Davis Dam in the Lower Colorado River, 2006-2010." The Bureau of Reclamation (Reclamation), through the LCR MSCP, has provided all necessary time and funding to flannelmouth sucker research. Additionally, Reclamation has provided two additional years of funding for a total of seven years and a cumulative budget expenditure of $495,740.45; and plans to continue flannelmouth sucker research through Work Task C53 from fiscal year 2015 to 2018.

The FWS concurs with Reclamation that the requirements under FLSU2 have been met and exceeded. Reclamation should document the completion of this conservation action in the appropriate annual report for LCR MSCP covered activities.

We congratulate Reclamation and the other LCR MSCP partners on this accomplishment and their commitment to research of the flannelmouth sucker. The LCR MSCP has accomplished significant conservation benefits in the ten years since it was signed in 2005. We look forward to our continuing involvement with this important program.

If there are other questions, or we may assist in any way, please contact Lesley Fitzpatrick (x236), Jessica Gwinn (x249), or me 242-0210 (x244).

Steven L. Spangle

cc: Chief, Nongame Branch, Arizona Game and Fish Department, Phoenix, AZ
Marty Tuegel, Environmental Review Supervisor, Ecological Services, Fish and Wildlife Service, Albuquerque, NM

W:\Jessica Gwinn\Final Docs\FLSU2 completion.docx:cgg

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services 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
02EAAZ00-2004-F-0161

October 13, 2015

Memorandum

To: Program Manager, Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada (LC-8461, ENV-7.00)

From: Field Supervisor

Subject: Lower Colorado River Multi-Species Conservation Program Biological and Conference Opinion: Confirmation of the Conference Opinion for the Threatened Yellow-Billed Cuckoo Western Distinct Population Segment (*Coccyzus americanus*)

The U.S. Fish and Wildlife Service (USFWS) is responding to your request of September 16, 2015, asking for our confirmation of the portion of the March 4, 2005, biological and conference opinion (BCO) prepared for the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) that constituted the conference opinion for the yellow-billed cuckoo (*Coccuzus americanus*). At the time the BCO was prepared, the yellow-billed cuckoo was a candidate species under the Endangered Species Act of 1973, as amended. The Western Distinct Population Segment of the yellow-billed cuckoo was listed as a Threatened species on October 3, 2014 (79 FR 5991) with an effective date of November 3, 2014. The listed range of the Western DPS includes the project area of the LCR MSCP.

The USFWS has reviewed the proposed action covered in the March 4, 2005, BCO, and finds that there have been no significant changes in the action as planned. Further, the additional information gathered on the Western DPS of the yellow-billed cuckoo through development of conservation areas, species monitoring, and other supporting activities under the LCR MSCP has contributed to the effectiveness of the planned conservation actions for this species. We therefore confirm that the conference opinion is now the biological opinion for the Western DPS of the yellow-billed cuckoo and no further section 7 consultation is necessary for the listing of this species. As of this date, the incidental take statement contained in the BCO is now in effect.

Critical habitat for the Western DPS of the yellow-billed cuckoo is currently proposed; should critical habitat be designated within the project area of the LCR MSCP, additional confirmation to address that designation would be necessary.

We remind you that with this listing and confirmation of the BCO, the standard reinitiation criteria of formal consultation are in place. Reinitiation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency

action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The USFWS appreciates the continuing efforts of the Bureau of Reclamation to manage and implement the conservation plan of the LCR MSCP effectively for all the covered species. If you have any questions or concerns regarding this consultation or the consultation process in general, please contact Lesley Fitzpatrick at (602) 242-0210 (x236) or me at (x244).

Steven L. Spangle

cc: Southwest Regional Office, USFWS, Albuquerque, New Mexico (ES: Attn. Marty Tuegel)

W:\Lesley Fitzpatrick\LCR MSCP FY 11 &12\Confirmation BCO for Western DPS of YBC.docx:cgg

United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services 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
22410-2004-F-0161

May 16, 2016

OFFICIAL FILE COPY RECEIVED		
REPLY DATE		
DATE	INITIALS	CODE
5/20/16		LC-8000

Memorandum

To: Program Manager, Lower Colorado River Multi-Species Conservation Plan, Bureau of Reclamation, Boulder City, Nevada (LC-8315)

From: Field Supervisor

Subject: Completion of Conservation Measure RLFR1-Provide Funding to Support Existing Relict Leopard Frog Conservation Programs.

CLASSIFICATION
CONTROL NO.
FOLDER I.D.
KEYWORD

This memorandum responds to your October 26, 2014, request for Fish and Wildlife Service (FWS) concurrence with the completion of the requirement under RLFR1 to provide $10,000 per year for 10 years ($100,000 total) to support relict leopard frog (*Lithobates onca*) research and conservation. Funding was provided to the National Park Service, with final funding being transferred on March 30, 2015, and was pooled with funding from other agencies. The grand total for this work was $114,832.84, with additional funding contributing to the Bureau of Reclamation's oversight (Draft Implementation Report, Fiscal Year 2017 Work Plan and Budget, Fiscal Year 2015 Accomplishment Report, and nine additional reports to be provided). The funds supported work of the Relict Leopard Frog Conservation Team, who conducted inventories, monitored, captivitely bred, and introduced frogs into refugia. This funding was provided to offset the effects of actions covered under the Lower Colorado River Multi-Species Conservation Program (LCR MSCP).

The FWS concurs with Reclamation that the requirements under RLFR1 have been met. Reclamation should document the completion of this conservation action in the appropriate annual report for LCR MSCP covered activities.

We congratulate Reclamation and the other LCR MSCP partners on this accomplishment and their commitment to conservation and research regarding relict leopard frog. The LCR MSCP has accomplished significant conservation benefits in the eleven years since it was signed in 2005. We look forward to our continuing involvement with this important program.

If there are other questions, or we may assist in any way, please contact Jessica Gwinn (602) 242-0210, (x249) or me (x244).

Steven L. Spangle

cc: Chief, Nongame Branch, Arizona Game and Fish Department, Phoenix, AZ
Marty Tuegel, Environmental Review Supervisor, Ecological Services, Fish and Wildlife Services, Albuquerque, NM

W:\Jessica Gwinn\LCRMSCP_RLFR1_Closure.docx: jkey

Attachment D – Financial Statement

D-1: Required Contributions

	FY06	FY07	FY08	FY09	FY10	Subtotal
Reclamation						
Cash	6,072,381.00	6,291,054.00	6,655,509.00	6,784,470.00	7,255,458.00	33,058,872.00
Total	**6,072,381.00**	**6,291,054.00**	**6,655,509.00**	**6,784,470.00**	**7,255,458.00**	**33,058,872.00**
Arizona						
Cash	471,863.10	488,855.40	517,175.90	866,420.50	926,568.70	3,270,883.60
Habitat Maintenance Fund	135,375.00	140,250.00	148,375.00	151,250.00	161,750.00	737,000.00
Total	**607,238.10**	**629,105.40**	**665,550.90**	**1,017,670.50**	**1,088,318.70**	**4,007,883.60**
Nevada						
Cash	1,838,148.82	1,904,342.55	2,014,665.43	1,884,091.00	1,578,887.40	9,220,135.20
Habitat Maintenance Fund	135,375.00	140,250.00	148,375.00	151,250.00	161,750.00	737,000.00
In-Kind Credit	0	0	0	0	436,000.00	436,000.00
Total	**1,973,523.82**	**2,044,592.55**	**2,163,040.43**	**2,035,341.00**	**2,176,637.40**	**10,393,135.20**
California						
Cash	**3,220,869.08**	**3,336,856.05**	**3,530,167.67**	**3,266,131.22**	**3,492,870.91**	**16,846,894.93**
Metropolitan Water District of Southern California	1,887,361.54	1,955,327.46	2,068,604.00	1,939,074.72	2,073,688.19	9,924,055.91
Imperial Irrigation District	500,971.43	519,011.96	549,079.48	559,718.78	598,575.29	2,727,356.94
Coachella Valley Water District	273,257.15	283,097.43	299,497.92	305,301.15	326,495.61	1,487,649.26
Los Angeles Department of Water and Power	154,845.72	160,421.88	169,715.48	173,003.99	185,014.18	843,001.25
San Diego County Water Authority	145,737.14	150,985.30	159,732.19	0	0	456,454.63
Palo Verde Irrigation District	122,067.53	126,463.31	133,789.60	136,382.00	145,849.84	664,552.28
Southern California Public Power Authority	63,760.00	66,056.07	69,882.84	71,236.94	76,182.31	347,118.16
Southern California Edison Company	54,651.43	56,619.49	59,899.60	61,060.23	65,299.11	297,529.86
Bard	6,072.38	6,291.05	6,655.52	6,784.47	7,255.46	33,058.88
Colorado River Board of California	6,072.38	6,291.05	6,655.52	6,784.47	7,255.46	33,058.88
Needles	6,072.38	6,291.05	6,655.52	6,784.47	7,255.46	33,058.88
Funding Credit						
San Diego County Water Authority	**0**	**0**	**0**	**162,827.28**	**174,130.99**	**336,958.27**
Metropolitan Water District of Southern California	**0**	**0**	**0**	**0**	**0**	**0**
Habitat Maintenance Fund	**270,750.00**	**280,500.00**	**296,750.00**	**302,500.00**	**323,500.00**	**1,474,000.00**
Total	**3,491,619.10**	**3,617,356.05**	**3,826,917.67**	**3,731,458.50**	**3,990,501.90**	**18,657,853.20**
TOTAL	**12,144,762.00**	**12,582,108.00**	**13,311,018.00**	**13,568,940.00**	**14,510,916.00**	**66,117,744.00**

	FY11	FY12	FY13	FY14	Underfunding	FY15
Reclamation						
Cash	16,400.070.00	16,661,700.00	17,226,270.00	17,570,520.00	0	18,699,660.00
Funding Credit					3,800,520.00	
Total	**16,400.070.00**	**16,661,700.00**	**17,226,270.00**	**17,570,520.00**	**3,800,520.00**	**18,699,660.00**
Arizona						
Cash	1,120,135.50	1,138,005.00	926,991.00	818,554.00	0	1,502,461.88
Funding Credit					(20,219.36)	20,384.48
Habitat Maintenance Fund	1,339,875.00	1,361,250.00	1,407,375.00	1,732,170.00	338,020.32	1,201,002.18
Remedial Measures Fund	0	0	249,574.50	84,854.00	252,277.04	81,100.46
Total	**2,460,010.50**	**2,499,255.00**	**2,583,940.50**	**2,635,578.00**	**570,078.00**	**2,804,949.00**
Nevada						
Cash	3,144,146.00	3,637,260.00	3,510,931.50	3,454,132.00	0	4,307,245.77
Funding Credit					(40,438.72)	40,768.95
Habitat Maintenance Fund	1,339,875.00	1,361,250.00	1,407,375.00	1,732,170.00	338,020.32	1,201,002.18
Remedial Measures Fund	0	0	249,574.50	84,854.00	842,574.40	60,881.10
In-Kind Credit	436,000.00	0	0	0	0	0
Total	**4,920,021.00**	**4,998,510.00**	**5,167,881.00**	**5,271,156.00**	**1,140,156.00**	**5,609,898.00**
California						
Cash	**5,333,036.34**	**5,418,114.16**	**5,102,554.16**	**5,608,045.52**	**0**	**7,231,377.16**
Metropolitan Water District of Southern California	2,320,583.58	2,357,603.81	1,938,340.56	2,380,598.24	(698,099.89)	3,796,523.39
Imperial Irrigation District	1,353,005.78	1,374,590.25	1,421,167.27	1,449,567.90	313,542.90	1,542,721.95
Coachella Valley Water District	738,003.15	749,776.50	775,182.15	790,673.40	171,023.40	841,484.70
Los Angeles Department of Water and Power	418,201.78	424,873.35	439,269.89	448,048.26	96,913.26	476,841.33
San Diego County Water Authority	0	0	0	0	0	0
Palo Verde Irrigation District	134,240.47	136,382.00	141,003.21	143,821.02	31,108.63	153,063.44
Southern California Public Power Authority	172,200.74	174,947.85	180,875.84	184,490.46	39,905.46	196,346.43
Southern California Edison Company	147,600.63	149,955.30	155,036.43	158,134.68	34,204.68	168,296.94
Bard	16,400.07	16,661.70	17,226.27	17,570.52	3,800.52	18,699.66
Colorado River Board of California	16,400.07	16,661.70	17,226.27	17,570.52	3,800.52	18,699.66
Needles	16,400.07	16,661.70	17,226.27	17,570.52	3,800.52	18,699.66
Funding Credit						
San Diego County Water Authority	**393,601.68**	**399,880.80**	**413,430.48**	**421,692.48**	**105,624.14**	**448,791.84**
Metropolitan Water District of Southern California	**613,650.48**	**623,440.04**	**644,564.86**	**0**	**91,212.48**	**0**
Habitat Maintenance Fund	**2,679,750.00**	**2,722,500.00**	**2,814,750.00**	**3,464,340.00**	**654,015.00**	**2,424,030.00**
Remedial Measures Fund	**0**	**0**	**499,149.00**	**169,708.00**	**1,239,434.38**	**180,614.00**
Total	**9,020,038.50**	**9,163,935.00**	**9,474,448.50**	**9,663,786.00**	**2,090,286.00**	**10,284,813.00**
TOTAL	**32,800,140.00**	**33,323,400.00**	**34,452,540.00**	**35,141,040.00**	**7,601.040.00**	**37,399,320.00**

