Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Final Implementation Report, Fiscal Year 2019 Work Plan and Budget, Fiscal Year 2017 Accomplishment Report

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

June 2018

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 2019 Work Plan and Budget, Fiscal Year 2017 Accomplishment Report

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

June 2018

ACRONYMS AND ABBREVIATIONS

AGFD	Arizona Game and Fish Department
AJ	Arizona Juvenile backwater
ALS	aerial laser scanning
AMM	Avoidance and Minimization Measure
AMP	Adaptive Management Program
ARCC	Aquatic Research Conservation Center (Arizona Game and Fish Department)
BBCA	Big Bend Conservation Area
BEVI	Arizona Bell's vireo (*Vireo bellii arizonae*) conservation measure
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*) conservation measure
BO	Biological and Conference Opinion
BONY	bonytail (*Gila elegans*) conservation measure
CDFW	California Department of Fish and Wildlife
Center	Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico
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*) conservation measure
CLRA	Yuma clapper rail (*Rallus longirostris yumanensis* [also known as Yuma Ridgway's rail = *R. obsoletus yumanensis*]) conservation measure
CMM	Conservation Area Management Measure
Commission	California State Lands Commission
CRCR	Colorado River cotton rat (*Sigmodon arizonae plenus*) conservation measure
CRTO	Colorado River toad (*Bufo alvarius = Incilius alvarius*) conservation measure
CVCA	Cibola Valley Conservation Area
CVIDD	Cibola Valley Irrigation and Drainage District

DAR	digital automated recorder
DETO	desert tortoise (Mojave population) (*Gopherus agassizii*) conservation measure
DNA	deoxyribonucleic acid
DO	dissolved oxygen
DPMO	desert pocket mouse (*Chaetodipus penicillatus sobrinus*) conservation measure
eDNA	environmental deoxyribonucleic acid
ELOW	elf owl (*Micrathene whitneyi*) conservation measure
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FLSU	flannelmouth sucker (*Catostomus latipinnis*) conservation measure
FMA	Funding and Management Agreement
FTHL	flat-tailed horned lizard (*Phrynosoma mcalli*) conservation measure
FY	fiscal year
GIFL	gilded flicker (*Colaptes chrysoides*) conservation measure
GIWO	Gila woodpecker (*Melanerpes uropygialis*) conservation measure
Glen Canyon Dam AMP	Glen Canyon Dam Adaptive Management Program
GNSS	global navigation satellite system
Havasu NWR	Havasu National Wildlife Refuge
HCP	Habitat Conservation Plan
HMF	Habitat Maintenance Fund
HUCH	humpback chub (*Gila cypha*) conservation measure
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 hesperis*) conservation measure
lidar	light detection and ranging
LLFR	lowland leopard frog (*Rana yavapaiensis* = *Lithobates yavapaiensis*) conservation measure
m	meter(s)
MAPS	Monitoring Avian Productivity and Survivorship
MEFF	mobile electronic field form
mg/L	milligram(s) per liter
mm	millimeter(s)
MNSW	MacNeill's sootywing skipper (*Pholisora gracielae* = *Hesperopsis gracielae* [MacNeill]) conservation measure
Mora NFH	Mora National Fish Hatchery
MOU	Memorandum of Understanding
MRM	Monitoring and Research Measure
mtDNA	mitochondrial deoxyribonucleic acid
MVCA	Mohave Valley Conservation Area
N/A	not applicable
NDOW	Nevada Department of Wildlife
NMGS	northern Mexican gartersnake (*Thamnophis eques megalops*) conservation measure
NPS	National Park Service
Pahranagat NWR	Pahranagat National Wildlife Refuge
pH	acidity or alkalinity of a solution
PIT	passive integrated transponder
ppm	parts per million
PTBB	pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens* = *Plecotus townsendii pallescens* =*C. townsendii townsendii*) conservation measure
PVC	polyvinyl chloride
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*) conservation measure
Reclamation	Bureau of Reclamation
RISE	Reclamation Information Sharing Environment
RLFR	relict leopard frog (*Rana onca*) conservation measure
RMF	Remedial Measures Fund
SDCWA	San Diego County Water Authority
SNP	single nucleotide polymorphism
SNWA	Southern Nevada Water Authority
sootywing	MacNeill's sootywing skipper (*Pholisora gracielae* = *Hesperopsis gracielae* [MacNeill]) conservation measure
SSA	species status assessment
STBU	sticky buckwheat (*Eriogonum viscidulum*) conservation measure
SUR	submersible ultrasonic receiver
SUTA	summer tanager (*Piranga rubra*) conservation measure
SWFL	southwestern willow flycatcher (*Empidonax trailli extimus*) conservation measure
THMI	threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*) conservation measure
TL	total length
TLS	terrestrial laser scanning
UAS	unmanned aerial system
USFWS	U.S. Fish and Wildlife Service
VEFL	vermilion flycatcher (*Pyrocephalus rubinus*) conservation measure
VES	visual encounter survey
VES C/R	visual encounter survey with a call/response component
WIFL	southwestern willow flycatcher (*Empidonax traillii extimus*) conservation measure
Willow Beach NFH	Willow Beach National Fish Hatchery
WRBA	western red bat (*Lasiurus blossevilli*) conservation measure
WYBA	western yellow bat (*Lasiurus xanthinus*) conservation measure

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

Symbols

°C	degrees Celsius
>	greater than
<	less than
≤	less than or equal
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter
%	percent
+	plus (at least)

LIST OF COMMON AND SCIENTIFIC NAMES

Common name	Scientific name
Amphibians	
Lowland leopard frog	*Rana yavapaiensis* = *Lithobates yavapaiensis*
Relict leopard frog	*Rana onca*
Bats	
California leaf-nosed bat	*Macrotus californicus*
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens* = *Plecotus townsendii pallescens* = *C. townsendii*
Western red bat	*Lasiurus blossevillii*
Western yellow bat	*Lasiurus xanthinus*
Birds	
Abert's towhee	*Melozone aberti*
Arizona Bell's vireo	*Vireo bellii arizonae*
Bell's vireo	*Vireo bellii*
Blue grosbeak	*Passerina caerulea*
Brown-headed cowbird	*Molothrus ater*
California black rail	*Laterallus jamaicensis coturniculus*
Cormorant	*Phalacrocorax auritus*
Elf owl	*Micrathene whitneyi*
Flycatcher	*Empidonax traillii*
Gila woodpecker	*Melanerpes uropygialis*
Gilded flicker	*Colaptes chrysoides*
Great blue heron	*Ardea herodias*
Northern flicker	*Colaptes auratus*
Osprey	*Pandion haliaetus*
Sonoran yellow warbler	*Dendroica petechia sonorana* = *Setophaga petechia sonorana*
Southwestern willow flycatcher	*Empidonax traillii extimus*
Summer tanager	*Piranga rubra*
Vermilion flycatcher	*Pyrocephalus rubinus*
Western least bittern	*Ixobrychus exilis hesperis*
Yellow-billed cuckoo	*Coccyzus americanus occidentalis*
Yellow warbler	*Setophaga petechia*
Yuma clapper rail	*Rallus longirostris yumanensis* (also known as Yuma Ridgway's rail = *R. obsoletus yumanensis*)

Fish	
Bluegill	*Lepomis macrochirus*
Bonytail	*Gila elegans*
Flannelmouth sucker	*Catostomus latipinnis*
Flathead catfish	*Pylodictis olivaris*
Humpback chub	*Gila cypha*
Largemouth bass	*Micropterus salmoides*
Mosquitofish	*Gambusia affinis*
Rainbow trout	*Oncorhynchus mykiss*
Razorback sucker	*Xyrauchen texanus*
Striped bass	*Morone saxatilis*
Freshwater parasites	
Ich	*Ichthyophthirius multifiliis*
Invertebrates	
MacNeill's sootywing skipper	*Pholisora gracielae* = *Hesperopsis gracielae* (MacNeill)
Quagga mussel	*Dreissena bugensis*
Plants	
Alfalfa	*Medicago sativa*
Bulrush	*Scirpus* spp.
California bulrush	*Schoenoplectus californicus*
Cattail	*Typha* spp.
Common three-square bulrush	*Schoenoplectus pungens*
Five-hook bassia	*Bassia hyssopifolia*
Fremont cottonwood	*Populus fremontii*
Goodding's willow	*Salix gooddingii*
Honey mesquite	*Prosopis glandulosa*
Mesquite	*Prosopis* spp.
Phragmites	*Phragmites australis*
Quailbush	*Atriplex lentiformis*
Saguaro	*Carnegiea gigantea*
Sahara mustard	*Brassica tournefortii*
Saltcedar	*Tamarix* spp.
Softstem bulrush	*Scripus tabermontani*
Sticky buckwheat	*Eriogonum viscidulum*
Olney's three-square bulrush	*Scirpus olneyii*
Threecorner milkvetch	*Astragalus geyeri* var. *triquetrus*
Willow	*Salix* spp.