	Subtotal FY11 – FY15	Total FY06 – FY15
Reclamation		
Cash	86,558,220.00	119,617,092.00
Funding Credit	3,800,520.00	3,800,520.00
Total	**90,358,740.00**	**123,417,612.00**
Arizona		
Cash	5,506,146.38	8,777,029.98
Funding Credit	165.12	165.12
Habitat Maintenance Fund	7,379,692.50	8,116,692.50
Remedial Measures Fund	667,806.00	667,806.00
Total	**13,553,811.00**	**17,561,694.60**
Nevada		
Cash	18,053,715.27	27,273,850.47
Funding Credit	330.23	330.23
Habitat Maintenance Fund	7,379,692.50	8,116,692.50
Remedial Measures Fund	1,237,884.00	1,237,884.00
In-Kind Credit	436,000.00	872,000.00
Total	**27,107,622.00**	**37,500,757.20**
California		
Cash	**28,693,127.34**	**45,540,022.27**
Metropolitan Water District of Southern California	12,095,549.69	22,019,605.60
Imperial Irrigation District	7,454,596.05	10,181,952.99
Coachella Valley Water District	4,066,143.30	5,553792.56
Los Angeles Department of Water and Power	2,304,147.87	3,147,149.12
San Diego County Water Authority	0	456,454.63
Palo Verde Irrigation District	739,618.77	1,404,171.05
Southern California Public Power Authority	948,766.78	1,295,884.94
Southern California Edison Company	813,228.66	1,110,758.52
Bard	90,358.74	123,417.62
Colorado River Board of California	90,358.74	123,417.62
Needles	90,358.74	123,417.62
Funding Credit		
San Diego County Water Authority	2,183,021.42	2,519,979.69
Metropolitan Water District of Southern California	1,972,867.86	1,972,867.86
Habitat Maintenance Fund	**14,759,385.00**	**16,233,385.00**
Remedial Measures Fund	**2,088,905.38**	**2,088,905.38**
Total	**49,697,307.00**	**68,355,160.20**
TOTAL	**180,717,480.00**	**246,835,224.00**

D-1a: Underfunding and Makeup Strategy – Current Year Dollars

Total Underfunding Fiscal Year 11–14

FY	Arizona	Nevada	California	Federal	Total
FY11 Required Original i = 1.191	$2,460,010.50	$4,920,021.00	$9,020,038.50	$16,400,070.00	$32,800,140.00
FY11 Required Revised i = 1.258	$2,598,399.00	$5,196,798.00	$9,527,463.00	$17,322,660.00	$34,645,320.00
FY11 Underfunding	**$138,388.50**	**$276,777.00**	**$507,424.50**	**$922,590.00**	**$1,845,180.00**
FY12 Required Original i = 1.210	$2,499,255.00	$4,998,510.00	$9,163,935.00	$16,661,700.00	$33,323,400.00
FY12 Required Revised i = 1.278	$2,639,709.00	$5,279,418.00	$9,678,933.00	$17,598,060.00	$35,196,120.00
FY12 Underfunding	**$140,454.00**	**$280,908.00**	**$514,998.00**	**$936,360.00**	**$1,872,720.00**
FY13 Required Original i = 1.251	$2,583,940.50	$5,167,881.00	$9,474,448.50	$17,226,270.00	$34,452,540.00
FY13 Required Revised i = 1.321	$2,728,525.50	$5,457,051.00	$10,004,593.50	$18,190,170.00	$36,380,340.00
FY13 Underfunding	**$144,585.00**	**$289,170.00**	**$530,145.00**	**$963,900.00**	**$1,927,800.00**
FY14 Required Original i = 1.276	$2,635,578.00	$5,271,156.00	$9,663,786.00	$17,570,520.00	$35,141,040.00
FY14 Required Revised i = 1.347	$2,782,228.50	$5,564,457.00	$10,201,504.50	$18,548,190.00	$37,096,380.00
FY14 Underfunding	**$146,650.50**	**$293,301.00**	**$537,718.50**	**$977,670.00**	**$1,955,340.00**
Total Underfunding	**$570,078.00**	**$1,140,156.00**	**$2,090,286.00**	**$3,800,520.00**	**$7,601,040.00**

Habitat Maintenance Fund Underfunding

FY	(1) Required 2003 Dollars	(2) Additional 2003 Dollars	(3) Original i	(4) (1+2) x (3) Total Current Year Dollars	(5) Revised i	(6) (1+2) x (5) Revised Total Current Year Dollars	(7) (6) - (4) Underfunding Current Year Dollars
2011	$4,500,000	$0	1.191	$5,359,500	1.258	$5,661,000	$301,500
2012	$4,500,000	$0	1.210	$5,445,000	1.278	$5,751,000	$306,000
2013	$4,500,000	$0	1.251	$5,629,500	1.321	$5,944,500	$315,000
2014	$4,500,000	$930,000	1.276	$6,928,680	1.347	$7,314,210	$385,530
Total	**$18,000,000**	**$930,000**		**$23,362,680**		**$24,670,710**	**$1,308,030**

Remedial Measures Fund Underfunding

FY	(1) Required 2003 Dollars	(2) Additional 2003 Dollars	(3) Original i	(4) (1 + 2) x (3) Total Current Year Dollars	(5) Revised i	(6) (1 + 2) x (5) Revised Total Current Year Dollars	(7) (6) - (4) Underfunding Current Year Dollars
2011	$266,000	$0	1.191	0	1.258		
2012	$266,000	$0	1.210	0	1.278		
2013	$266,000	$532,000	1.251	$998,298	1.321	$1,054,158	$55,860
2014	$266,000		1.276	$339,416	1.347	$358,302	$18,886
Total				**$1,337,714**		**$1,412,460**	**$74,746**

Distribution of Non-Federal Underfunding Makeup Funds

Entity	(1) (2) + (5) Total	(2) Habitat Maintenance Fund Makeup	(3) Remedial Measures Fund Makeup	(4) Additional Remedial Measures Fund	(5) (3) + (4) Total Remedial Measures Fund
Arizona	**$570,078.00**	**$327,007.50**	$18,686.50	$224,384.00	**$243,070.50**
Nevada	**$1,140,156.00**	**$327,007.50**	$18,686.50	$794,462.00	**$813,148.50**
California	**$2,090,286.00**	**$654,015.00**	$37,373.00	$1,398,898.00	**$1,436,271.00**
Total	**$3,800,520.00**	**$1,308,030.00**	$74,746.00	$2,417,744.00	**$2,492,490.00**

Distribution of California Underfunding Makeup Funds by Fiscal Year

FY	(1) (2) + (5) Total California Underfunding	(2) Habitat Maintenance Fund Makeup	(3) Remedial Measures Fund Makeup	(4) Additional Remedial Measures Fund	(5) (3) + (4) Total Remedial Measures Fund
2011	**$507,424.50**	**$150,750.00**	$0	$356,674.50	**$356,674.50**
2012	**$514,998.00**	**$153,000.00**	$0	$361,998.00	**$361,998.00**
2013	**$530,145.00**	**$157,500.00**	$27,930	$344,715.00	**$372,645.00**
2014	**$537,718.50**	**$192,765.00**	$9,443	$335,510.50	**$344,953.50**
Total	**$2,090,286.00**	**$654,015.00**	$37,373.00	$1,398,898.00	**$1,436,271.00**

Distribution of Nevada Underfunding Makeup Funds by Fiscal Year

FY	(1) (2) + (5) Total Nevada Underfunding	(2) Habitat Maintenance Fund Makeup	(3) Remedial Measures Fund Makeup	(4) Additional Remedial Measures Fund	(5) (3) + (4) Total Remedial Measures Fund
2011	**$276,777.00**	**$75,375.00**	$0	$201,402.00	**$201,402.00**
2012	**$280,908.00**	**$76,500.00**	$0	$204,408.00	**$204,408.00**
2013	**$289,170.00**	**$78,750.00**	$13,965.00	$196,455.00	**$210,420.00**
2014	**$293,301.00**	**$96,382.50**	$4,721.50	$192,197.00	**$196,918.50**
Total	**$1,140,156.00**	**$327,007.50**	$18,686.50	$794,462.00	**$813,148.50**

Distribution of Arizona Underfunding Makeup Funds by Fiscal Year

FY	(1) (2) + (5) Total Arizona Underfunding	(2) Habitat Maintenance Fund Makeup	(3) Remedial Measures Fund Makeup	(4) Additional Remedial Measures Fund	(5) (3) + (4) Total Remedial Measures Fund
2011	**$138,388.50**	**$75,375.00**	$0	$63,013.50	**$63,013.50**
2012	**$140,454.00**	**$76,500.00**	$0	$63,954.00	**$63,954.00**
2013	**$144,585.00**	**$78,750.00**	$13,965.00	$51,870.00	**$65,835.00**
2014	**$146,650.50**	**$96,382.50**	$4,721.50	$45,546.50	**$50,268.00**
Total	**$570,078.00**	**$327,007.50**	$18,686.50	$224,384.00	**$243,070.50**

D-2: Funding Credits

D-2a: San Diego County Water Authority

Credits Earned

FY	Credits Earned	Composite i	2003 Dollars	Total 2003 Dollars
2005	145,737.14	1.019	143,019.76	143,019.76
2006	500,000	1.083	461,680.51	604,700.27
2007	250,000	1.122	222,816.39	827,516.66
2008	3,298,069.94	1.187	2,778,491.95	3,606,008.61

Credits Used

FY	Total 2003 Credits Available	2003 Credits Used	Composite i	Current Year Credits
2009	3,606,008.61	134,568.00	1.210	162,827.28
2010	3,471,440.61	134,568.00	1.294	174,130.99
2011	3,336,872.61	330,480.00	1.191	393,601.68
2012	3,006,392.61	330,480.00	1.210	339,880.80
2013	2,675,912.61	330,480.00	1.251	413,430.48
2014	2,345,432.61	330,480.00	1.276	421,692.48
2015	2,014,952.61			

Credits Used – Revised Inflation Rate

FY	Total 2003 Credits Available	2003 Credits Used	Composite i	Current Year Credits	Difference
2009	3,606,008.61	134,568.00	1.210	162,827.28	
2010	3,471,440.61	134,568.00	1.294	174,130.99	
2011*	3,336,872.61	330,480.00	1.258	415,743.84	22,142.16
2012*	3,006,392.61	330,480.00	1.278	422,353.44	22,472.64
2013*	2,675,912.61	330,480.00	1.321	436,564.08	23,133.60
2014*	2,345,432.61	330,480.00	1.347	445,156.56	23,464.08
2015	2,014,952.61	330,480.00	1.358	448,791.84	91,212.48
2016	1,684,472.61	265,968.00	1.387	368,897.62	
2017	1,418,504.61				

* Difference between current year credits with revised inflation rate and credits with original inflation rate of $91,212.48 used to reduce California's required underfunding.