Reptiles	
Desert tortoise (Mojave population)	*Gopherus agassizii*
Flat-tailed horned lizard	*Phrynosoma mcalli*
Northern Mexican gartersnake	*Thamnophis eques megalops*
Small mammals	
Colorado River cotton rat	*Sigmodon arizonae plenus*
Desert pocket mouse	*Chaetodipus penicillatus sobrinus*
Yuma hispid cotton rat	*Sigmodon hispidus eremicus*

CONTENTS

Page

Program Overview 1
Program Implementation 2
LCR MSCP Funding 3
FY19 Contributions and Adjustments 4
2001 Biological Opinion Account 4
Habitat Maintenance Fund 5
Remedial Measures Fund 5
Land and Water Fund 6
In-Kind Contributions 6
California Endangered Species Act Permit 6
Proposed FY19 Program Activities and FY17 Accomplishments 7
Compliance Reporting 15
LCR MSCP 15
2001 Biological Opinion 34
California Endangered Species Act Permit 34

Overview of Work Tasks

Fish Augmentation, Monitoring, and Research 37
Fish Augmentation (Section B) 37
FY17 Accomplishments 38
FY18 Activities 41
Species Research (Section C) 43
FY17 Accomplishments 43
FY18 Activities 46
Proposed FY19 Activities 48
System Monitoring (Section D) 48
FY17 Accomplishments 48
FY18 Activities 51
Proposed FY19 Activities 51
Post-Development Monitoring (Section F) 51
FY17 Accomplishments 51
FY18 Activities 52
Proposed FY19 Activities 53
Adaptive Management Program (Section G) 53
FY17 Accomplishments 54
FY18 Activities 54
Proposed FY19 Activities 55
Monitoring and Research of Terrestrial, Riparian, and Marsh Habitats and Associated Covered Species 57
Species Research (Section C) 57
FY17 Accomplishments 59

Page

FY18 Activities 61
Proposed FY19 Activities 62
System Monitoring (Section D) 62
FY17 Accomplishments 63
FY18 Activities 65
Proposed FY19 Activities 67
Post-Development Monitoring (Section F) 68
FY17 Accomplishments 68
FY18 Activities 72
FY19 Proposed Activities 73
Adaptive Management Program (Section G) 73
FY17 Accomplishments 73
FY18 Activities 74
FY19 Proposed Activities 75
Conservation Area Development, Maintenance, and Adaptive Management 77
Conservation Area Development and Management (Section E) 77
Site Identification and Selection 79
Development and Maintenance 104
Adaptive Management Program (Section G) 110
FY17 Accomplishments 110
FY18 Activities 112
FY19 Proposed Activities 112

Work Tasks – Section A (Program Administration)

Work Task A1: Program Administration 115

Work Tasks – Section B (Fish Augmentation)

Work Task B1: Lake Mohave Razorback Sucker Larvae Collections 117
Work Task B2: Willow Beach National Fish Hatchery 120
Work Task B3: Achii Hanyo Native Fish Rearing Facility 124
Work Task B4: Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico 127
Work Task B5: Bubbling Ponds Fish Hatchery 130
Work Task B6: Lake Mead Fish Hatchery 133
Work Task B7: Lakeside Rearing Ponds 137
Work Task B8: Fish Tagging Equipment 141
Work Task B12: Maintenance of Alternate Bonytail Broodstock 143

Work Tasks – Section C (Species Research)

Work Task C2: Sticky Buckwheat and Threecorner Milkvetch Conservation 145
Work Task C14: Humpback Chub Program Support 147

Page

Work Task C24: Avian Species Habitat Requirements 149
Work Task C25: Imperial Ponds Native Fish Research 153
Work Task C31: Razorback Sucker Genetic Diversity Assessment 156
Work Task C32: Determination of Salinity, Temperature, pH, and Oxygen Limits for Bonytail and Razorback Suckers 159
Work Task C40: Genetic and Demographic Studies to Inform Conservation Management of Razorback Suckers and Bonytail in Off-Channel Habitats 162
Work Task C52: Gilded Flicker Riparian Habitat Use and Seasonal Movement Research..... 166
Work Task C53: Sonic Telemetry of Juvenile Flannelmouth Suckers in Reach 3 169
Work Task C59: Selenium Monitoring in Created Backwater and Marsh Habitats 172
Work Task C60: Habitat Manipulation..... 175
Work Task C61: Evaluation of Alternative Stocking Methods for Fish Augmentation..... 180
Work Task C62: Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study 185
Work Task C63: Evaluation of Habitat Features that May Influence Success of Razorback Suckers and Bonytail in Backwater Environments 187
Work Task C64: Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail..... 191
Work Task C65: Evaluation of Immediate Post-Stocking Survival of Razorback Suckers and Bonytail..... 197
Work Task C66: Marsh Bird Water Depth Analysis 201

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 211
Work Task D6: System Monitoring for Riparian Obligate Avian Species 214
Work Task D7: Yellow-billed Cuckoo Presence/ Absence Surveys 218
Work Task D8: Razorback Sucker and Bonytail Stock Assessment..... 221
Work Task D9: System Monitoring of Covered Bat Species 226
Work Task D10: System Monitoring of Rodent Populations..... 229
Work Task D12: Lowland Leopard Frog and Colorado River Toad Surveys..... 231
Work Task D14: System-Wide Monitoring of MacNeill's Sootywing Skippers..... 233

Page

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

Work Task E1: Beal Lake Conservation Area 235
Work Task E4: Palo Verde Ecological Reserve 241
Work Task E5: Cibola Valley Conservation Area 245
Work Task E9: Hart Mine Marsh 249
Work Task E13: McAllister Lake 252
Work Task E14: Imperial Ponds Conservation Area 256
Work Task E16: Conservation Area Site Selection 261
Work Task E17: Topock Marsh Pumping 267
Work Task E18: Law Enforcement and Fire Suppression 270
Work Task E21: Planet Ranch 272
Work Task E24: Cibola National Wildlife Refuge Unit #1 Conservation Area 277
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 E35: Mohave Valley Conservation Area 300
Work Task E36: Parker Dam Camp 303
Work Task E37: Palo Verde Ecological Reserve-South 306
Work Task E38: Three Fingers Lake 308
Work Task E39: Dennis Underwood Conservation Area 311
Work Task E40: Yuma Meadows Conservation Area 313

Work Tasks – Section F (Post-Development Monitoring)

Work Task F1: Habitat Monitoring at Conservation Areas 315
Work Task F2: Avian Monitoring at Conservation Areas 319
Work Task F3: Rodent Monitoring at Conservation Areas 325
Work Task F4: Bat Species Monitoring at Conservation Areas 327
Work Task F5: Post-Development Monitoring of Fishes at Conservation Areas 330
Work Task F6: Post-Development Monitoring of MacNeill's Sootywing Skippers at Conservation Areas 334
Work Task F7: Marsh Bird Monitoring at Conservation Areas 336
Work Task F8: Reptile and Amphibian Monitoring at Conservation Areas 339
Work Task F9: Southwestern Willow Flycatcher Monitoring at Conservation Areas 341
Work Task F10: Yellow-billed Cuckoo Monitoring at Conservation Areas 343

Page

Work Tasks – Section G (Adaptive Management Program)

Work Task G1: Data Management 345
Work Task G3: Adaptive Management Research Projects..... 350
Work Task G4: Science/Adaptive Management Strategy 352
Work Task G6: Conceptual Ecological Models 357

Work Tasks – Section H (Funding Accounts)

Work Task H1: Habitat Maintenance Fund 361
Work Task H2: Remedial Measures Fund..... 364

Work Tasks – Section I (Public Outreach)

Work Task I1: Public Outreach 367

Tables

Table Page

1-1 Federal/Non-Federal Funding Requirements for the LCR MSCP..... 3
1-2 FY19 Contribution Schedule 4
1-3 RMF 5
1-4 Land and Water Fund..... 6
1-5 FY19 Proposed Program Funding 7
1-6 Annual Funding Matrix..... 8
1-7 Conservation Area Land Cover Type 16
1-8 Conservation Area by Species Habitat Creation Conservation Measures 17
1-9a Summary of Fish Augmentation Conservation Measure RASU5 21
1-9b Summary of Fish Augmentation Conservation Measure RASU3 21
1-9c Summary of Fish Augmentation Conservation Measure BONY3 21
1-10 Status of Conservation Measures..... 22
1-11 Population estimate for razorback suckers by LCR MSCP river reach in FY17..... 49
1-12 LCR MSCP Covered Species Post-Development Monitoring Conducted in FY17..... 69
1-13 Acreage by Conservation Area Through FY17 106
1-14 Land Cover Type by Reach and State Through FY17..... 107

Figures

Figure Page

1-1 Conservation area development and management, 2017. 83
1-2 E1 – Beal Lake Conservation Area managed acreage through FY17. 84
1-3 E4 – Palo Verde Ecological Reserve managed acreage through FY17. 85
1-4 E5 – Cibola Valley Conservation Area managed acreage through FY17. 86
1-5 E9 – Hart Mine Marsh managed acreage through FY17. 87
1-6 E14 – Imperial Ponds Conservation Area managed acreage through FY17. 88
1-7 E21 – Planet Ranch managed acreage through FY17. 89
1-8 E24 – Cibola National Wildlife Refuge Unit #1 Conservation Area managed acreage through FY17. 90
1-9 E25 – Big Bend Conservation Area managed acreage through FY17. 91
1-10 E27 – Laguna Division Conservation Area managed acreage through FY17. 92
1-11 E28 – Yuma East Wetlands managed acreage through FY17. 93
1-12 E31 – Hunters Hole managed acreage through FY17. 94
1-13 E33 – Pretty Water Conservation Area managed acreage through FY17. 95
1-14 E35 – Mohave Valley Conservation Area managed acreage through FY17. 96
1-15 E36 – Parker Dam Camp managed acreage through FY17. 97
1-16 E1 – Beal Lake Conservation Area proposed boundary expansion. 98
1-17 E24 – Cibola National Wildlife Refuge Unit #1 Conservation Area proposed boundary expansion. 99
1-18 E37 – Palo Verde Ecological Reserve-South proposed conservation area boundary. 100
1-19 E38 – Three Fingers Lake proposed conservation area boundary. 101
1-20 E39 – Dennis Underwood Conservation Area proposed conservation area boundary. 102
1-21 E40 – Yuma Meadows Conservation Area proposed conservation area boundary. 103

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 2017

B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2017

B-3: LCR MSCP Non-Federal Covered Activities and Incidental Take Summary, Fiscal Year 2017

C Recommendations from Resource Agencies

D Financial Statement

D-1: Required Contributions

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 2017

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) program 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-seven 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 27 covered species, 8 are currently listed under the Federal ESA. This program addresses the biological needs of mammals, birds, fishes, 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 fishes 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, as outlined in the Funding and Management Agreement (FMA), in 2003 dollars is approximately $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 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. Requirements under the 2001 BO for the Secretarial Implementation Agreements were completed in fiscal year (FY) 2008, and requirements for the interim surplus criteria (ISC) were completed on December 31, 2015.

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 the 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 (www.lcrmscp.gov). During FY17, Perri Benemelis, Central Arizona Groundwater Replenishment District, served as Chair of the Steering Committee, and Jayne Harkins, Colorado River Commission, 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 FY17, a summary of work underway during FY18, and proposed work to be performed during FY19. It also documents research and monitoring activities undertaken in support of the LCR MSCP and incidental take for covered actions implemented during FY17. 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[1]	2009	$32,800,140	$16,400,070	$16,400,070
2012	$27,540,000	1.210[1]	2010	$33,323,400	$16,661,700	$16,661,700
2013	$27,540,000	1.251[1]	2011	$34,452,540	$17,226,270	$17,226,270
2014	$27,540,000	1.276[1]	2012	$35,141,040	$17,570,520	$17,570,520
2011–14	Underfunding makeup			$7,601,040	$3,800,520	$3,800,520
2015	$27,540,000	1.358	2013	$37,399,320	$18,699,660	$18,699,660
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
2018	$22,164,000	1.410	2016	$31,251,240	$15,625,620	$15,625,620
2019	$22,164,000	1.442	2017	$31,960,488	$15,980,244	$15,980,244

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as "Underfunding makeup."

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. Attachment D-2 provides a summary of funding credits earned and funding credits used.

FY19 Contributions and Adjustments

As outlined in table 1-1, the annual funding commitment for FY19 is $22,164,000, based on the 2003 estimate, and $31,960,488 after the composite inflation index of 1.442 is applied. In accordance with Section 8.3 of the FMA, the Federal share of the cost for FY19 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 FY19 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 [attachment A]).

Table 1-2.—FY19 Contribution Schedule

Funding Entity	FY19 Contributions	FY19 Adjusted Contributions
Federal	$15,980,244.00	$15,980,244.00
Non-Federal	$15,980,244.00	$15,980,244.00
California	*$7,990,122.00*	*$7,610,531.72*
Arizona	*$3,995,061.00*	*$4,754,241.56*
Nevada	*$3,995,061.00*	*$3,615,470.72*
Total	**$31,960,488.00**	**$31,960,488.00**

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 at the outset 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) Habitat Maintenance Fund (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. Each State is maintaining its own account, and interest earned on these accounts will be added to the accounts for the benefit of implementing the LCR MSCP. The HMF was fully funded in FY15. A detailed accounting of the HMF is included in attachment D-3a. The total amount in the HMF through FY17 is $33,771,897.09. No funds have been withdrawn from any of the accounts to date.

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 Remedial Measures Fund (RMF) accounts. Interest earned on these accounts will be added to the accounts for implementation of remedial measures. Table 1-3 provides FY17 contributions, total funds contributed through FY17 with interest, FY18 contributions, and FY19 projected contributions. 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 1-3.—RMF

Funding Partner	FY17 Contribution	Cumulative through FY17[1]	FY18 Contribution	FY19 Projected Contribution
California	$554,414.00	$3,277,059.19	$561,180.00	$573,916.00
Arizona	$227,207.00	$1,227,167.99	$280,590.00	$286,958.00
Nevada	$227,207.00	$1,811,095.89	$280,590.00	$286,958.00
Total	$1,108,828.00	$6,315,323.07	$1,122,360.00	$1,147,832.00

[1] Includes interest earned.

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 Office of Valuation Services, land and water resources nominated by Reclamation for acquisition must be approved by the Steering Committee. 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 1-4 lists the funds set aside in the Land and Water Fund through FY17. It was anticipated that an additional $2,100,000 would be contributed in FY17. However due to Federal funding reductions, this amount was not contributed. It is anticipated that no funding will be contributed in FY18 and $3,300,000 will be contributed in FY19. A detailed accounting of the Land and Water Fund can be found in attachment D-3c.

Table 1-4.—Land and Water Fund

Funding Partner	FY17 Contribution	Cumulative through FY17	FY18 Contribution	F19 Projected Contribution
Reclamation	$0	$15,400,000	$0	$3,300,000

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 FY17.

California Endangered Species Act Permit

As discussed earlier in the "Program Implementation" section, 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 the 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 FY19 Program Activities and FY17 Accomplishments

The minimum funding required in the LCR MSCP documents for FY19 is $31,960,488: $15,980,244 Federal and $15,980,244 non-Federal. Reclamation is proposing an annual program budget of $31,968,788 (table 1-5).

Table 1-5.—FY19 Proposed Program Funding

Program Area	FY19 Funding
Program Administration	$1,467,956
Fish Augmentation	$2,200,000
Species Research	$807,000
System Monitoring	$2,325,000
Conservation Area Development and Management	$15,566,000
Post-Development Monitoring	$3,040,000
Adaptive Management Program	$1,990,000
Funding Accounts – Remedial Measures	$1,147,832
Public Outreach	$125,000
Subtotal	$28,668,788
Land and Water Fund	$3,300,000
Total	**$31,968,788**

Table 1-6 shows the following by work task: FY17 approved estimates and actual accomplishment, cumulative program expenditures (FY04–17), FY18 approved program funding, FY19 proposed program funding, and out-year funding for FY20 and FY21. 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 1-6, 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 1-6.—Annual Funding Matrix