D-2b: The Metropolitan Water District of Southern California

Credits Earned

FY	Credits Earned	Composite i	2003 Dollars	Total 2003 Dollars
2008	1,834,768.57	1.187	1,545,719.10	1,545,719.10

Credits Used

FY	Total 2003 Credits Available	2003 Credits Used	Composite i	Current Year Credits
2011	1,545,719.10	515,239.70	1.191	613,650.48
2012	1,030,479.40	515,239.70	1.210	623,440.04
2013	515,239.70	515,239.70	1.251	644,564.86
2014	0			

Credits Used – Revised Inflation Rate

FY	Total 2003 Credits Available	2003 Credits Used	Composite i	Current Year Credits	Difference
2011*	1,545,719.10	515,239.70	1.258	648,171.54	34,521.06
2012*	1,030,479.40	515,239.70	1.278	658,476.34	35,036.30
2013*	515,239.70	515,239.70	1.321	680,631.64	36,066.78
2014*	0				
					105,624.14

* Difference between current year credits with revised inflation rate and credits with original inflation rate of $105,624.14 used to reduce California's required underfunding.

D-2c: Nevada

Credits Earned

FY	Credits Earned	Composite i	2003 Dollars	Total 2003 Dollars
2014	40,438.72	1.347	30,021.32	30,021.32

Credits Used

FY	Total 2003 Credits Available	2003 Credits Used	Composite i	Current Year Credits
2015	30,021.32	30,021.32	1.358	40,768.95
2016	0			

D-2d: Arizona

Credits Earned

FY	Credits Earned	Composite i	2003 Dollars	Total 2003 Dollars
2014	20,219.36	1.347	15,010.66	15,010.66

Credits Used

FY	Total 2003 Credits Available	2003 Credits Used	Composite i	Current Year Credits
2015	15,010.66	15,010.66	1.358	20,384.48
2016	0			

D-2e: Bureau of Reclamation

Credits/Debits

FY	Credits/Debits Earned	Composite i	2003 Dollars	Total 2003 Dollars
2004	1,559,739.07	1.000	1,559,739.07	1,559,739.07
2005	4,112,477.11	1.019	4,035,796.97	5,595,536.04
2006	(2,871,624.04)	1.083	(2,651,545.74)	2,943,990.30
2007	2,314,455.02	1.122	2,062,794.14	5,006,784.44
2008	(495,025.15)	1.187	(417,038.88)	4,589,745.56
2009	1,833,416.80	1.210	1,515,220.50	6,104,966.06
2010	4,335,477.54	1.294	3,350,446.32	9,455,412.38
2011	796,149.37	1.191	668,471.34	10,123,883.72
2012	(3,105,120.42)	1.210	(2,566,215.22)	7,557,668.50
2013	(2,174,507.51)	1.251	(1,738,215.44)	5,819,453.06

Credits/Debits – Revised Inflation Rate

FY	Credits/Debits Earned	Composite i	2003 Dollars	Total 2003 Dollars
2004	1,559,739.07	1.000	1,559,739.07	1,559,739.07
2005	4,112,477.11	1.019	4,035,796.97	5,595,536.04
2006	(2,871,624.04)	1.083	(2,651,545.74)	2,943,990.30
2007	2,314,455.02	1.122	2,062,794.14	5,006,784.44
2008	(495,025.15)	1.187	(417,038.88)	4,589,745.56
2009	1,833,416.80	1.210	1,515,220.50	6,104,966.06
2010	7,099,834.74*	1.294	5,486,734.73	11,591,700.73
2011	796,149.37	1.258	632,869.13	12,224,569.86
2012	(3,105,120.42)	1.278	(2,429,671.69)	9,794,898.17
2013	(2,174,507.51)	1.321	(1,646,107.12)	8,148,791.05
Underfunding 2014	(3,800,520.00)	1.347	(2,821,469.93)	5,327,321.12
2014	(1,054,326.44)	1.347	(782,721.93)	4,544,599.19
2015	1,502,469.24	1.358	1,106,383.83	5,650,983.02

*Adjusted.

D-3: Funding Accounts

D-3a: Habitat Maintenance Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2006	$500,000	$500,000		$500,000	1.083	$541,500		$541,500.00	$541,500.00	$552,705.68
2007	$500,000	$500,000		$500,000	1.122	$561,000		$561,000.00	$1,102,500.00	$1,154,574.04
2008	$500,000	$500,000		$500,000	1.187	$593,500		$593,500.00	$1,696,000.00	$1,812,275.61
2009	$500,000	$500,000		$500,000	1.210	$605,000		$605,000.00	$2,301,000.00	$2,467,094.21
2010	$500,000	$500,000		$500,000	1.294	$647,000		$647,000.00	$2,948,000.00	$3,154,714.70
2011	$4,500,000	$4,500,000		$4,500,000	1.191*	$5,359,500		$5,359,500.00	$8,307,500.00	$8,579,502.74
2012	$4,500,000	$4,500,000		$4,500,000	1.210*	$5,445,000		$5,445,000.00	$13,752,500.00	$14,164,435.13
2013	$4,500,000	$4,500,000		$4,500,000	1.251*	$5,629,500		$5,629,500.00	$19,382,000.00	$19,884,284.86
2014	$4,500,000	$4,500,000	$930,000	$5,430,000	1.276*	$5,742,000	$1,186,680.00	$6,928,680.00	$26,310,680.00	
2014 Under Funding Make Up						$654,015		$654,015.00	$26,964,695.00	
2014 Under Funding Overpay							$22,025.64	$22,025.64	$26,986,720.64	$27,619,568.11
2015 Under Funding Make Up							$654,015.00	$654,015.00	$27,640,735.64	
2015	$4,500,000	$3,570,000		$3,570,000	1.358	$4,848,060	-$22,025.64*	$4,826,034.36	$32,446,770.00	$33,051,595.90
Total	**$25,000,000**	**$24,070,000**	**$930,000**	**$25,000,000**						
Program Total	**$25,000,000**			**$25,000,000**						

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding make up interest

** Reduction for FY14 overpayment.

Arizona Habitat Maintenance Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2006	$125,000	$125,000		$125,000	1.083	$135,375.00		$135,375.00	$135,375.00	$138,251
2007	$125,000	$125,000		$125,000	1.122	$140,250.00		$140,250.00	$275,625.00	$287,860
2008	$125,000	$125,000		$125,000	1.187	$148,375.00		$148,375.00	$424,000.00	$444,052.83
2009	$125,000	$125,000		$125,000	1.210	$151,250.00		$151,250.00	$575,250.00	$596,037.45
2010	$125,000	$125,000		$125,000	1.294	$161,750.00		$161,750.00	$737,000.00	$757,787.45
2011	$1,125,000	$1,125,000		$1,125,000	1.191*	$1,339,875.00		$1,339,875.00	$2,076,875.00	$2,097,622.45
2012	$1,125,000	$1,125,000		$1,125,000	1.210*	$1,361,250.00		$1,361,250.00	$3,438,125.00	$3,458,912.45
2013	$1,125,000	$1,125,000		$1,125,000	1.251*	$1,407,375.00		$1,407,375.00	$4,845,500.00	$4,866,287.45
2014	$1,125,000	$1,125,000	$232,500	$1,357,500	1.276*	$1,435,500.00	$296,670	$1,732,170.00	$6,577,670.00	
2014 Under Funding Make Up						$327,007.50		$327,007.50	$6,904,677.50	
2014 Under Funding Overpay							$11,012.82	$11,012.82	$6,915,690.32	$6,936,580.16
2015	$1,125,000	$892,500		$892,500	1.358	$1,212,015.00	-$11,012.82*	$1,201,002.18	$8,116,692.50	$8,137,521.39
Total	**$6,250,000**	**$6,017,500**	**$232,500**	**$6,250,000**						
Program Total	**$6,250,000**			**$6,250,000**						

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding make up interest
** Reduction for FY14 overpayment.

Nevada Habitat Maintenance Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2006	$125,000	$125,000		$125,000	1.083	$135,375.00		$135,375.00	$135,375.00	$137,378.85
2007	$125,000	$125,000		$125,000	1.122	$140,250.00		$140,250.00	$275,625.00	$286,813.26
2008	$125,000	$125,000		$125,000	1.187	$148,375.00		$148,375.00	$424,000.00	$453,778.83
2009	$125,000	$125,000		$125,000	1.210	$151,250.00		$151,250.00	$575,250.00	$619,413.59
2010	$125,000	$125,000		$125,000	1.294	$161,750.00		$161,750.00	$737,000.00	$789,731.22
2011	$1,125,000	$1,125,000		$1,125,000	1.191*	$1,339,875.00		$1,339,875.00	$2,076,875.00	$2,133,479.56
2012	$1,125,000	$1,125,000		$1,125,000	1.210*	$1,361,250.00		$1,361,250.00	$3,438,125.00	$3,500,534.71
2013	$1,125,000	$1,125,000		$1,125,000	1.251*	$1,407,375.00		$1,407,375.00	$4,845,500.00	$4,920,897.14
2014	$1,125,000	$1,125,000	$232,500	$1,357,500	1.276*	$1,435,500.00	$296,670.00	$1,732,170.00	$6,577,670.00	
2014 Under Funding Make Up						$327,007.50		$327,007.50	$6,904,677.50	
2014 Under Funding Overpay							$11,012.82	$11,012.82	$6,915,690.32	$7,005,875.48
2015	$1,125,000	$892,500		$892,500	1.358	$1,212,015.00	-$11,012.82*	$1,201,002.18	$8,116,692.50	$8,236,569.18
Total	**$6,250,000**	**$6,017,500**	**$232,500**	**$6,250,000**						
Program Total	**$6,250,000**			**$6,250,000**						

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding make up interest
** Reduction for FY14 overpayment.

California Habitat Maintenance Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2006	$250,000	$250,000		$250,000	1.083	$270,750.00		$270,750.00	$270,750.00	$277,075.83
2007	$250,000	$250,000		$250,000	1.122	$280,500.00		$280,500.00	$551,250.00	$579,900.78
2008	$250,000	$250,000		$250,000	1.187	$296,750.00		$296,750.00	$848,000.00	$914,443.95
2009	$250,000	$250,000		$250,000	1.210	$302,500.00		$302,500.00	$1,150,500.00	$1,251,643.17
2010	$250,000	$250,000		$250,000	1.294	$323,500.00		$323,500.00	$1,474,000.00	$1,607,196.03
2011	$2,250,000	$2,250,000		$2,250,000	1.191*	$2,679,750.00		$2,679,750.00	$4,153,750.00	$4,348,400.73
2012	$2,250,000	$2,250,000		$2,250,000	1.210*	$2,722,500.00		$2,722,500.00	$6,876,250.00	$7,204,987.97
2013	$2,250,000	$2,250,000		$2,250,000	1.251*	$2,814,750.00		$2,814,750.00	$9,691,000.00	$10,097,100.27
2014	$2,250,000	$2,250,000	$465,000	$2,715,000	1.276*	$2,871,000.00	$593,340.00	$3,464,340.00	$13,155,340.00	$13,677,112.47
2015 Under Funding Make Up							$654,015.00	$654,015.00	$13,809,355.00	
2015	$2,250,000	$1,785,000		$1,785,000	1.358	$2,424,030.00		$2,424,030.00	$16,233,385.00	$16,677,505.33
Total	**$12,500,000**	**$12,035,000**	**$465,000**	**$12,500,000**						
Program Total	**$12,500,000**			**$12,500,000**						

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding make up interest.

D-3b: Remedial Measures Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2011	$266,000									
2012	$266,000									
2013	$266,000	$798,000	$0	$798,000	1.251*	$998,298.00	$0	$998,298.00	$998,298.00	$1,001,102.71
2014	$266,000	$266,000	$0	$266,000	1.276*	$339,416.00	$0	$339,416.00	$1,337,714.00	
2014 Under Funding Make up						$37,373.00		$37,373.00	$1,375,087.00	
2014 Under Funding Make Up Additional			$756,381.59	$756,381.59	1.347		$1,018,846.00	$1,018,846.00	$2,393,933.00	
2014 Under Funding Overpay							$38,632.44	$38,632.44	$2,432,565.44	$2,441,713.88
2015 Under Funding Make up						$37,373.00		$37,373.00	$2,469,938.44	
2015 Under Funding Make up Additional			$892,398.95	$892,398.95	1.347		$1,202,061.38	$1,202,061.38	$3,671,999.82	
2015	$266,000	$266,000		$266,000	1.358	$361,228.00	-$38,632.44**	$322,595.56	$3,994,595.38	$4,019,296.52
Total	**$1,330,000**	**$1,330,000**	**$1,648,780.54**	**$2,978,780.54**						
2016	$796,000	$796,000	$0	$796,000	1.387	$1,104,052.00				
2017	$796,000	$796,000		$796,000	1.393	$1,108,828.00				
Program Total	**$13,270,000**			**$13,270,000**						

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding make up interest.
** Reduction for FY14 overpayment.