Work Task	Name	FY17 Approved Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Projected Estimate[1]	FY21 Projected Estimate[1]
A	**Program Administration**							
A1	Program Administration	$1,418,074.00	$1,196,839.51	$13,305,054.07	$1,435,380.00	$1,467,956.00	$1,467,956.00	$1,467,956.00
Closed[2]	Work Tasks Pre-FY17			$130,535.22				
		$1,418,074.00	**$1,196,839.51**	**$13,435,589.29**	**$1,435,380.00**	**$1,467,956.00**	**$1,467,956.00**	**$1,467,956.00**
B	**Fish Augmentation**							
B1	Lake Mohave Razorback Sucker Larvae Collections	$215,000.00	$137,699.21	$2,561,900.75	$215,000.00	$215,000.00	$215,000.00	$215,000.00
B2	Willow Beach National Fish Hatchery	$325,000.00	$299,717.05	$3,886,639.94	$325,000.00	$325,000.00	$325,000.00	$325,000.00
B3	Achii Hanyo Native Fish Rearing Facility	$50,000.00	$19,643.79	$1,528,072.43	$170,000.00	$170,000.00	$170,000.00	$170,000.00
B4	Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico	$260,000.00	$236,605.59	$2,541,864.43	$260,000.00	$260,000.00	$260,000.00	$260,000.00
B5	Bubbling Ponds Fish Hatchery	$330,000.00	$162,031.14	$3,515,792.26	$330,000.00	$475,000.00	$475,000.00	$475,000.00
B6	Lake Mead Fish Hatchery	$325,000.00	$280,966.59	$1,316,858.04	$400,000.00	$350,000.00	$400,000.00	$400,000.00
B7	Lakeside Rearing Ponds	$200,000.00	$174,790.62	$2,388,129.07	$200,000.00	$200,000.00	$200,000.00	$200,000.00
B8	Fish Tagging Equipment	$135,000.00	$130,604.88	$1,095,900.17	$135,000.00	$135,000.00	$135,000.00	$135,000.00
B12	Maintenance of Alternate Bonytail Broodstock	$65,000.00	$76,778.77	$144,281.93	$65,000.00	$70,000.00	$70,000.00	$70,000.00
Closed[2]	Work Tasks Pre-FY17			$987,445.58				
		$1,905,000.00	**$1,518,837.64**	**$19,966,884.60**	**$2,100,000.00**	**$2,200,000.00**	**$2,250,000.00**	**$2,250,000.00**
C	**Species Research**							
C2	Sticky Buckwheat and Threecorner Milkvetch Conservation	$11,000.00	$10,844.47	$128,007.16	$11,000.00	$11,000.00	$11,000.00	$11,000.00
C14	Humpback Chub Program Support	$57,000.00	$229.50	$288,216.61	$57,000.00	$1,000.00	$1,000.00	$1,000.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY17 Approved Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Projected Estimate[1]	FY21 Projected Estimate[1]
C24	Avian Species Habitat Requirements	$340,000.00	$349,373.16	$2,317,424.51	$150,000.00	$0.00	$0.00	$0.00
C25	Imperial Ponds Native Fish Research	$200,000.00	$186,861.08	$2,017,243.48	$0.00	$0.00	$0.00	$0.00
C31	Razorback Sucker Genetic Diversity Assessment	$160,000.00	$145,010.65	$877,780.46	$160,000.00	$0.00	$0.00	$0.00
C32	Determination of Salinity, Temperature, pH, and Oxygen Limits for Bonytail and Razorback Suckers	$110,000.00	$117,484.11	$908,080.02	$0.00	$0.00	$0.00	$0,00
C40	Genetic and Demographic Studies to Inform Conversation Management of Razorback Suckers and Bonytail in Off-Channel Habitats	$300,000.00	$399,170.09	$1,100,389.59	$415,000.00	$0.00	$0.00	$0.00
C52	Gilded Flicker Riparian Habitat Use and Seasonal Movement Research	$300,000.00	$169,883.43	$825,675.70	$0.00	$0.00	$0.00	$0.00
C53	Sonic Telemetry of Juvenile Flannelmouth Suckers in Reach 3	$100,000.00	$81,661.52	$637,118.37	$40,000.00	$0.00	$0.00	$0.00
C59	Selenium Monitoring in Created Backwater and Marsh Habitats	$160,000.00	$169,998.97	$207,720.00	$160,000.00	$160,000.00	$160,000.00	$160,000.00
C60	Habitat Manipulation	$175,000.00	$230,860.93	$239,770.48	$175,000.00	$175,000.00	$175,000.00	$175,000.00
C61	Evaluation of Alternative Stocking Methods for Fish Augmentation	$300,000.00	$38,271.69	$497,122.01	$300,000.00	$10,000.00	$10,000.00	$10,0000.00
C62	Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study	$25,000.00	$12,554.37	$488,287.85	$0.00	$0.00	$0.00	$0.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY17 Approved Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Projected Estimate[1]	FY21 Projected Estimate[1]
C63	Evaluation of Habitat Features that May Influence Success of Razorback Suckers and Bonytail in Backwater Environments	$150,000.00	$141,661.66	$253,566.11	$150,000.00	$0.00	$0.00	$0.00
C64	Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail	$750,000.00	$452,557.00	$1,377,928.07	$750,000.00	$450,000.00	$450,000.00	$450,000.00
C65	Evaluation of Immediate Post-Stocking Survival of Razorback Suckers and Bonytail	$120,000.00	$135,135.12	$179,187.51	$120,000.00	$0.00	$0.00	$0.00
C66	Marsh Bird Water Depth Analysis	$100,000.00	$43,378.83	$127,096.63	$20,000.00	$0.00	$0.00	$0.00
Closed[2]	Work Tasks Pre-FY17		$8,683.84	$16,857,965.10				
		$3,358,000.00	**$2,693,620.42**	**$29,328,579.66**	**$2,508,000.00**	**$807,000.00**	**$807,000.00**	**$807,000.00**
D	**System Monitoring**							
D1	Marsh Bird Surveys	$40,000.00	$37,432.99	$364,376.83	$40,000.00	$40,000.00	$40,000.00	$40,000.00
D2	Southwestern Willow Flycatcher Presence/Absence Surveys	$750,000.00	$812,409.57	$9,367,975.99	$650,000.00	$200,000.00	$200,000.00	$200,000.00
D5	Monitoring Avian Productivity and Survivorship	$250,000.00	$233,591.60	$3,319,923.22	$250,000.00	$250,000.00	$250,000.00	$250,000.00
D6	System Monitoring for Riparian Obligate Avian Species	$480,000.00	$21,818.80	$2,635,887.80	$480,000.00	$500,000.00	$500,000.00	$500,000.00
D7	Yellow-billed Cuckoo Presence/Absence Surveys	$650,000.00	$621,507.82	$6,777,978.78	$50,000.00	$50,000.00	$50,000.00	$50,000.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY17 Approved Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Projected Estimate[1]	FY21 Projected Estimate[1]
D8	Razorback Sucker and Bonytail Stock Assessment	$925,000.00	$940,176.70	$7,463,124.61	$925,000.00	$1,125,000.00	$1,125,000.00	$1,125,000.00
D9	System Monitoring of Covered Bat Species	$140,000.00	$125,396.79	$2,337,352.30	$140,000.00	$100,000.00	$100,000.00	$100,000.00
D10	System Monitoring of Rodent Populations	$40,000.00	$32,248.98	$288,928.41	$40,000.00	$40,000.00	$40,000.00	$40,000.00
D12	Lowland Leopard Frog and Colorado River Toad Surveys	$35,000.00	$17,835.26	$486,256.04	$0.00	$0.00	$0.00	$0.00
D14	System-Wide Monitoring of MacNeill's Sootywing Skippers	$0.00	$0.00	$0.00	$0.00	$20,000.00	$20,000.00	$20,000.00
Closed[2]	Work Tasks Pre-FY17			$1,298,090.77				
		$3,310,000.00	**$2,842,418.51**	**$34,339,894.75**	**$2,575,000.00**	**$2,325,000.00**	**$2,325,000.00**	**$2,325,000.00**
E	**Conservation Area Development and Management**							
E1	Beal Lake Conservation Area	$250,000.00	$205,584.41	$4,359,323.11	$250,000.00	$900,000.00	$900,000.00	$750,000.00
E4	Palo Verde Ecological Reserve	$600,000.00	$488,325.18	$10,230,059.70	$600,000.00	$500,000.00	$500,000.00	$500,000.00
E5	Cibola Valley Conservation Area	$800,000.00	$436,085.32	$12,457,921.39	$850,000.00	$850,000.00	$600,000.00	$350,000.00
E9	Hart Mine Marsh	$250,000.00	$131,649.13	$7,312,979.80	$250,000.00	$250,000.00	$200,000.00	$200,000.00
E13	McAllister Lake	$50,000.00	$24,709.69	$152,046.51	$400,000.00	$400,000.00	$50,000.00	$50,000.00
E14	Imperial Ponds Conservation Area	$1,450,000.00	$496,526.61	$10,512,052.06	$1,450,000.00	$350,000.00	$350,000.00	$350,000.00
E16	Conservation Area Site Selection	$700,000.00	$2,966,489.85	$5,403,846.89	$700,000.00	$200,000.00	$150,000.00	$100,000.00
E17	Topock Marsh Pumping	$1,000.00	$0.00	$475,824.63	$1,000.00	$1,000.00	$1,000.00	$1,000.00
E18	Law Enforcement and Fire Suppression	$250,000.00	$212,393.13	$1,876,740.78	$200,000.00	$250,000.00	$250,000.00	$250,000.00
E21	Planet Ranch	$2,000,000.00	$689,679.10	$11,026,508.63	$3,000,000.00	$4,000,000.00	$4,000,000.00	$3,000,000.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY17 Approved Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Projected Estimate[1]	FY21 Projected Estimate[1]
E24	Cibola National Wildlife Refuge Unit #1 Conservation Area	$750,000.00	$900,063.09	$5,918,390.62	$750,000.00	$900,000.00	$900,000.00	$1,400,000.00
E25	Big Bend Conservation Area	$30,000.00	$29,993.90	$1,231,363.15	$20,000.00	$20,000.00	$20,000.00	$320,000.00
E27	Laguna Division Conservation Area	$200,000.00	$179,098.65	$27,515,124.80	$150,000.00	$120,000.00	$100,000.00	$100,000.00
E28	Yuma East Wetlands	$450,000.00	$269,402.54	$2,372,563.15	$300,000.00	$275,000.00	$275,000.00	$275,000.00
E31	Hunters Hole	$60,000.00	$41,975.85	$497,692.18	$30,000.00	$30,000.00	$30,000.00	$30,000.00
E33	Pretty Water Conservation Area	$150,000.00	$173,882.03	$1,724,886.24	$40,000.00	$30,000.00	$20,000.00	$20,000.00
E35	Mohave Valley Conservation Area	$5,500,000.00	$4,765,001.75	$3,532,302.58	$3,500,000.00	$1,750,000.00	$160,000.00	$80,000.00
E36	Parker Dam Camp	$100,000.00	$16,424.69	$16,424.69	$50,000.00	$40,000.00	$20,000.00	$20,000.00
E37	Palo Verde Ecological Reserve-South	$200,000.00	$10,027.29	$10,027.29	$500,000.00	$100,000.00	$150,000.00	$1,000,000.00
E38	Three Fingers Lake	$200,000.00	$115,742.63	$115,742.63	$200,000.00	$100,000.00	$100,000.00	$100,000.00
E39	Dennis Underwood Conservation Area	$0.00	$0.00	$0.00	$6,000,000.00	$500,000.00	$500,000.00	$200,000.00
E40	Yuma Meadows Conservation Area	$0.00	$0.00	$0.00	$0.00	$4,000,000.00	$3,000,000.00	$300,000.00
Closed[2]	Work Tasks Pre-FY17		$11.83	$5,531,635.42				
		$13,991,000.00	**$12,153,066.67**	**$112,273,456.25**	**$19,241,000.00**	**$15,566,000.00**	**$12,276,000.00**	**$9,396,000.00**
F	**Post-Development Monitoring**							
F1	Habitat Monitoring at Conservation Areas	$950,000.00	$839,620.04	$5,330,401.31	$850,000.00	$700,000.00	$700,000.00	$700,000.00
F2	Avian Monitoring at Conservation Areas	$350,000.00	$487,309.71	$2,252,652.83	$350,000.00	$450,000.00	$450,000.00	$450,000.00
F3	Rodent Monitoring at Conservation Areas	$65,000.00	$42,126.44	$531,391.11	$65,000.00	$65,000.00	$65,000.00	$65,000.00
F4	Bat Species Monitoring at Conservation Areas	$150,000.00	$123,507.75	$1,152,713.33	$80,000.00	$140,000.00	$140,000.00	$140,000.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY17 Approved Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Projected Estimate[1]	FY21 Projected Estimate[1]
F5	Post-Development Monitoring of Fishes at Conservation Areas	$250,000.00	$362,211.47	$2,029,301.63	$500,000.00	$450,000.00	$450,000.00	$500,000.00
F6	Post-Development Monitoring of MacNeill's Sootywing Skippers at Conservation Areas	$80,000.00	$22,198.36	$524,555.15	$40,000.00	$20,000.00	$20,000.00	$20,000.00
F7	Marsh Bird Monitoring at Conservation Areas	$40,000.00	$30,633.05	$132,225.17	$40,000.00	$40,000.00	$40,000.00	$50,000.00
F8	Reptile and Amphibian Monitoring at Conservation Areas	$0.00	$0.00	$0.00	$25,000.00	$25,000.00	$25,000.00	$25,000.00
F9	Southwestern Willow Flycatcher Monitoring at Conservation Areas	$0.00	$0.00	$0.00	$100,000.00	$500,000.00	$500,000.00	$500,000.00
F10	Yellow-billed Cuckoo Monitoring at Conservation Areas	$0.00	$0.00	$0.00	$600,000.00	$650,000.00	$650,000.00	$650,000.00
		$1,885,000.00	**$1,907,606.82**	**$11,953,240.53**	**$2,650,000.00**	**$3,040,000.00**	**$3,040,000.00**	**$3,100,000.00**
G	**Adaptive Management Program**							
G1	Data Management	$1,000,000.00	$1,277,295.14	$6,509,405.60	$1,000,000.00	$1,250,000.00	$750,000.00	$750,000.00
G3	Adaptive Management Research Projects	$300,000.00	$4,493.69	$2,752,164.23	$300,000.00	$300,000.00	$300,000.00	$300,000.00
G4	Science/Adaptive Management Strategy	$400,000.00	$692,311.87	$1,796,329.55	$400,000.00	$400,000.00	$400,000.00	$400,000.00
G6	Conceptual Ecological Models	$40,000.00	$97,582.09	$24,391.45	$40,000.00	$40,000.00	$40,000.00	$40,000.00
		$1,740,000.00	**$2,071,682.79**	**$11,082,290.83**	**$1,740,000.00**	**$1,990,000.00**	**$1,490,000.00**	**$1,490,000.00**

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY17 Approved Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Projected Estimate[1]	FY21 Projected Estimate[1]
H	**Funding Accounts**							
H1[3]	Habitat Maintenance Fund	$0.00	$0.00	$32,466,770.00	$0.00	$0.00	$0.00	$0.00
H2[3]	Remedial Measures Fund	$1,108,828.00	$1,108,828.00	$6,207,475.38	$1,122,360.00	$1,147,832.00	$1,147,832.00	$1,147,832.00
		$1,108,828.00	**$1,108,828.00**	**$38,674,245.38**	**$1,122,360.00**	**$1,147,832.00**	**$1,147,832.00**	**$1,147,832.00**
I	**Public Outreach**							
I1	Public Outreach	$125,000.00	$133,126.02	$749,060.99	$125,000.00	$125,000.00	$125,000.00	$125,000.00
Closed	Work Tasks Pre-FY17			$61,059.68				
		$125,000.00	**$133,126.02**	**$810,120.67**	**$125,000.00**	**$125,000.00**	**$125,000.00**	**$125,000.00**
	Program Total:	**$28,840,902.00**	**$25,626,026.38**	**$271,864,301.96**	**$33,496,740.00**	**$28,668,788.00**	**$24,928,788.00**	**$22,108,788.00**

[1] FY20 and FY21 numbers are not adjusted for inflation.
[2] Closed work tasks are shown in attachment D-4.
[3] H1 Cumulative Habitat Maintenance Fund and H2 Cumulative Remedial Measures Fund amounts 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 FY19, 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 FY20 or FY21, (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 FY17, Reclamation estimated work tasks totaling $28,840,902.00. Actual LCR MSCP accomplishment (obligations) for FY17 was $25,626,026.38. Actual accomplishment was less than the minimum accomplishment due to delays in developing Planet Ranch, resulting from the need to add the northern Mexican gartersnake to the list of covered species; a delay in starting construction of the Mohave Valley Conservation Area (MVCA); postponement of infrastructure improvements at the Imperial Ponds Conservation Area (IPCA); and the delay of system monitoring of riparian covered species while the monitoring protocol is evaluated (D6). In accordance with the FMA, Reclamation incurred a funding debit of $724,589.65 for FY17 (attachment D-2e). Cumulative program accomplishment (expenditures) through FY17 was $271,864,301.96 (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, honey 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 1-7 shows how much land cover by type has been created at each conservation area. Total land cover established through FY17 was 5,698 acres.

Table 1-7.—Conservation Area Land Cover Type

Land Cover Type	Management Unit	Established Acres FY17	Established Acres Total[1]
Cottonwood-willow	E1 Beal Lake Conservation Area (Arizona)	0	119
	E4 Palo Verde Ecological Reserve (California)	0	945
	E5 Cibola Valley Conservation Area (Arizona)	76	452
	E21 Planet Ranch (Arizona)	0	396
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area (Arizona)	122	628
	E27 Laguna Division Conservation Area (California and Arizona)	0	1,129
	E28 Yuma East Wetlands (Arizona)	0	183
	E31 Hunters Hole (Arizona)	0	44
Total		**198**	**3,896**
Honey Mesquite	E4 Palo Verde Ecological Reserve (California)	0	78
	E5 Cibola Valley Conservation Area (Arizona)	0	477
	E27 Laguna Division Conservation Area (California and Arizona)	0	42
	E28 Yuma East Wetlands (Arizona)	0	103
	E33 Pretty Water Conservation Area (California)	0	566
	E36 Parker Dam Camp	0	80
Total		**0**	**1,346**
	E9 Hart Mine Marsh (Arizona)	0	255
	E14 Imperial Ponds Conservation Area (Arizona)	0	12
	E28 Yuma East Wetlands (Arizona)	0	94
Total		**0**	**361**
Backwater	E14 Imperial Ponds Conservation Area (Arizona)	0	80
	E25 Big Bend Conservation Area (Nevada)	0	15
Total		**0**	**95**
	TOTAL	**198**	**5,698**

[1] May be adjusted due to projected versus actual acreage established, changes in conservation area or phase acreage, or changes in habitat composition.

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 21 of the 27 species. Table 1-8 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 1-8.—Conservation Area by Species Habitat Creation Conservation Measures

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres FY17	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	94	
Total		**0**	**361**	**71%**
WIFL1 (4,050 acres)	E1 Beal Lake Conservation Area	0[1]	0	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0[1]	0	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0[1]	0	
Total		**0**	**945**	**23%**
BONY2 (360 acres)	E14 Imperial Ponds Conservation Area	80[2]	80	
	E25 Big Bend Conservation Area	0	15	
Total		**0**	**95**	**26%**
RASU2 (360 acres)	E14 Imperial Ponds Conservation Area	80[2]	80	
	E25 Big Bend Conservation Area	0	15	
Total		**80**	**95**	**26%**
WRBA2 (765 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	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	271	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,163[4]**	**> 100%**
WYBA3 (765 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	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	271	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,163[4]**	**> 100%**
CRCR2 (125 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	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	365	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,512[4]**	**> 100%**
YHCR2 (76 acres)	E28 Yuma East Wetlands	0	183	
Total		**0**	**183[4]**	**> 100%**

Table 1-8.—Conservation Area by Species Habitat Creation Conservation Measures

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres FY17	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	94	
Total		**0**	**361**	**71%**
BLRA1 (130 acres)	E9 Hart Mine Marsh	0[5]	0	
	E14 Imperial Ponds Conservation Area	0	12	
	E28 Yuma East Wetlands	0	94	
Total		**0**	**106**	**82%**
YBCU1 (4,050 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	365	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,877**	**46%**
ELOW1 (1,784 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	E4 Palo Verde Ecological Reserve	0	985	
	E5 Cibola Valley Conservation Area	0	670	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	270	
	E28 Yuma East Wetlands	0	286	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,410[4]**	**> 100%**
GIFL1 (4,050 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	365	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,877**	**46%**
GIWO1 (1,702 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	365	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,877[4]**	**> 100%**

Table 1-8.—Conservation Area by Species Habitat Creation Conservation Measures

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres FY17	Creditable Acres Total	Percent of Acres Creditable by Species Conservation Measure
VEFL1 (5,208 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	E4 Palo Verde Ecological Reserve	0	985	
	E5 Cibola Valley Conservation Area	0	670	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	365	
	E28 Yuma East Wetlands	0	286	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,505**	**48%**
BEVI1 (2,983 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	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	365	
	E28 Yuma East Wetlands	0	286	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,543**	**85%**
YWAR1 (4,050 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	365	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,877**	**46%**
SUTA1 (602 acres)	E1 Beal Lake Conservation Area	0	119[3]	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	265	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	271	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,783[4]**	**> 100%**
FLSU1 (85 acres)	E25 Big Bend Conservation Area	0	15	
Total		**0**	**15**	**18%**
MNSW2 (222 acres)	E4 Palo Verde Ecological Reserve	0	40	
	E5 Cibola Valley Conservation Area	0	405	
Total		**0**	**445[4]**	**> 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 these 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 – Native fishes were stocked at the Imperial Ponds Conservation Area and are now deemed creditable in FY17.

[3] Beal Lake Conservation Area – In previous years, an incorrect number was reported for creditable acreage. The additional planting, known as Willow Marsh, was reported as 9 acres when actual acreage is 12 acres.