Arizona Remedial Measures Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2011	$66,500									
2012	$66,500									
2013	$66,500	$199,500.00	$0	$199,500.00	1.251*	$249,574.50	$0	$249,574.50	$249,574.50	$249,574.50
2014	$66,500	$66,500.00	$0	$66,500.00	1.276*	$84,854.00	$0	$84,854.00	$334,428.50	
2014 Under Funding Make up						$18,686.50		$18,686.50	$353,115.00	
2014 Under Funding Make Up Additional			$166,580.55	$166,580.55	1.347		$224,384.00	$224,384.00	$577,495.00	
2014 Under Funding Overpay							$9,206.54	$9,206.54	$586,705.54	$586,705.54
2015	$66,500	$66,500.00		$66,500.00	1.358	$90,307.00	-$9,206.54**	$81,100.46	$667,806.00	$667,806.00
Total	**$332,500**	**$332,500**	**$166,580.55**	**499,080.55**						
2016	$199,000	$199,000	$0		1.387	$276,013.00	$0	$276,013.00		
2017	$199,000	$199,000	$0		1.393	$277,207.00	$0	$277,207.00		
Program Total	**$3,317,500**			**$3,317,500**						

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding make up interest.
** Reduction for FY14 overpayment.

Nevada Remedial Measures Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2011	$66,500									
2012	$66,500									
2013	$66,500	$199,500.00	$0	$199,500.00	1.251*	$249,574.50	$0	$249,574.50	$249,574.50	$249,601.70
2014	$66,500	$66,500.00	$0	$66,500.00	1.276*	$84,854.00	$0	$84,854.00	$334,428.50	
2014 Under Funding Make up						$18,686.50		$18,686.50	$353,115.00	
2014 Under Funding Make Up Additional			$589,801.04	$589,801.04	1.347		$794,462.00	$794,462.00	$1,147,577.00	
2014 Under Funding Overpay							$29,425.90	$29,425.90	$1,177,002.90	$1,177,637.60
2015	$66,500	$66,500.00		$66,500.00	1.358	$90,307.00	-$29,425.90**	$60,881.10	$1,237,884.00	$1,242,877.63
Total	**$332,500**	**$332,500**	**$589,801.04**	**$922,301.04**						
2016	$199,000	$199,000	$0		1.387	$276,013.00	$0	$276,013.00		
2017	$199,000	$199,000	$0		1.393	$277,207.00	$0	$277,207.00		
Program Total	**$3,317,500**			**$3,317,500**						

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding make up interest.
** Reduction for FY14 overpayment.

California Remedial Measures Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2011	$133,000									
2012	$133,000									
2013	$133,000	$399,000	$0	$399,000	1.251*	$499,149.00	$0	$499,149.00	$499,149.00	$501,926.51
2014	$133,000	$133,000	$0	$133,000.00	1.276*	$169,708.00	$0	$169,708.00	$668,857.00	$677,370.74
2015 Under Funding Make up						$37,373.00		$37,373.00	$706,230.00	
2015 Under Funding Make Up Additional			$892,398.95	$892,398.95	1.347		$1,202,061.38	$1,202,061.38	$1,908,291.38	
2015	$133,000	$133,000		$133,500.00	1.358	$180,614.00		$180,614.00	$2,088,905.38	$2,108,612.89
Total	**$665,000**	**$665,000**	**$892,398.95**	**$1,557,398.95**						
2016	$398,000	$398,000	$0		1.387	$552,026.00	$0	$552,026.00		
2017	$398,000	$398,000	$0		1.393	$554,414.00	$0	$554,414.00		
Program Total	**$6,635,000**			**$6,635,000**						

* Original inflation index. Difference between original inflation index and revised inflation index is shown as underfunding make up interest.

D-3c: Land and Water Fund

FY	Current Year Contributions	Current Year Withdrawals	Cumulative Contributions
2011	$8,900,000		$8,900,000
2012	$4,600,000		$13,500,000
2013	0		$13,500,000
2014	0		$13,500,000
2015	$6,100,000		$19,600,000
2016	$4,100,000*	$8,300,000	$15,400,000
2017	$2,100,000		$17,500,000

*May be adjusted during FY16.

D-4: Cumulative Program Accomplishment

Work Task	2004 Obligations	2004 Expenditures	2005 Obligations	2005 Expenditures	Subtotal Expenditures
A1	$0.00	$0.00	$421,740.74	$403,953.57	$403,953.57
G2	$0.00	$0.00	$0.00	$0.00	$0.00
Total A	**$0.00**	**$0.00**	**$421,740.74**	**$403,953.57**	**$403,953.57**
B1	$55,223.00	$55,223.00	$115,645.72	$115,645.72	$170,868.72
B2	$0.00	$0.00	$155,810.60	$145,568.04	$145,568.04
B3	$200,000.00	$0.00	$0.00	$14,527.30	$14,527.30
B4	$0.00	$0.00	$100,000.00	$9,857.95	$9,857.95
B5	$0.00	$0.00	$108.50	$40,720.81	$40,720.81
B6	$0.00	$0.00	$25,878.76	$25,878.76	$25,878.76
B7	$0.00	$0.00	$186,003.61	$186,003.61	$186,003.61
B8	$54,762.00	$54,762.00	$70,030.00	$70,030.00	$124,792.00
B9	$0.00	$0.00	$3,073.11	$3,073.11	$3,073.11
B10	$0.00	$0.00	$0.00	$0.00	$0.00
B11	$0.00	$0.00	$0.00	$0.00	$0.00
Total B	**$309,985.00**	**$109,985.00**	**$656,550.30**	**$611,305.30**	**$721,290.30**
C1	$0.00	$0.00	$45,276.00	$45,276.00	$45,276.00
C2	$0.00	$0.00	$0.00	$0.00	$0.00
C3	$0.00	$0.00	$0.00	$0.00	$0.00
C4	$0.00	$0.00	$0.00	$0.00	$0.00
C5	$0.00	$0.00	$0.00	$0.00	$0.00
C6	$0.00	$0.00	$0.00	$0.00	$0.00
C7	$0.00	$0.00	$0.00	$0.00	$0.00
C8	$0.00	$0.00	$177,053.00	$136,060.00	$136,060.00
C9	$0.00	$0.00	$43,816.00	$43,816.00	$43,816.00
C10	$0.00	$0.00	$0.00	$0.00	$0.00
C11	$0.00	$0.00	$0.00	$0.00	$0.00
C12	$0.00	$0.00	$0.00	$0.00	$0.00
C13	$0.00	$0.00	$99,996.80	$99,996.80	$99,996.80

Work Task	2004 Obligations	2004 Expenditures	2005 Obligations	2005 Expenditures	Subtotal Expenditures
C14	$0.00	$0.00	$0.00	$0.00	$0.00
C15	$0.00	$0.00	$22,255.00	$22,255.00	$22,255.00
C16	$0.00	$0.00	$0.00	$0.00	$0.00
C17	$0.00	$0.00	$45,000.00	$9,750.00	$9,750.00
C18	$0.00	$0.00	$41,981.82	$41,981.82	$41,981.82
C19	$0.00	$0.00	$0.00	$0.00	$0.00
C20	$64,011.00	$0.00	$53,779.96	$53,779.96	$53,779.96
C21	$0.00	$0.00	$95,534.00	$70,000.00	$70,000.00
C22	$0.00	$0.00	$48,096.00	$0.00	$0.00
C23	$0.00	$0.00	$0.00	$0.00	$0.00
C24	$0.00	$0.00	$0.00	$0.00	$0.00
C25	$0.00	$0.00	$0.00	$0.00	$0.00
C26	$0.00	$0.00	$0.00	$0.00	$0.00
C27	$0.00	$0.00	$0.00	$0.00	$0.00
C28	$0.00	$0.00	$0.00	$0.00	$0.00
C29	$0.00	$0.00	$0.00	$0.00	$0.00
C30	$0.00	$0.00	$0.00	$0.00	$0.00
C31	$0.00	$0.00	$0.00	$0.00	$0.00
C32	$0.00	$0.00	$0.00	$0.00	$0.00
C33	$0.00	$0.00	$0.00	$0.00	$0.00
C34	$0.00	$0.00	$0.00	$0.00	$0.00
C35	$0.00	$0.00	$0.00	$0.00	$0.00
C36	$0.00	$0.00	$0.00	$0.00	$0.00
C37	$0.00	$0.00	$0.00	$0.00	$0.00
C38	$0.00	$0.00	$0.00	$0.00	$0.00
C39	$0.00	$0.00	$0.00	$0.00	$0.00
C40	$0.00	$0.00	$0.00	$0.00	$0.00
C41	$0.00	$0.00	$0.00	$0.00	$0.00
C42	$0.00	$0.00	$0.00	$0.00	$0.00
C43	$0.00	$0.00	$0.00	$0.00	$0.00

Work Task	2004 Obligations	2004 Expenditures	2005 Obligations	2005 Expenditures	Subtotal Expenditures
C44	$0.00	$0.00	$0.00	$0.00	$0.00
C45	$0.00	$0.00	$0.00	$0.00	$0.00
C46	$0.00	$0.00	$0.00	$0.00	$0.00
C47	$0.00	$0.00	$0.00	$0.00	$0.00
C48	$0.00	$0.00	$0.00	$0.00	$0.00
C49	$0.00	$0.00	$0.00	$0.00	$0.00
C50	$0.00	$0.00	$0.00	$0.00	$0.00
Total C	**$64,011.00**	**$0.00**	**$672,788.58**	**$522,915.58**	**$522,915.58**
D1	$0.00	$0.00	$29,367.09	$29,367.09	$29,367.09
D2	$0.00	$0.00	$750,000.00	$370,174.62	$370,174.62
D3	$0.00	$0.00	$0.00	$0.00	$0.00
D4	$0.00	$0.00	$60,520.00	$60,520.00	$60,520.00
D5	$0.00	$0.00	$247,118.33	$247,118.33	$247,118.33
D6	$0.00	$0.00	$0.00	$0.00	$0.00
D7	$0.00	$0.00	$0.00	$0.00	$0.00
D8	$0.00	$0.00	$134,246.08	$134,246.08	$134,246.08
D9	$55,000.00	$0.00	$0.00	$0.00	$0.00
D10	$0.00	$0.00	$0.00	$0.00	$0.00
D11	$400,000.00	$168,133.36	$341,866.45	$100,963.76	$269,097.12
D12	$0.00	$0.00	$0.00	$0.00	$0.00
Total D	**$455,000.00**	**$168,133.36**	**$1,563,117.95**	**$942,389.88**	**$1,110,523.24**
E1	$1,077,729.33	$835,629.33	$348,991.39	$388,028.39	$1,223,657.72
E2	$0.00	$0.00	$147,333.85	$147,333.85	$147,333.85
E3	$1,037,791.00	$400,290.00	$31,268.45	$83,721.77	$484,011.77
E4	$0.00	$0.00	$17,278.54	$17,278.54	$17,278.54
E5	$0.00	$0.00	$80,058.95	$100,548.43	$100,548.43
E6	$110,004.00	$0.00	$109,927.52	$79,586.39	$79,586.39
E7	$0.00	$0.00	$370,437.68	$312,199.68	$312,199.68
E8	$0.00	$0.00	$1,035.50	$1,035.50	$1,035.50
E9	$0.00	$0.00	$53,320.19	$53,320.19	$53,320.19

Work Task	2004 Obligations	2004 Expenditures	2005 Obligations	2005 Expenditures	Subtotal Expenditures
E10	$0.00	$0.00	$0.00	$0.00	$0.00
E11	$0.00	$0.00	$0.00	$0.00	$0.00
E12	$6,673.38	$6,673.38	$70,893.38	$25,754.05	$32,427.43
E13	$0.00	$0.00	$48,482.00	$25,912.33	$25,912.33
E14	$0.00	$0.00	$84,309.07	$84,309.07	$84,309.07
E15	$0.00	$0.00	$0.00	$0.00	$0.00
E16	$0.00	$0.00	$134,814.86	$5,392.59	$5,392.59
E17	$0.00	$0.00	$0.00	$0.00	$0.00
E18	$0.00	$0.00	$0.00	$0.00	$0.00
E19	$0.00	$0.00	$0.00	$0.00	$0.00
E20	$95,000.00	$35,000.00	$0.00	$0.00	$35,000.00
E21	$0.00	$0.00	$19,729.97	$19,739.97	$19,739.97
E22	$5,088.00	$4,028.00	$0.00	$0.00	$4,028.00
E23	$0.00	$0.00	$0.00	$0.00	$0.00
E24	$0.00	$0.00	$0.00	$0.00	$0.00
E25	$0.00	$0.00	$0.00	$0.00	$0.00
E25 In-Kind	$0.00	$0.00	$0.00	$0.00	$0.00
E26	$0.00	$0.00	$0.00	$0.00	$0.00
E27	$0.00	$0.00	$0.00	$0.00	$0.00
E28	$0.00	$0.00	$0.00	$0.00	$0.00
E29	$0.00	$0.00	$0.00	$0.00	$0.00
E30	$0.00	$0.00	$0.00	$0.00	$0.00
E31	$0.00	$0.00	$0.00	$0.00	$0.00
Total E	**$2,332,285.71**	**$1,281,620.71**	**$1,517,881.35**	**$1,344,160.75**	**$2,625,781.46**