[4] 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. A portion of the creditable acres will be actively managed to meet species habitat needs.

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

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 1-9a–c (following page) provide a summary of fish repatriation. Table 1-10 provides a matrix showing the work tasks and their related conservation measures. Attachment E lists the technical reports that were published in FY17.

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 FY17 is reported in attachment B. The USFWS Section 10 Permit and the 2005 BO authorize incidental take resulting from the 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 were used to determine the types and levels of any incidental take known to have occurred in FY17. 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 1-9a.—Summary of Fish Augmentation Conservation Measure RASU5

Reach	Number of Razorback Suckers, FY17	Total Number of Razorback Suckers
2	1,385	122,387
Total	**1,385**	**122,387**

Table 1-9b.—Summary of Fish Augmentation Conservation Measure RASU3

Reach	Number of Razorback Suckers, FY17	Total Number of Razorback Suckers
3	8,497	87,615
4 and 5	6,519	93,112
Total	**15,016**	**180,727**

Table 1-9c.—Summary of Fish Augmentation Conservation Measure BONY3

Reach	Number of Bonytail, FY17	Bonytail Program
2	684[1]	1,597[1]
3	5,011	54,976
4 and 5	6,687	32,460
Total	**12,382**	**89,033**

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

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Yuma Clapper Rail	CLRA1	Create habitat, 512 acres	C60 E9 E14 E16 E21 E28 E38 F1 G1 G4 G6 H2	C60 E9 E14 E16 E21 E28 E38 F1 G1 G4 G6 H2	C60 E9 E14 E16 E21 E28 E38 F1 G1 G4 G6 H2
	CLRA2	Maintain existing important habitat	G1 G4 G6 H1	G1 G4 G6 H1	G1 G4 G6 H1
	MRM1	Define habitat characteristics	C24 C66 D1 F7 G1 G4 G6	C24 C66 D1 F7 G1 G4 G6	D1 F7 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C59 C60 C66 F1 F7 G1 G4 G6	C24 C59 C60 C66 F1 F7 G1 G4 G6	C59 C60 F1 F7 G1 G4 G6
	MRM5	Monitor selenium levels in backwater	C59 G1 G4	C59 G1 G4	C59 G1 G4
	CMM1	Reduce risk of loss to wildfire	E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	G1 G4	G1 G4	G1 G4
Southwestern Willow Flycatcher	WIFL1	Create habitat, 4,050 acres	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2
	WIFL2	Maintain existing important habitat	D2 E21 G1 G4 G6 H1	D2 E21 G1 G4 G6 H1	D2 E21 G1 G4 G6 H1
	MRM1	Define habitat characteristics	C24 C42 D2 D5 G1 G4 G6	C24 D2 D5 F9 G1 G4 G6	D2 D5 F9 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C55 C60 D2 D5 F1 G1 G4 G6	C24 C60 D2 D5 F1 F9 G1 G4 G6	C60 D2 D5 F1 F9 G1 G4 G6
	MRM4	Brown-headed cowbird (*Molothrus ater*) evaluation	D2 G1 G4	D2 F9 G1 G4	D2 F9 G1 G4
	CMM1	Reduce risk of loss to wildfire	C55 E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	G1 G4	G1 G4	G1 G4
Desert Tortoise	**DETO1**	**Acquire, protect 230 acres – Completed**			
	DETO2	Avoid impacts on individuals and burrows	G1 G4	G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Bonytail	BONY1	Coordinate conservation efforts with the USFWS and recovery programs	A1	A1	A1
	BONY2	Create 360 acres of bonytail habitat	C25 C32 C40 C60 E1 E14 E16 E21 E25 E35 G1 G3 G4 G6 H2	C40 C60 E1 E14 E16 E21 E25 E35 G1 G4 G6 H2	C60 E1 E14 E16 E21 E25 E35 E40 G1 G4 G6 H2
	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	B2 B3 B4 B6 B7 B8 B12 C32 C61 C63 C64 C65 G1 G4 H2	B2 B3 B4 B6 B7 B8 B12 C61 C63 C64 C65 G1 G4 H2	B2 B3 B4 B6 B7 B8 B12 C61 C64 G1 G4 H2
	BONY4	Develop (if necessary) additional rearing capacity	B2 B3 B4 B6 B7 B8 B12 C47 C49 C64 C65 G1 G4	B2 B3 B4 B6 B7 B8 B12 C64 C65 G1 G4	B2 B3 B4 B6 B7 B8 B12 C64 E40 G1 G4
	BONY5	Monitor, research, and adaptively manage augmentations and created habitat	B7 B8 C32 C40 C47 C56 C59 C60 C61 C63 C64 C65 D8 F5 G1 G3 G4 G6	B7 B8 C40 C59 C60 C61 C63 C64 C65 D8 F5 G1 G4 G6	B7 B8 C59 C60 C61 C64 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	C14	C14

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Razorback Sucker	RASU1	Coordinate conservation efforts with the USFWS and recovery programs	A1	A1	A1
	RASU2	Create 360 acres of razorback sucker habitat	C25 C31 C32 C40 C60 E1 E14 E16 E21 E25 E35 G1 G3 G4 G6 H2	C31 C40 E1 E14 C60 E16 E21 E25 E35 G1 G4 G6 H2	C60 E1 E14 E16 E21 E25 E35 E40 G1 G4 G6 H2
	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 C31 C32 C61 C63 C64 C65 G1 G4 H2	B1 B2 B3 B4 B5 B6 B7 B8 C31 C61 C63 C64 C65 G1 G4 H2	B1 B2 B3 B4 B5 B6 B7 B8 C61 C64 G1 G4 H2
	RASU4	Develop (if necessary) additional rearing capacity	B2 B3 B4 B5 B6 B7 B8 C10 C64 C65 G1 G4	B2 B3 B4 B5 B6 B7 B8 C64 C65 G1 G4	B2 B3 B4 B5 B6 B7 B8 C64 E40 G1 G4
	RASU5	Support ongoing Lake Mohave conservation efforts	B1 B2 B7 B8 C31 C32 C61 C63 G1 G4	B1 B2 B7 B8 C31 C61 C63 G1 G4	B1 B2 B7 B8 C61 G1 G4
	RASU6	Monitor, research, and adaptively manage augmentations and created habitat	B7 B8 C31 C32 C40 C59 C60 C61 C63 C64 C65 D8 F5 G1 G3 G4 G6	B7 B8 C31 C40 C59 C60 C61 C63 C64 C65 D8 F5 G1 G4 G6	B7 B8 C59 C60 C61 C64 D8 F5 G1 G4 G6
	RASU7	Funding for ongoing Reclamation/Southern Nevada Water Authority Lake Mead studies	B6 G1 G4	B6 G1 G4	B6 G1 G4
	RASU8	Continue razorback sucker conservation measure identified in the 2001 BO	B1 B6 G1 G4	B1 B6 G1 G4	B1 B6 G1 G4
	MRM5	Monitor selenium levels in backwater	C59 G1 G4	C59 G1 G4	C59 G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Western Red Bat	WRBA1	Status/habitat surveys	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6
	WRBA2	**Create 765 acres – Creditable acres established exceed requirement**	C60 E1 E4 E5 E14 E16 E21 E24 E33 E36 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E33 E36 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E33 E36 E37 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	C35 D9 F4 G1 G4 G6	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 F1 F4 G1 G4 G6	C60 F1 F4 G1 G4 G6	C60 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	G1 G4	G1 G4	G1 G4
Western Yellow Bat	WYBA1	Conduct surveys for species distribution	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6
	WYBA2	Avoid removal of roost trees (palms)	G1 G4	G1 G4	G1 G4
	WYBA3	**Create 765 acres – Creditable acres established exceed requirement**	E1 E4 E5 E14 E16 E21 E24 E33 E36 E37 F1 G1 G4 G6 H2	E1 E4 E5 E14 E16 E21 E24 E33 E36 E37 E39 F1 G1 G4 G6 H2	E1 E4 E5 E14 E16 E21 E24 E33 E36 E37 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	C35 D9 F4 G1 G4 G6	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 F1 F4 G1 G4 G6	C60 F1 F4 G1 G4 G6	C60 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	G1 G4	G1 G4	G1 G4
Desert Pocket Mouse	DPMO1	Locate occupied habitat and restore disturbed habitat	D10 F3 G1 G4 G6	D10 F3 G1 G4 G6	D10 F3 G1 G4 G6
	MRM1	Define habitat characteristics	D10 F3 G1 G6	D10 F3 G1 G6	D10, F3, G1 G6
	MRM2	Monitor and adaptively manage created habitat	F3 G1 G6	F3 G1 G6	F3 G1 G6

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Colorado River Cotton Rat	CRCR1	Status/habitat surveys – define habitat first 5 years	D10 F3 G1 G4 G6	D10 F3 G1 G4 G6	D10 F3 G1 G4 G6
	CRCR2	**Create 125 acres – Creditable acres established exceed requirement**	C54 C60 E9 E16 E21 E24 E38 F1 G1 G4 G6 H2	C60 E9 E16 E21 E24 E38 F1 G1 G4 G6 H2	C60 E1 E4 E5 E9 E16 E21 E24 E36 E38 F1 G1 G4 G6 H2
	MRM2	Monitor and adaptively manage created habitat	C54 C60 D10 F1 F3 G1 G4 G6	C60 D10 F1 F3 G1 G4 G6	C60 D10 F1 F3 G1 G4 G6
	CMM1	Reduce risk of loss of habitat to wildfire	C54 E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	G1 G4	G1 G4	G1 G4
Yuma Hispid Cotton Rat	YHCR1	Status/habitat surveys – define habitat first 5 years	D10 F3, G1 G4 G6	D10 F3, G1 G4 G6	D10 F3, G1 G4 G6
	YHCR2	**Create 76 acres – Creditable acres established exceed requirement**	C54 C60 E16 E27 E28 E31 F1 G1 G4 G6 H2	C60 E16 E27 E28 E31 F1 G1 G4 G6 H2	C60 E16 E27 E28 E31 F1 G1 G4 G6 H2
	MRM2	Monitor and adaptively manage created habitat	C54 C60 D10 F1 F3 G1 G4 G6	C60 D10 F1 F3 G1 G4 G6	C60 D10 F1 F3 G1 G4 G6
	CMM1	Reduce risk of loss of habitat to wildfire	C54 E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	G1 G4	G1 G4	G1 G4
Western Least Bittern	LEBI1	Create 512 acres	C60 E9 E14 E16 E21 E28 E38 F1 G1 G4 G6 H2	C60 E9 E14 E16 E21 E28 E38 F1 G1 G4 G6 H2	C60 E9 E14 E16 E21 E28 E38 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	C24 C66 D1 F7 G1 G4 G6	C24 C66 D1 F7 G1 G4 G6	D1 F7 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C59 C60 C66 F1 F7 G1 G4 G6	C24 C59 C60 C66 F1 F7 G1 G4 G6	C59 C60 F1 F7 G1 G4 G6
	MRM5	Monitor selenium levels	C59 G1	C59 G1	C59 G1
	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	G1 G4	G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
California Black Rail	BLRA1	Create 130 acres	C60 E9 E14 E16 E28 E38 F1 G1 G4 G6 H2	C60 E9 E14 E16 E28 E38 F1 G1 G4 G6 H2	C60 E9 E14 E16 E28 E38 F1 G1 G4 G6 H2
	BLRA2	Maintain existing occupied habitat	G1 G4 G6 H1	G1 G4 G6 H1	G1 G4 G6 H1
	MRM1	Define habitat characteristics	C24 C66 D1 F7 G1 G4 G6	C24 C66 D1 F7 G1 G4 G6	D1 F7 1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C59 C60 C66 D1 F1 F7 G1 G4 G6	C24 C59 C60 C66 D1 F1 F7 G1 G4 G6	C59 C60 D1 F1 F7 G1 G4 G6
	MRM5	Monitor selenium levels	C59 G1 G4	C59 G1 G4	C59 G1 G4
	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	G1 G4	G1 G4	G1 G4
Yellow-billed Cuckoo	YBCU1	Create 4,050 acres	E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 F1 G1 G4 G6 H2	E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2	E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2
	YBCU2	Maintain existing habitat	C60 E21 G1 G4 G6 H1	C60 E21 G1 G4 G6 H1	C60 E21 G1 G4 G6 H1
	MRM1	Define habitat characteristics	C24 D5 D7 G1 G4 G6	C24 D5 D7 F10 G1 G4 G6	D5 D7 F10 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C55 C60 D5 D7 F1 G1 G4 G6	C24 C55 C60 D5 D7 F1 F10 G1 G4 G6	C55 C60 D5 D7 F1 F10 G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	C55 E18 G1 G4	E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire	G1 G4	G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Elf Owl	**ELOW1**	**Create 1,784 acres in Reaches 3–5 – Creditable acres established exceed requirement**	C60 E1 E4 E5 E14 E16 E21 E24 E27 E33 E36 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E33 E36 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E33 E36 E37 E39 F1 G1 G4 G6 H2
	ELOW2	Install elf owl boxes before Gila woodpeckers (*Melanerpes uropygialis*) established	G1 G4	G1 G4	G1 G4
	MRM1	Define habitat characteristics	C24 D5 D6 F2 G1 G4 G6	C24 D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C60 D5 F1 F2 G4 G6	C24 C60 D5 F1 F2 G4 G6	C60 D5 F1 F2 G4 G6
	MRM3	Research nest competition of European starlings (*Sturnus vulgaris*)	G1 G4 G6	G1 G4 G6	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	G1 G4	G1 G4	G1 G4
Gilded Flicker	GIFL1	Create 4,050 acres in Reaches 3–7	C52 C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2
	GIFL2	Install artificial snags until vegetation has matured			
	MRM1	Define habitat characteristics	C24 C52 D5 D6 F2 G1 G4 G6	C24 D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C60 D5 F1 F2 G1 G4 G6	C24 C60 D5 F1 F2 G1 G4 G6	C60 D5 F1 F2 G1 G4 G6
	MRM3	Research nest competition of European starlings	G1 G4 G6	G1 G4 G6	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	G1 G4	G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Gila Woodpecker	**GIWO1**	**Create 1,702 acres in Reaches 3–6 – Creditable acres established exceed requirement**	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2
	GIWO2	Install artificial snags			
	MRM1	Define habitat characteristics	C24 D5 D6 F2 G1 G4 G6	C24 D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C60 D5 F1 F2 G1 G4 G6	C24 C60 D5 F1 F2 G1 G4 G6	C60 D5 F1 F2 G1 G4 G6
	MRM3	Research nest competition of European starlings	G1 G4 G6	G1 G4 G6	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	G1 G4	G1 G4	G1 G4
Vermilion Flycatcher	VEFL1	Create 5,208 acres	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 E37 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	C24 D5 D6 F2 G1 G4 G6	C24 D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C60 D5 F1 F2 G1 G4 G6	C24 C60 D5 F1 F2 G1 G4 G6	C60 D5 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation			
	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	G1 G4	G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Arizona Bell's Vireo	BEVI1	Create 2,983 acres	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 E37 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	C24 D5 D6 F2 G1 G4 G6	C24 D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C55 C60 D5 F1 F2 G1 G4 G6	C24 C55 C60 D5 F1 F2 G1 G4 G6	C55 C60 D5 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation			
	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	G1 G4	G1 G4	G1 G4
Sonoran Yellow Warbler	YWAR1	Create 4,050 acres	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E37 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	C24 D5 D6 F2 G1 G4 G6	C24 D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C60 D5 F1 F2 G1 G4 G6	C24 C60 D5 F1 F2 G1 G4 G6	C60 D5 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation			
	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	G1 G4	G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Summer Tanager	**SUTA1**	**Create 602 acres – Creditable acres established exceed requirement**	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E37 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E37 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E37 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	C24 D5 D6 F2 G1 G4 G6	C24 D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C24 C60 D5 F1 F2 G1 G4 G6	C24 C60 D5 F1 F2 G1 G4 G6	C60 D5 F1 F2 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation			
	CMM1	Reduce risk of loss of habitat affected by wildfire	G1 G4	G1 G4	G1 G4
	CMM2	Replace created habitat affected by wildfire	G1 G4	G1 G4	G1 G4
Flat-tailed Horned Lizard	**FTHL1**	**Acquire and protect 230 acres – Completed**			
	FTHL2	Implement conservation measures to avoid take	G1 G4	G1 G4	G1 G4
Relict Leopard Frog	**RLFR1**	**$10,000 per year for 10 years to conservation program – Completed**			
Flannelmouth Sucker	FLSU1	85 acres – Reach 3	C53 C60 E16 E25 E35 G1 G4 G6 H2	C53 C60 E16 E25 E35 G1 G4 G6 H2	C60 E16 E25 E35 G1 G4 G6 H2
	FLSU2	**$80,000 per year for 5 years – Completed**			
	FLSU3	Develop management needs/strategies	C53 G1 G4	C53 G1 G4	G1 G4
	MRM2	Monitor and adaptively manage created habitat	C59 C60 G1 G4 G6	C59 C60 G1 G4 G6	C59 C60 G1 G4 G6
	MRM5	Monitor selenium levels in backwaters	C59 G1 G4	C59 G1 G4	C59 G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
MacNeill's Sootywing Skipper	MNSW1	Status surveys/habitat – define habitat first 5 years	F6 G1 G4 G6	F6 G1 G4 G6	D14 F6 G1 G4 G6
	MNSW2	**Create 222 acres – Creditable acres established exceed requirement**	C60 E1 E4 E5 E16 G1 G4 G6 H2	C60 E1 E4 E5 E16 E37 E39 G1 G4 G6 H2	C60 E1 E4 E5 E16 E37 E39 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 F1 F6 G1 G4 G6	C60 F1 F6 G1 G4 G6	C60 D14 F1 F6 G1 G4 G6
	CMM1	Reduce risk of loss of habitat affected by wildfire	E18 G1 G4	E18 G1 G4 G6	E18 G1 G4 G6
	CMM2	Replace created habitat affected by wildfire	G1 G4	G1 G4	G1 G4
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	C34 G1 G4 G6	G1 G4 G6	G1 G4 G6
	CLNB2	Create habitat near roost sites (priority when creating cottonwood-willow and honey mesquite habitat for other species)	C34 G1 G4 G6	G1 G4 G6	G1 G4 G6
	MRM1	Define habitat characteristics	C5 D9 F4 G1 G4 G6	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	F4 G1 G4 G6	F4 G1 G4 G6	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	G1 G4	G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY17 Approved	FY18 Approved	FY19 Proposed
Pale Townsend's Big-eared Bat	PTBB1	Distribution surveys	G1 G4 G6	G1 G4 G6	G1 G4 G6
	PTBB2	Create habitat near roost sites	E16 G1 G4	E16 G1 G4 G6	E16 G1 G4 G6
	MRM1	Determine habitat characteristics	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6	D9 F4 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	F4 G1 G4 G6	F4 G1 G4 G6	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	G1 G4	G1 G4	G1 G4
Colorado River Toad	CRTO1	Distribution surveys, habitat affinity, limiting factors	C62 D12 G1 G4 G6	F8 G1 G4 G6	F8 G1 G4 G6
	CRTO2	Protect existing occupied habitat	C62 G1 G4 G6	G1 G4 G6	G1 G4 G6
	CRTO3	Research to establish in unoccupied habitat	C62 G1 G4 G6	G1 G4 G6	G1 G4 G6
Lowland Leopard Frog	LLFR1	Distribution surveys, habitat affinity, limiting factors	C62 D12 G1 G4 G6	F8 G1 G4 G6	F8 G1 G4 G6
	LLFR2	Protect existing occupied habitat	C62 G1 G4 G6	G1 G4 G6	G1 G4 G6
	LLFR3	Research to establish in unoccupied habitat	C62 G1 G4	G1 G4 G6	G1 G4 G6
Northern Mexican Gartersnake	NMGS1	Create 1,496 acres		E1 E28 G1 G4	E1 E28 G1 G4
	NMGS2	Implement measures to avoid/minimize take		G1 G4	G1 G4
	MRM2	Monitor and adaptively manage created habitat		F8 G1 G4	F8 G1 G4
	CMM1	Reduce risk of loss of habitat affected by wildfire		E18 G1 G4	E18 G1 G4
	CMM2	Replace created habitat affected by wildfire		G1 G4	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 G1	E18 G1	E18 G1