Work Task	2004 Obligations	2004 Expenditures	2005 Obligations	2005 Expenditures	Subtotal Expenditures
F1	$0.00	$0.00	$199,492.67	$199,492.67	$199,492.67
F2	$0.00	$0.00	$65,235.81	$65,235.81	$65,235.81
F3	$0.00	$0.00	$23,023.55	$23,023.55	$23,023.55
F4	$0.00	$0.00	$0.00	$0.00	$0.00
F5	$0.00	$0.00	$0.00	$0.00	$0.00
F6	$0.00	$0.00	$0.00	$0.00	$0.00
F7	$0.00	$0.00	$0.00	$0.00	$0.00
Total F	**$0.00**	**$0.00**	**$287,752.03**	**$287,752.03**	**$287,752.03**
G1	$235,000.00	$0.00	$0.00	$0.00	$0.00
G3	$0.00	$0.00	$0.00	$0.00	$0.00
G4	$0.00	$0.00	$0.00	$0.00	$0.00
Total G	**$235,000.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
H1	$0.00	$0.00	$0.00	$0.00	$0.00
H2	$0.00	$0.00	$0.00	$0.00	$0.00
Total H	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
I1	$0.00	$0.00	$0.00	$0.00	$0.00
G5	$0.00	$0.00	$0.00	$0.00	$0.00
Total I	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
GRAND Totals	**$3,396,281.71**	**$1,559,739.07**	**$5,119,830.95**	**$4,112,477.11**	**$5,672,216.18**

Work Task	2006 Obligations	2006 Expenditures	2007 Obligations	2007 Expenditures	2008 Obligations	2008 Expenditures	2009 Obligations	2009 Expenditures	2010 Obligations	2010 Expenditures	Subtotal Expenditures
A1	$1,120,653.36	$1,138,440.53	$1,052,867.52	$1,037,492.71	$965,660.35	$965,660.35	$1,052,853.25	$1,052,853.25	$1,296,959.74	$1,255,046.41	$5,449,493.25
G2	$57,262.87	$57,262.87	$73,272.35	$73,272.35	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$130,535.22
Total A	**$1,177,916.23**	**$1,195,703.40**	**$1,126,139.87**	**$1,110,765.06**	**$965,660.35**	**$965,660.35**	**$1,052,853.25**	**$1,052,853.25**	**$1,296,959.74**	**$1,255,046.41**	**$5,580,028.47**
B1	$222,390.86	$216,316.31	$227,440.83	$246,686.92	$149,085.82	$144,764.64	$206,001.63	$223,658.88	$234,965.09	$234,965.09	$1,066,391.84
B2	$206,485.90	$206,485.90	$233,348.47	$149,191.21	$334,013.77	$330,768.94	$503,628.30	$417,210.83	$352,255.56	$555,904.57	$1,659,561.45
B3	$13,190.17	$13,190.17	$41,588.73	$41,588.73	$102,288.46	$77,288.46	$169,669.00	$179,239.39	$95,522.93	$106,304.52	$417,611.27
B4	$127,627.57	$54,248.17	$117,698.86	$174,269.47	$140,519.61	$86,110.71	$229,364.46	$212,292.78	$269,833.73	$318,418.43	$845,339.56
B5	$176,017.60	$121,570.05	$301,359.83	$95,138.87	$303,301.12	$186,455.13	$259,449.57	$231,055.42	$351,957.84	$481,429.95	$1,115,649.42
B6	$101,713.03	$36,713.03	$20,654.33	$50,255.33	$48,190.46	$10,897.25	$31,769.89	$59,462.10	$41,521.10	$77,031.09	$234,358.80
B7	$205,640.44	$167,528.16	$136,000.40	$171,075.40	$173,950.09	$173,950.09	$185,238.41	$185,238.41	$165,056.32	$165,056.32	$862,848.38
B8	$50,869.73	$50,869.73	$46,711.07	$46,711.07	$66,890.83	$66,890.83	$73,421.00	$26,111.00	$78,710.75	$126,020.75	$316,603.38
B9	$570.14	$570.14	-$36.00	-$36.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$534.14
B10	$57,122.00	$0.00	$260,000.00	$147,305.11	$74,191.86	$126,084.93	$89,956.67	$122,880.49	$70,053.15	$140,878.20	$537,148.73
B11	$39,704.30	$39,704.30	$67,010.31	$2,010.31	$16,879.79	$28,895.98	$119,439.72	$47,327.37	$53,930.37	$132,727.00	$250,664.96
Total B	**$1,201,331.74**	**$907,195.96**	**$1,451,776.83**	**$1,124,196.42**	**$1,409,311.81**	**$1,232,106.96**	**$1,867,938.65**	**$1,704,476.67**	**$1,713,806.84**	**$2,338,735.92**	**$7,306,711.93**
C1	$73,525.15	$72,382.15	$0.00	$29,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$101,382.15
C2	$10,000.00	$0.00	$10,000.00	$0.00	$10,000.00	$20,000.00	$10,000.00	$20,000.00	$10,000.00	$10,000.00	$50,000.00
C3	$161,445.47	$161,445.47	$34,848.11	$34,848.11	$4,637.56	$4,637.56	$11,547.48	$11,547.48	$13,285.36	$13,285.36	$225,763.98
C4	$14,128.53	$4,128.53	$11,780.56	$1,780.56	$12,667.29	$22,667.29	$15,557.23	$25,557.23	$11,532.14	$10,648.80	$64,782.41
C5	$8,583.92	$8,583.92	$47,425.58	$47,425.58	$82,971.14	$82,971.14	$83,428.78	$83,428.78	$97,189.14	$97,189.14	$319,598.56
C6	$76,875.35	$76,875.35	$26,676.33	$26,676.33	-$2,110.00	-$2,110.00	$0.00	$0.00	$0.00	$0.00	$101,441.68
C7	$189,789.41	$68,121.58	$80,818.40	$102,387.02	$88,573.21	$148,829.53	$129,403.53	$110,818.42	$58,380.22	$116,808.22	$546,964.77
C8	$187,973.54	$108,932.54	$180,751.80	$157,708.80	$190,297.91	$142,918.10	$23,606.34	$39,115.60	-$4,417.26	-$4,417.26	$444,257.78
C9	$30,253.86	$5,828.86	$38,785.76	$63,210.76	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$69,039.62
C10	$63,519.00	$47,365.78	$106,382.73	$116,382.73	$159,000.24	$156,041.84	$132,905.58	$51,983.16	$127,882.41	$204,288.36	$576,061.87
C11	$95,301.06	$44,091.06	$142,660.83	$147,083.82	$128,801.82	$121,895.64	$135,376.13	$98,043.33	$160,883.55	$137,378.89	$548,492.74
C12	$173,576.33	$122,584.33	$184,685.94	$155,160.86	$174,728.02	$155,237.02	$184,842.91	$209,012.49	$216,432.73	$171,572.67	$813,567.37
C13	$265,621.17	$160,471.22	$302,066.02	$325,075.86	$147,816.23	$170,683.76	$149,876.40	$209,148.98	$341,670.90	$266,310.38	$1,131,690.20
C14	$38,229.17	$8,229.17	$67.52	$67.52	$0.00	$0.00	$65,136.31	$13,360.30	$67,997.50	$63,679.95	$85,336.94

Work Task	2006 Obligations	2006 Expenditures	2007 Obligations	2007 Expenditures	2008 Obligations	2008 Expenditures	2009 Obligations	2009 Expenditures	2010 Obligations	2010 Expenditures	Subtotal Expenditures
C15	$98,025.48	$98,025.48	$92,892.96	$92,892.96	$81,892.97	$81,892.97	$80,882.78	$80,882.78	$96,551.48	$96,551.48	$450,245.67
C16	$0.00	$0.00	$55,332.60	$18,882.60	$0.00	$36,450.00	$0.00	$0.00	$0.00	$0.00	$55,332.60
C17	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C18	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C21	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C22	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C23	$0.00	$0.00	$138,945.21	$138,945.21	$148,207.26	$143,751.26	$70,985.95	$74,129.95	$0.00	$0.00	$356,826.42
C24	$0.00	$0.00	$0.00	$0.00	$86,935.13	$86,935.13	$377,198.25	$281,820.73	$165,079.12	$250,183.33	$618,939.19
C25	$0.00	$0.00	$0.00	$0.00	$210,841.42	$129,741.75	$228,412.27	$216,650.06	$213,756.65	$245,692.99	$592,084.80
C26	$0.00	$0.00	$0.00	$0.00	$621.85	$621.85	$74,709.00	-$291.00	$82,395.92	$49,780.55	$50,111.40
C27	$0.00	$0.00	$0.00	$0.00	$93,190.68	$39,734.64	$110,074.68	$147,061.35	$57,914.14	$71,248.65	$258,044.64
C28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$130,739.27	$68,885.22	$26,392.77	$52,670.45	$121,555.67
C29	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$80,464.99	$80,464.99	$126,061.29	$26,061.29	$106,526.28
C30	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$94,554.39	$59,880.30	$77,335.50	$93,241.41	$153,121.71
C31	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$103,693.22	$66,655.68	$100,903.63	$73,863.03	$140,518.71
C32	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$87,893.04	$87,893.04	$85,228.77	$85,228.77	$173,121.81
C33	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$205,229.84	$5,229.84	$70,817.31	$75,956.21	$81,186.05
C34	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$42,196.13	$42,196.13	$69,518.18	$69,518.18	$111,714.31
C35	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$33,949.46	$10,688.46	$10,688.46
C36	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$21,836.95	$93,004.96	$93,004.96
C37	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$266,477.27	$113,822.56	$113,822.56
C38	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6,250.70	$6,250.70	$6,250.70
C39	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$251,804.17	$170,403.17	$170,403.17
C40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$71,936.76	$2,106.76	$2,106.76
C41	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5,885.67	$5,885.67	$5,885.67
C42	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$49,236.73	$49,236.73	$49,236.73
C43	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Work Task	2006 Obligations	2006 Expenditures	2007 Obligations	2007 Expenditures	2008 Obligations	2008 Expenditures	2009 Obligations	2009 Expenditures	2010 Obligations	2010 Expenditures	Subtotal Expenditures
C44	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C45	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C46	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C47	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C48	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C49	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C50	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total C	**$1,486,847.44**	**$987,065.44**	**$1,454,120.35**	**$1,457,528.72**	**$1,619,072.73**	**$1,542,899.48**	**$2,628,714.50**	**$2,083,474.84**	**$2,980,169.16**	**$2,728,139.86**	**$8,799,108.34**
D1	$44,997.82	$44,997.82	$18,766.77	$18,766.77	$20,146.27	$20,146.27	$27,400.01	$27,400.01	$18,997.38	$18,997.38	$130,308.25
D2	$848,505.45	$708,099.72	$915,330.65	$711,050.40	$621,896.84	$907,303.29	$1,274,835.64	$556,069.59	$152,316.08	$719,637.66	$3,602,160.66
D3	$74,346.50	$25,199.42	$72,362.72	$78,829.48	$81,286.79	$69,400.31	$222,500.41	$140,793.91	$104,750.84	$113,389.00	$427,612.12
D4	$66,045.80	$3,058.80	$71,104.98	$111,368.21	$75,233.41	$61,170.52	$780.62	$24,973.85	$0.00	$0.00	$200,571.38
D5	$245,205.41	$245,205.41	$238,487.89	$238,487.89	$254,903.38	$254,903.38	$282,279.28	$282,279.28	$224,813.84	$224,813.84	$1,245,689.80
D6	$158,961.43	$58,961.43	$177,773.39	$192,511.07	$124,050.07	$166,931.67	$300,988.48	$148,813.20	$226,354.82	$194,266.82	$761,484.19
D7	$454,775.02	$166,600.05	$450,164.71	$463,095.44	$526,687.60	$710,350.15	$526,939.86	$447,287.78	$548,459.47	$521,922.72	$2,309,256.14
D8	$310,623.73	$302,623.73	$332,620.94	$340,620.94	$339,719.60	$339,719.60	$469,412.71	$469,412.71	$676,835.76	$636,835.76	$2,089,212.74
D9	$99,886.92	$33,254.92	$89,831.54	$79,684.54	$101,177.29	$40,618.43	$139,417.88	$153,474.97	$162,881.50	$169,968.27	$477,001.13
D10	$18,977.01	$18,977.01	$27,483.85	$12,118.85	$5,369.81	$20,734.81	$0.00	$0.00	$0.00	$0.00	$51,830.67
D11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
D12	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12,886.12	$7,730.12	$7,730.12
Total D	**$2,322,325.09**	**$1,606,978.31**	**$2,393,927.44**	**$2,246,533.59**	**$2,150,471.06**	**$2,591,278.43**	**$3,244,554.89**	**$2,250,505.30**	**$2,128,295.81**	**$2,607,561.57**	**$11,302,857.20**
E1	$273,378.20	$240,612.20	$230,237.45	$181,081.26	$120,026.35	$115,480.80	$195,931.36	$197,716.08	$204,821.21	$213,790.05	$948,680.39
E2	$270,978.22	$238,212.22	$0.00	$0.00	$26,446.69	$95,003.21	$86,242.83	$68,373.83	$91,981.79	$106,416.04	$508,005.30
E3	$53,581.02	$53,581.02	$94,430.60	$94,430.60	$65,565.30	$65,565.30	$97,370.14	$96,480.04	$17,434.18	$15,805.84	$325,862.80
E4	$590,485.99	$275,398.70	$782,488.02	$706,458.13	$828,982.19	$662,454.83	$1,349,593.46	$952,890.91	$1,553,565.67	$1,355,331.31	$3,952,533.88
E5	$1,292,930.68	$843,994.77	$3,322,086.06	$997,606.83	$3,611,928.60	$3,207,890.57	$789,905.06	$3,373,478.92	$770,765.54	$559,001.12	$8,981,972.21
E6	$23,437.93	$23,437.93	$16,036.43	$16,036.43	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$39,474.36
E7	$12,309.09	$12,309.09	$5,515.55	$5,515.55	$4,410.55	$597.23	$0.00	$0.00	$0.00	$0.00	$18,421.87
E8	$488,610.09	$185,255.91	$71,382.17	$317,523.58	$163,444.58	$169,788.34	$132,389.11	$104,938.56	$0.00	$59,498.19	$837,004.58

Work Task	2006 Obligations	2006 Expenditures	2007 Obligations	2007 Expenditures	2008 Obligations	2008 Expenditures	2009 Obligations	2009 Expenditures	2010 Obligations	2010 Expenditures	Subtotal Expenditures
E9	$117,538.92	$77,538.92	$85,084.59	$115,256.59	$182,393.19	$184,705.20	$2,285,834.49	$1,776,712.34	$2,129,989.54	$2,072,293.39	$4,226,506.44
E10	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E12	$32,151.02	$32,151.02	$11,633.08	$11,633.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$43,784.10
E13	$82,438.05	$82,438.05	$18,876.44	$18,876.44	$110.00	$110.00	$0.00	$0.00	$0.00	$0.00	$101,424.49
E14	$2,114,868.58	$1,630,141.53	$3,188,676.30	$3,664,056.46	$965,430.09	$970,775.11	$540,515.32	$442,013.60	$655,197.95	$464,914.90	$7,171,901.60
E15	$265,497.38	$220,949.66	$421,634.95	$383,320.87	$433,665.01	$338,520.03	$161,470.80	$201,103.14	$4,331.69	$121,330.87	$1,265,224.57
E16	$158,330.58	$200,443.47	$103,685.80	$103,685.80	$234,994.34	$234,994.34	$203,840.83	$203,145.39	$294,547.68	$251,048.46	$993,317.46
E17	$1,287.40	$1,287.40	$4,757.28	$4,757.28	$10,480.66	$10,480.66	$7,711.94	$7,711.94	$1,013,487.38	$13,487.38	$37,724.66
E18	$0.00	$0.00	$2,376.11	$2,376.11	$25,218.68	$25,218.68	$205,056.92	$190,497.11	$197,050.80	$154,637.24	$372,729.14
E19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E21	$0.00	$0.00	$0.00	$0.00	-$802.38	-$802.38	$83,869.06	$83,869.06	$26,129.72	$26,129.72	$109,196.40
E22	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E23	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E24	$0.00	$0.00	$55,957.46	$51,332.46	$1,075,422.08	$389,885.00	$689,711.29	$988,219.33	$523,414.75	$590,792.33	$2,020,229.12
E25	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$137,722.25	$117,119.60	$63,672.19	$84,274.84	$201,394.44
E25 In-Kind	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$436,000.00	$436,000.00	$436,000.00
E26	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$147.62	$147.62	$0.00	$0.00	$147.62
E27	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$12,635.95	$12,635.95	$688,738.54	$283,233.36	$295,869.31
E28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$257,890.16	$156,905.74	$156,905.74
E29	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$173,512.57	$173,512.57	$173,512.57
E30	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E31	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total E	**$5,777,823.15**	**$4,117,751.89**	**$8,414,858.29**	**$6,673,947.47**	**$7,747,715.93**	**$6,470,666.92**	**$6,979,948.43**	**$8,817,053.42**	**$9,102,531.36**	**$7,138,403.35**	**$33,217,823.05**
F1	$138,265.04	$138,265.04	$286,184.13	$255,369.52	$305,647.09	$221,016.81	$360,842.17	$344,424.98	$394,781.36	$379,228.21	$1,338,304.56
F2	$28,524.45	$28,524.45	$143,492.76	$143,492.76	$157,021.22	$78,686.22	$143,556.56	$182,724.56	$114,944.30	$125,520.30	$558,948.29
F3	$10,384.22	$10,384.22	$30,038.11	$30,038.11	$33,109.48	$33,109.48	$55,782.13	$55,782.13	$48,782.43	$48,782.43	$178,096.37
F4	$0.00	$0.00	$69,897.69	$69,897.69	$93,145.13	$93,145.13	$92,697.58	$92,697.58	$115,018.90	$115,018.90	$370,759.30

Work Task	2006 Obligations	2006 Expenditures	2007 Obligations	2007 Expenditures	2008 Obligations	2008 Expenditures	2009 Obligations	2009 Expenditures	2010 Obligations	2010 Expenditures	Subtotal Expenditures
F5	$0.00	$0.00	$41,573.87	$41,573.87	$137,912.88	$129,939.88	$175,494.19	$167,068.67	$156,279.56	$169,647.12	$508,229.54
F6	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$17,076.49	$17,076.49	$41,207.42	$41,207.42	$58,283.91
F7	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total F	**$177,173.71**	**$177,173.71**	**$571,186.56**	**$540,371.95**	**$726,835.80**	**$555,897.52**	**$845,449.12**	**$859,774.41**	**$871,013.97**	**$879,404.38**	**$3,012,621.97**
G1	$97,959.45	$97,959.45	$144,443.78	$94,607.72	$145,357.59	$174,902.91	$337,661.19	$318,351.29	$484,297.71	$438,276.83	$1,124,098.20
G3	$283,189.83	$206,117.04	$342,265.08	$230,401.38	$414,505.30	$273,816.05	$388,826.06	$441,109.20	$241,728.79	$326,952.38	$1,478,396.05
G4	$82,039.77	$80,869.98	$60,549.49	$61,719.28	$8,485.07	$8,485.07	$33,419.32	$33,419.32	$33,414.42	$33,414.42	$217,908.07
Total G	**$463,189.05**	**$384,946.47**	**$547,258.35**	**$386,728.38**	**$568,347.96**	**$457,204.03**	**$759,906.57**	**$792,879.81**	**$759,440.92**	**$798,643.63**	**$2,820,402.32**
H1	$541,500.00	$541,500.00	$561,000.00	$561,000.00	$593,500.00	$593,500.00	$605,000.00	$605,000.00	$647,000.00	$647,000.00	$2,948,000.00
H2	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total H	**$541,500.00**	**$541,500.00**	**$561,000.00**	**$561,000.00**	**$593,500.00**	**$593,500.00**	**$605,000.00**	**$605,000.00**	**$647,000.00**	**$647,000.00**	**$2,948,000.00**
I1	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$16,429.75	$16,429.75	$18,946.39	$18,946.39	$35,376.14
G5	$8,789.12	$8,789.12	$35,511.43	$35,511.43	$16,759.13	$16,759.13	$0.00	$0.00	$0.00	$0.00	$61,059.68
Total I	**$8,789.12**	**$8,789.12**	**$35,511.43**	**$35,511.43**	**$16,759.13**	**$16,759.13**	**$16,429.75**	**$16,429.75**	**$18,946.39**	**$18,946.39**	**$96,435.82**
GRAND Totals	**$13,156,895.53**	**$9,927,104.30**	**$16,555,779.12**	**$14,136,583.02**	**$15,797,674.77**	**$14,425,972.82**	**$18,000,795.16**	**$18,182,447.45**	**$19,518,164.19**	**$18,411,881.51**	**$75,083,989.10**

Work Task	2011 Obligations	2011 Expenditures	2012 Obligations	2012 Expenditures	2013 Obligations	2013 Expenditures	2014 Obligations	2014 Expenditures	2015 Obligations	2015 Expenditures	Expenditures Grand Total
A1	$1,138,509.80	$1,164,324.46	$917,627.80	$917,627.80	$975,426.99	$969,759.51	$985,556.40	$985,457.99	$1,140,477.22	$1,104,389.01	$10,995,005.59
G2	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$130,535.22
Total A	$1,138,509.80	$1,164,324.46	$917,627.80	$917,627.80	$975,426.99	$969,759.51	$985,556.40	$985,457.99	$1,140,477.22	$1,104,389.01	$11,125,540.81
B1	$206,468.97	$196,380.27	$203,360.50	$186,340.73	$195,004.95	$152,635.70	$193,518.74	$179,737.54	$183,182.91	$206,307.57	$2,158,662.37
B2	$230,585.84	$215,918.30	$298,730.97	$180,923.42	$615,852.78	$343,915.36	$305,132.56	$308,238.89	$312,306.38	$642,201.69	$3,496,327.15
B3	$136,901.52	$141,549.52	$145,868.05	$109,027.59	$197,235.85	$186,396.43	$183,710.01	$166,462.04	$174,637.87	$208,839.94	$1,244,414.09
B4	$150,310.56	$111,787.33	$148,422.27	$166,656.48	$247,640.41	$259,507.68	$606,288.45	$596,353.32	$224,440.99	$153,262.76	$2,142,765.08
B5	$270,542.88	$516,841.63	$306,855.83	$287,412.97	$308,173.52	$218,444.47	$300,297.40	$231,069.94	$686,937.96	$329,397.65	$2,739,536.89
B6	$17,692.75	$23,230.91	$66,798.28	$30,281.95	$96,823.96	$119,515.93	$135,579.70	$146,246.94	$238,485.46	$71,584.82	$651,098.11
B7	$246,148.11	$242,893.11	$173,805.16	$170,634.16	$190,829.84	$168,099.87	$223,986.77	$248,091.51	$181,782.56	$171,800.23	$2,050,370.87
B8	$83,094.77	$63,127.77	$65,514.81	$85,481.81	$96,819.84	$96,819.84	$102,290.33	$80,913.05	$115,059.95	$111,067.21	$878,805.06
B9	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,607.25
B10	$3,498.01	$17,672.96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$554,821.69
B11	$25,979.31	$72,240.61	$36,397.60	-$8,660.52	$49,516.55	$83,448.61	$50,000.00	$2,596.71	$0.00	$28,664.08	$428,954.45
Total B	$1,371,222.72	$1,601,642.41	$1,445,753.47	$1,208,098.59	$1,997,897.70	$1,628,783.89	$2,100,803.96	$1,959,709.94	$2,116,834.08	$1,923,125.95	$16,349,363.01
C1	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$146,658.15
C2	$11,293.33	$1,293.33	$10,731.82	$731.82	$11,341.43	$31,329.22	$21,811.11	$21,823.32	$10,673.49	$10,673.49	$115,851.18
C3	$10,270.70	$10,270.70	$13,408.44	$13,408.44	$19,456.71	$19,456.71	$9,297.76	$9,297.76	$466.27	$466.27	$278,663.86
C4	$11,705.91	$8,879.67	$10,162.78	$10,901.46	$10,506.74	$13,477.64	$10,846.42	$1,259.62	$10,843.67	$15,532.04	$114,832.84
C5	$95,482.79	$95,482.79	$86,835.87	$86,835.87	$48,599.65	$48,599.65	$3,360.57	$3,360.57	$0.00	$0.00	$553,877.44
C6	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$101,441.68
C7	-$2,315.00	-$2,315.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$544,649.77
C8	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$580,317.78
C9	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$112,855.62
C10	$132,922.93	$117,400.67	$126,121.64	$72,417.95	$120,874.14	$125,353.43	$133,266.56	$109,426.09	$0.00	$64,062.25	$1,064,722.26
C11	$57,589.11	$165,093.69	$140,147.91	$73,984.67	$152,127.61	$111,169.59	$153,129.68	$111,670.90	$97.67	$116,877.11	$1,127,288.70
C12	$196,158.23	$230,969.52	$54.45	-$8,270.02	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,036,266.87
C13	$80,324.83	$155,096.91	$134,764.80	$135,353.24	$135,193.23	$135,193.23	$135,247.93	$8,671.93	$135,241.40	$29,606.10	$1,695,608.41
C14	$71,883.70	$117,164.58	$71,167.73	$12,243.41	$1,468.04	$71,205.04	$1,949.93	$1,949.93	$87.21	$87.21	$287,987.11

Work Task	2011 Obligations	2011 Expenditures	2012 Obligations	2012 Expenditures	2013 Obligations	2013 Expenditures	2014 Obligations	2014 Expenditures	2015 Obligations	2015 Expenditures	Expenditures Grand Total
C15	$23,239.78	$23,239.78	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$495,740.45
C16	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$55,332.60
C17	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9,750.00
C18	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$41,981.82
C19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$53,779.96
C21	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$70,000.00
C22	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C23	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$356,826.42
C24	$183,056.69	$24,155.95	$243,998.17	$207,976.82	$187,914.63	$322,007.97	$414,350.46	$194,369.60	$161,927.64	$339,933.36	$1,707,382.89
C25	$252,351.95	$243,390.68	$246,544.45	$229,804.62	$226,898.52	$230,291.57	$179,807.87	$169,446.24	$184,143.25	$179,423.65	$1,644,441.56
C26	$4,795.46	$112,410.83	$1,165.90	-$33,711.16	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$128,811.07
C27	$42,984.20	$42,984.20	$56,612.17	$36,612.17	$20,514.72	$8,968.15	$39,890.93	$44,403.27	$39,005.31	$47,692.75	$438,705.18
C28	-$4,261.38	$31,314.99	$483.66	$212.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$153,082.74
C29	$0.00	$100,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$206,526.28
C30	$91,603.18	$84,466.75	$65,684.91	$68,876.25	$10,656.35	$33,249.11	$305.47	$305.47	$0.00	$0.00	$340,019.29
C31	$111,372.84	$175,450.98	$124,776.15	$63,276.86	$131,290.14	$151,860.69	$134,780.01	$45,850.27	$141,928.74	$73,073.82	$650,031.33
C32	$92,560.49	$92,560.49	$115,711.54	$115,711.54	$108,597.79	$108,597.79	$104,611.98	$104,611.98	$96,353.36	$96,353.36	$690,956.97
C33	$50,844.82	$245,705.92	$97,020.68	$78,504.28	$103,611.38	$80,964.08	$4,096.37	$26,374.45	$4.17	$18,889.79	$531,624.57
C34	$12,304.81	$12,304.81	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$124,019.12
C35	$146,076.28	$11,161.28	$289,115.34	$188,039.98	$25,598.83	$253,834.76	$28,887.66	$59,903.09	-$2,710.51	-$2,710.51	$520,917.06
C36	$50,440.81	$138,207.29	$13,383.19	$20,656.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$251,868.95
C37	$53,704.86	$150,988.99	$26,351.59	$26,351.59	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$291,163.14
C38	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6,250.70
C39	$174,690.00	$201,453.00	$252,447.59	$271,872.42	$279,418.33	$291,213.50	$212,290.69	$200,152.09	$305.36	$35,861.96	$1,170,956.14
C40	$125,751.99	$125,107.76	$180,401.56	$143,503.91	$221,864.02	$89,576.45	$180,030.92	$149,088.81	$186,066.42	$251,064.67	$760,448.36
C41	$31,150.14	$31,150.14	$31,584.07	$31,584.07	$57,946.18	$32,946.18	$59,605.33	$84,605.33	$330.22	$330.22	$186,501.61
C42	$103,142.42	$32,289.92	$118,748.43	$171,949.11	$180,759.55	$145,283.37	$6,542.58	$59,670.58	$1,768.46	$1,768.46	$460,198.17
C43	$1,099.56	$1,099.56	$15,413.97	$11,859.12	$27,536.19	$18,536.19	$57,873.82	$51,799.42	$24,984.19	$26,805.34	$110,099.63

Work Task	2011 Obligations	2011 Expenditures	2012 Obligations	2012 Expenditures	2013 Obligations	2013 Expenditures	2014 Obligations	2014 Expenditures	2015 Obligations	2015 Expenditures	Expenditures Grand Total
C44	$33,542.26	$33,542.26	$94,204.34	$94,204.34	$98,327.59	$98,327.59	$16,059.47	$16,059.47	$0.00	$0.00	$242,133.66
C45	$175,342.41	$125,969.16	$193,102.42	$187,812.06	$203,401.27	$214,788.25	$145,520.50	$169,729.36	$0.00	$19,067.77	$717,366.60
C46	$103,992.63	$56,680.51	$117,603.73	$112,123.63	$72,730.42	$119,691.78	$2,210.78	$7,562.21	$0.00	$0.00	$296,058.13
C47	$1,147.88	$1,147.88	$237,437.06	$50,689.87	$242,379.43	$98,332.90	$236,065.29	$229,356.08	$505.49	$338,008.42	$717,535.15
C48	$50,572.34	$50,502.41	$50,590.60	$47,752.42	-$78.00	$2,830.11	$0.00	$0.00	$0.00	$0.00	$101,084.94
C49	$0.00	$0.00	$59,867.17	$59,867.17	$150,247.28	$108,750.98	$111,069.75	$55,525.84	$62.98	$25,091.79	$249,235.78
C50	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C51	$0.00	$0.00	$26,532.93	$26,532.93	$16,027.17	$16,027.17	$0.00	$0.00	$0.00	$0.00	$42,560.10
C52	$0.00	$0.00	$22,422.40	$22,422.40	$149,568.98	$72,953.74	$290,368.44	$238,350.92	$107,103.99	$179,542.54	$513,269.60
C53	$0.00	$0.00	$105,869.79	$54,806.89	$112,559.64	$104,822.29	$117,501.56	$89,776.63	$117,133.38	$161,483.35	$410,889.16
C54	$0.00	$0.00	$0.00	$0.00	$9,110.44	$9,110.44	$0.00	$0.00	$0.00	$0.00	$9,110.44
C55	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C56	$0.00	$0.00	$0.00	$0.00	$22,208.29	$22,208.29	$0.00	$0.00	$0.00	$0.00	$22,208.29
C57	$0.00	$0.00	$0.00	$0.00	$232,247.32	$164,854.07	$229,689.31	$147,537.58	$226,958.99	$229,487.28	$541,878.93
C58	$0.00	$0.00	$0.00	$0.00	$30,179.14	$30,179.14	$0.00	$0.00	$0.00	$0.00	$30,179.14
C59	$0.00	$0.00	$0.00	$0.00	$21,530.67	$21,530.67	$23,637.54	$23,637.54	$65,217.24	$65,217.24	$110,385.45
C60	$0.00	$0.00	$0.00	$0.00	$58,428.29	$58,428.29	$64,680.00	$13,524.27	$74,319.36	$48,114.99	$120,067.55
C61	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$118,472.41	$15,602.82	$188,348.83	$194,290.53	$209,893.35
C62	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$192,514.27	$40,205.32	$175,622.04	$211,182.51	$251,387.83
C63	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$102,751.51	$102,751.51	$102,751.51
C64	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$686,445.37	$502,874.59	$502,874.59
C65	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$20,738.26	$20,738.26	$20,738.26
Total C	$2,576,822.95	$3,046,622.40	$3,380,469.25	$2,686,898.91	$3,501,042.11	$3,465,950.03	$3,439,773.37	$2,504,908.76	$2,756,723.76	$3,403,642.12	$24,430,046.14
D1	$18,725.89	$18,725.89	$21,802.58	$21,802.58	$16,679.67	$16,679.67	$35,186.60	$35,186.60	$38,402.79	$38,402.79	$290,472.87
D2	$655,142.92	$850,868.92	$708,540.74	$654,118.74	$751,497.04	$607,541.04	$717,918.05	$780,849.57	$848,055.38	$756,195.15	$7,621,908.70
D3	$120,009.76	$96,376.11	$111,833.44	$123,606.98	-$355.45	$90,388.13	$536.95	$536.95	$0.00	$0.00	$738,520.29
D4	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$261,091.38
D5	$289,547.70	$289,547.70	$253,792.34	$253,792.34	$223,815.69	$223,815.69	$290,972.22	$290,972.22	$300,836.44	$300,836.44	$2,851,772.52
D6	$237,749.92	$295,090.92	$465,205.66	$282,206.66	$204,049.07	$271,954.57	$366,627.83	$447,814.76	$368,062.30	$258,214.80	$2,316,765.90

Work Task	2011 Obligations	2011 Expenditures	2012 Obligations	2012 Expenditures	2013 Obligations	2013 Expenditures	2014 Obligations	2014 Expenditures	2015 Obligations	2015 Expenditures	Expenditures Grand Total
D7	$543,056.20	$600,256.19	$563,565.52	$569,156.61	$413,612.30	$477,418.69	$756,988.58	$677,804.89	$832,589.27	$694,743.66	$5,328,636.18
D8	$614,086.24	$592,711.03	$624,518.66	$617,542.15	$718,996.60	$680,269.86	$802,447.87	$707,882.53	$846,376.22	$901,689.69	$5,723,554.08
D9	$147,131.56	$217,528.56	$188,280.52	$141,512.52	$139,177.55	$120,617.55	$387,326.01	$266,830.50	$404,116.29	$446,743.21	$1,670,233.47
D10	$33,659.04	$33,659.04	$20,104.65	$20,104.65	$28,675.73	$28,675.73	$40,251.89	$40,251.89	$37,704.76	$37,704.76	$212,226.74
D11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$269,097.12
D12	$117,017.13	$45,155.76	$238,443.61	$135,439.05	$27,021.18	$156,693.19	$29,627.44	$57,774.25	$16,710.85	$34,622.00	$437,414.37
D13	$0.00	$0.00	$0.00	$0.00	$31,431.21	$31,431.21	-$2,049.23	-$2,049.23	$0.00	$0.00	$29,381.98
Total D	$2,776,126.36	$3,039,920.12	$3,196,087.72	$2,819,282.28	$2,554,600.59	$2,705,485.33	$3,425,834.21	$3,303,854.93	$3,692,854.30	$3,469,152.50	$27,751,075.60
E1	$267,986.63	$222,156.86	$916,620.08	$890,963.41	$194,295.82	$288,427.90	$130,785.45	$140,850.75	$280,221.40	$272,738.49	$3,987,475.52
E2	$132,989.92	$140,484.47	-$424.29	-$424.29	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$795,399.33
E3	$0.00	$61,353.62	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$871,228.19
E4	$1,483,727.80	$1,502,175.84	$1,154,766.77	$1,688,339.54	$620,712.27	$950,586.82	$487,583.25	$413,261.53	$822,212.91	$796,715.11	$9,320,891.26
E5	$451,820.04	$734,522.58	$361,277.27	$265,712.51	$330,356.42	$334,268.82	$505,920.13	$362,619.34	$722,727.85	$572,069.89	$11,351,713.78
E6	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$119,060.75
E7	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$330,621.55
E8	$0.00	$22,143.98	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$860,184.06
E9	$738,284.20	$961,222.68	$414,640.69	$449,967.31	$533,086.04	$743,401.36	$229,824.73	$124,625.32	$204,369.70	$263,913.43	$6,822,956.73
E10	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E12	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$76,211.53
E13	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$127,336.82
E14	$508,610.43	$683,705.92	$771,006.55	$456,991.14	$303,452.23	$211,790.86	$693,768.00	$603,003.55	$328,870.83	$457,512.18	$9,669,214.32
E15	$17,255.29	$17,255.29	$28,211.19	$28,211.19	$346,829.92	$346,829.92	$36,460.07	$36,460.07	$0.00	$0.00	$1,693,981.04
E16	$259,346.35	$186,157.60	$209,391.63	$261,624.65	$374,317.11	$340,717.17	$701,608.57	$664,262.56	$539,525.37	$502,846.80	$2,954,318.83
E17	$41,359.94	$730,765.63	$2,209,091.02	$332,533.05	$4,150.44	-$1,022.08	$29,544.13	$34,905.78	$1,450.25	$5,711.62	$1,140,618.66
E18	$205,944.26	$205,088.24	$326,234.76	$319,805.30	$320,149.03	$345,526.78	$268,053.92	$195,736.81	$226,303.00	$169,878.49	$1,608,764.76
E19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$35,000.00
E21	$34,019.70	$34,019.70	$44,803.79	$44,803.79	$21,118.37	$21,118.37	$45,033.35	$41,257.95	$78,302.48	$74,076.04	$344,212.22

Work Task	2011 Obligations	2011 Expenditures	2012 Obligations	2012 Expenditures	2013 Obligations	2013 Expenditures	2014 Obligations	2014 Expenditures	2015 Obligations	2015 Expenditures	Expenditures Grand Total
E22	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,028.00
E23	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E24	$639,675.70	$716,795.58	$862,441.09	$278,064.73	$486,307.81	$940,366.25	$209,836.42	$235,620.63	$655,451.78	$287,931.95	$4,479,008.26
E25	$10,293.25	$10,293.25	$16,826.97	$16,826.97	$33,525.59	$33,525.59	$30,349.86	$30,349.86	$24,878.09	$24,878.09	$317,268.20
E25 In-Kind	$436,000.00	$436,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$872,000.00
E26	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$147.62
E27	$3,060,556.46	$810,593.24	$6,562,631.03	$7,039,753.11	$9,741,932.20	$8,277,899.41	$6,081,471.60	$6,401,845.20	$1,759,859.79	$3,428,595.18	$26,254,555.45
E28	$258,521.17	$330,289.20	$75,792.42	$105,008.81	$407,557.78	$57,557.78	$492,318.96	$582,219.68	$467,563.97	$463,730.05	$1,695,711.26
E29	$59,667.12	$59,667.12	$16.19	$16.19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$233,195.88
E30	$88,884.93	$88,884.93	$166,849.05	$166,849.05	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$255,733.98
E31	$21,979.16	$16,115.11	$88,198.74	$40,690.67	$180,047.99	$166,150.09	$86,326.00	$121,088.85	$112,273.39	$96,396.54	$440,441.26
E32	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E33	$0.00	$0.00	$0.00	$0.00	$68,671.93	$68,671.93	$344,159.32	$46,007.34	$970,299.11	$1,153,339.17	$1,268,018.44
E34	$0.00	$0.00	$0.00	$0.00	$31,841.15	$31,841.15	$49,616.14	$49,616.14	$51,701.73	$51,701.73	$133,159.02
E35	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$460,588.99	$324,968.99	$324,968.99
Total E	$8,716,922.35	$7,969,690.84	$14,208,374.95	$12,385,737.13	$13,998,352.10	$13,157,658.12	$10,422,659.90	$10,083,731.36	$7,706,600.64	$8,947,003.75	$88,387,425.71
F1	$480,326.82	$497,781.32	$754,927.68	$534,777.49	$562,295.14	$570,240.00	$472,448.47	$556,007.87	$490,889.62	$582,775.42	$4,279,379.33
F2	$185,177.77	$158,354.77	$375,849.49	$144,306.35	$102,444.23	$251,596.81	$197,840.80	$219,866.33	$134,175.16	$249,662.70	$1,647,971.06
F3	$53,952.06	$53,952.06	$21,525.04	$21,525.04	$39,625.36	$39,625.36	$56,766.91	$56,766.91	$52,897.74	$52,897.74	$425,887.03
F4	$119,649.91	$118,393.86	$109,437.27	$108,730.08	$194,445.95	$115,358.44	$165,161.31	$135,657.71	$141,235.70	$204,901.37	$1,053,800.76
F5	$153,930.06	$153,930.06	$172,897.42	$172,897.42	$185,702.47	$169,462.47	$271,044.01	$282,119.71	$235,350.31	$235,255.38	$1,521,894.58
F6	$88,758.78	$88,758.78	$79,854.92	$79,854.92	$83,708.30	$83,708.30	$71,134.99	$71,134.99	$71,572.40	$65,976.52	$447,717.42
F7	$1,403.06	$1,403.06	$14,271.51	$14,271.51	$4,124.05	$4,124.05	$29,476.43	$29,476.43	$29,091.63	$29,091.63	$78,366.68
Total F	$1,083,198.46	$1,072,573.91	$1,528,763.33	$1,076,362.81	$1,172,345.50	$1,234,115.43	$1,263,872.92	$1,351,029.95	$1,155,212.56	$1,420,560.76	$9,455,016.86
G1	$678,848.47	$625,217.16	$728,250.63	$609,246.83	$735,993.97	$660,072.89	$878,992.90	$726,443.64	$572,953.39	$815,667.39	$4,560,746.11
G3	$54,339.42	$171,292.05	$282,786.62	$255,093.82	$276,217.73	$242,843.95	$260,667.43	$178,425.51	$133,374.64	$143,481.89	$2,469,533.27
G4	$137,434.07	$137,434.07	$127,754.31	$127,754.31	$260,581.13	$221,014.16	$275,414.62	$214,681.09	$212,457.02	$218,594.94	$1,137,386.64
Total G	$870,621.96	$933,943.28	$1,138,791.56	$992,094.96	$1,272,792.83	$1,123,931.00	$1,415,074.95	$1,119,550.24	$918,785.05	$1,177,744.22	$8,167,666.02

Work Task	2011 Obligations	2011 Expenditures	2012 Obligations	2012 Expenditures	2013 Obligations	2013 Expenditures	2014 Obligations	2014 Expenditures	2015 Obligations	2015 Expenditures	Expenditures Grand Total
H1	$5,359,500.00	$5,359,500.00	$5,445,000.00	$5,445,000.00	$5,629,500.00	$5,629,500.00	$7,604,720.64	$7,604,720.64	$5,480,049.36	$5,480,049.36	$32,466,770.00
H2	$0.00	$0.00	$0.00	$0.00	$998,298.00	$998,298.00	$1,434,267.44	$1,434,267.44	$1,562,029.94	$1,562,029.94	$3,994,595.38
Total H	$5,359,500.00	$5,359,500.00	$5,445,000.00	$5,445,000.00	$6,627,798.00	$6,627,798.00	$9,038,988.08	$9,038,988.08	$7,042,079.30	$7,042,079.30	$36,461,365.38
I1	$76,251.83	$76,251.83	$96,516.90	$96,516.90	$97,824.27	$97,824.27	$104,431.22	$104,431.22	$98,604.57	$98,604.57	$509,004.93
G5	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$61,059.68
Total I	$76,251.83	$76,251.83	$96,516.90	$96,516.90	$97,824.27	$97,824.27	$104,431.22	$104,431.22	$98,604.57	$98,604.57	$570,064.61
GRAND Totals	**$23,969,176.43**	**$24,264,469.25**	**$31,357,384.98**	**$27,627,619.38**	**$32,198,080.09**	**$31,011,305.58**	**$32,196,995.01**	**$30,451,662.47**	**$26,628,171.48**	**$28,586,302.18**	**$222,697,564.14**

Attachment E – Reports Published in Fiscal Year 2015

Except where otherwise noted for journal articles, these reports are available on the Lower Colorado River Multi-Species Conservation Program Web site at: http://www.lcrmscp.gov/steer_committee/technical_reports.html

Work Task	Report Title
C-2	Sticky Buckwheat/Threecorner Milkvetch Conservation, 2014 Annual Report
C-4	Relict Leopard Frog Monitoring and Management, 2013 Annual Report
C-4	Relict Leopard Frog Monitoring and Management, 2014 Annual Report
C-5	Effects of Abiotic Factors on Insect Populations in Riparian Restoration Sites, 2012 Annual Report
C-10	Razorback Sucker and Bonytail Chub Predator Recognition
C-12	Demographics and Post-Stocking Survival of Repatriated Razorback Suckers in Lake Mohave, 2007 Annual Report
C-12	Demographics and Post-Stocking Survival of Repatriated Razorback Suckers in Lake Mohave, 2009 Annual Report
C-12	Demographics and Post-Stocking Survival of Repatriated Razorback Suckers in Lake Mohave, 2011 Annual Report
C-13	Razorback Sucker Studies on Lake Mead, Nevada, and Arizona, 2006–2007 Annual Report
C-13	Razorback Sucker Studies on Lake Mead, Nevada, and Arizona, 2012 Annual Report
C-25	Imperial Ponds Water Management Plan 2011–2013
C-25	Imperial Ponds Renovation Plan, 2014
C-33	Comparative Survival of 500 mm Razorback Sucker Released in Reach 3, 2013 Annual Report
C-33	Comparative Survival of 500 mm Razorback Sucker Released in Reach 3, 2014 Annual Report
C-34	Characterization of Zooplankton Communities in Off-Channel Native Fish Habitats: 2009–2011
C-39	Post-Stocking Distribution and Survival of Bonytail in Reach 3, 2013 Annual Report
C-39	Post-Stocking Distribution and Survival of Bonytail in Reach 3, 2014 Annual Report

Work Task	Report Title
C-44	Management of Fish Food Resources in Off-Channel Native Fish Habitats, 2011–2013 Annual Report
C-46	Physiological Stress Response in Bonytail and Razorback Sucker to Handling and Transport
C-57	Sonic Telemetry of Lake Mead Juvenile Razorback Suckers, 2013–2014 Annual Report
C-57	Sonic Telemetry of Lake Mead Juvenile Razorback Suckers, 2014–2015 Annual Report
D-1	Marsh Bird Surveys, 2013 Annual Report
D-2	Southwestern Willow Flycatcher Presenc3/Absence Surveys, 2014 Annual Report
D-7	Yellow-billed Cuckoo Presence/Absence Surveys, 2014 Annual Report
D-8	Razorback Sucker and Bonytail Stock Assessment, 2011–2012 Annual Report
D-8	Razorback Sucker and Bonytail Stock Assessment, 2013 Annual Report
D-8	Razorback Sucker and Bonytail Stock Assessment, 2013–2014 Annual Report
D-8	Demographics and Monitoring of Repatriated Razorback Suckers in Lake Mohave 2011–2014
D-9	System Monitoring and Research of Covered Bat Species Roost Surveys, 2013 Annual Report
E-1	Beal Lake Conservation Area, 2011 Development and Monitoring Plan
E-1	Beal Lake Conservation Area, 2011 Annual Report
E-1	Beal Lake Conservation Area, 2012 Annual Report
E-4	Palo Verde Ecological Reserve, 2012 Annual Report
E-5	Cibola Valley Conservation Area, 2011 Annual Report
E-5	Cibola Valley Conservation Area, 2012 Annual Report
E-9	Hart Mine Marsh, 2012 Annual Report
E-14	Imperial Ponds Conservation Area, 2012 Annual Report
E-14	Monitoring and Research Priorities for the Imperial Ponds, Imperial Ponds Conservation Area, Five Year Plan: 2014–2018
E-24	Cibola NWR Unit #1, 2011 Annual Report
E-24	Cibola NWR Unit #1, 2012 Annual Report
E-25	Big Bend Conservation Area, 2012 Annual Report

Work Task	Report Title
F-1	Habitat Monitoring, 2011 Annual Report
F-1	Habitat Monitoring, 2012 Annual Report
F-1	Habitat Monitoring, 2013 Annual Report
F-1	Habitat Monitoring, 2014 Annual Report
F-7	Post-Development Monitoring of Marsh Birds, 2013 Annual Report
G-4	Bonytail Basic Conceptual Ecological Model for the Lower Colorado River