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

   The July 14, 2017, consistency letter from the USFWS for the *Final Implementation Report, Fiscal Year 2018 Work Plan and Budget, Fiscal Year 2016 Accomplishment Report* is included in attachment C

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 FY17. The northern Mexican gartersnake was added as a covered species by an amendment to the Program Documents on March 5, 2018.

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 implemented by Reclamation in conjunction with the LCR MSCP. According to the Record of Decision signed on January 16, 2001, the ISC expired on December 31, 2015. Requirements under the 2001 BO specifically related to the Secretarial Implementation Agreements 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 were completed when the ISC expired on December 31, 2015. Continuation of the ISC beyond December 31, 2015, is a covered action of the LCR MSCP.

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. The 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 FY17, CESA program requirements were also met for FY17.

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 (305 millimeters [mm]) in total length (TL) will be stocked into Reaches 4 and 5 of the LCR in California.

In fulfillment of item 6:

- Through FY17, 1,023 acres of riparian replacement habitat, including 945 acres of cottonwood-willow and 78 acres of honey mesquite land cover types at the Palo Verde Ecological Reserve (PVER), met all requirements for riparian replacement habitat under the CESA permit.

In fulfillment of item 11:

- Through FY17, 93,112 razorback suckers and 32,460 bonytail (305 mm or greater in TL) have been stocked into Reaches 4 and 5 (see tables 1-9b–c.). Since the start of the LCR MSCP, 125,572 native fishes have been stocked into Reaches 4 and 5 of the LCR in California.

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 fishes (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 (Section G). 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 Section D and Section 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 660,000 subadult razorback suckers and 620,000 subadult bonytail for reintroduction into the Colorado River over a 50-year term. Between

2005 and the end of FY17, 269,760 native fishes have been stocked toward completing this goal. This includes 180,727 razorback suckers that have been stocked into Reaches 3–5 (RASU3) and 89,033 bonytail that have been stocked into Reaches 2–5 (BONY3). In addition, 122,387 razorback suckers have been stocked into Reach 2 during this period in support of maintaining a genetic refuge in Lake Mohave (RASU5) (see tables 1-9a–c). This rate of stocking is expected to meet augmentation program goals.

To obtain sufficient numbers of young fishes for grow-out and eventual stocking, an adult broodstock for each species must be maintained by 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 from this stock are captured directly from the lake and are reared at the Willow Beach National Fish Hatchery (Willow Beach NFH) in Arizona and the Lake Mead Fish Hatchery in Nevada. 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 and Recovery Center in Dexter, New Mexico (Center). Additional fish rearing capacity is located at the Achii Hanyo Native Fish Rearing Facility (Arizona), the 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 Center's broodstock.

The Center maintains the only bonytail broodstock in the world used for species propagation (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 Center to (1) support the maintenance of this broodstock, (2) produce bonytail for augmentation needs, (3) deliver bonytail to other grow-out facilities, and (4) stock bonytail into the LCR. A second bonytail broodstock has been developed by the USFWS and is being maintained at the Mora National Fish Hatchery in Mora, New Mexico. This 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, such as disease outbreaks, that may limit production or loss of the genetic stock of the bonytail broodstock maintained at the Center.

FY17 Accomplishments

Fish production levels were reduced in FY17 due to losses experienced at two rearing facilities.

An outbreak of the parasite Ich occurred in October 2016 (FY17) at the Willow Beach NFH, which resulted in the loss of more than 32,000 razorback suckers. This event reduced the number of fish on station to approximately 13,500. Razorback suckers reared at the Willow Beach NFH are primarily directed to Lake Mohave to maintain the genetic diversity of the razorback sucker broodstock; fish are stocked into Lake Mohave to supplement the adult population in the lake as well as into the lakeside rearing ponds (B7) to produce larger adult fish for eventual stocking into Lake Mohave. The immediate effects of this loss were reduced stocking numbers for Lake Mohave and the lakeside rearing ponds, but additional impacts on the fish program may continue for several years into the future.

Additional losses were experienced at the Lake Mead Fish Hatchery in late FY17 following an extended water outage due to a lightning strike at the adjacent Basic Water Company. This company is the water utility and supplier for the Lake Mead Fish Hatchery, and as a result of the lightning strike, was unable to provide water to the hatchery for approximately 14 hours. Due to the outage, approximately 3,500 bonytail and 4,350 razorback suckers were lost as raceway water quality deteriorated. No additional losses were reported following the event, and at the end of FY17, approximately 34,000 native fishes from multiple year-classes remained on station.

The LCR MSCP worked with the Willow Beach NFH and the Lake Mead Fish Hatchery to identify any potential remedies, improvements, or techniques that could reduce the probability of future disease outbreaks and/or severity of unplanned events. There will always be potential for disease or natural events, so there is no guarantee that additional efforts will be 100% effective. Actions taken in FY17 included a review of all hatchery protocols and standard operating procedures, identification of additional potential vectors for contamination, implementation of some additional precautionary measures to reduce vectors for contamination (where applicable), identification of equipment to signal a water outage, and coordination meetings between hatcheries and partners. The LCR MSCP may support implementing improvements or remedies at these facilities in FY18.

In response to the losses that occurred, the LCR MSCP redirected FY17 stockings to balance augmentation across the LCR and to ensure that goals for all reaches were still met. Razorback suckers from the Achii Hanyo Native Fish Rearing Facility (B3) and the Lake Mead Fish Hatchery (B6) were released into Lake Mohave to offset losses experienced at the Willow Beach NFH. To allow for these razorback suckers to be stocked into Lake Mohave, experimental stocking regimes in Reaches 4 and 5 were postponed. The additional fish were redirected to other reaches in support of this altered augmentation plan. Overall, 28,783 native fishes were still stocked into the LCR in FY17 and included 684 bonytail and 1,385 razorback suckers stocked into Reach 2, 5,011 bonytail and 8,497 razorback suckers stocked into Reach 3, and 6,687 bonytail and

6,519 razorback suckers stocked into Reaches 4 and 5. There were still some impacts to individual research projects as a result of losses to hatchery stocks, especially to those in which razorback sucker research was expected for fish stocked into Lake Mohave (portions of Work Task C61). Research in future years may also be affected, as experimental stocking regimes for razorback suckers will also be suspended while hatchery stocks are rebuilt.

Additional measures were initiated in FY17 to rebuild stocks of razorback suckers at the Willow Beach NFH and to supplement additional hatcheries to create an opportunity for increased razorback sucker production in future years. In support of these measures, additional razorback sucker larvae were collected in FY17, the Lake Mead Fish Hatchery dedicated additional rearing space for razorback suckers to expand production, and the Achii Hanyo Native Fish Rearing Facility began rearing additional razorback suckers to meet future program goals. This additional rearing space is necessary to meet increased program stocking requirements (experimental stocking in Reaches 3, 4, and 5) and to have additional resiliency in the fish augmentation program for contingencies such as major disease outbreaks. Some grow-out capabilities are expected at the Yuma Meadows Conservation Area; however, that conservation area will not be able to support any immediate needs or cover these major unexpected events. Other options may be investigated to secure adequate levels of razorback sucker production.

Production in FY17–19 will continue to focus on providing fishes 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 was continued in FY17. This research has continued in order to focus on two areas of the augmentation program: (1) stocking/handling techniques and (2) stocking more “fit” fishes. Investigations of stocking/handling techniques involve comparing the survival of fishes stocked at larger sizes, during the day versus at night, at different locations, during different seasons, using different batch sizes, and using netted off portions of selected backwaters to acclimate fishes prior to release.

Studies being conducted to improve fish fitness as a way to improve post-stocking survival include flow conditioning fishes to improve physical attributes and conditioning fishes to recognize and avoid predators. Because of low initial recontact rates of stocked fishes, these treatments will need to be tracked for several years before data can be used to detect trends. 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) above.” Key accomplishments for FY17 include:

- Successful capture of 34,541 wild razorback sucker larvae from Lake Mohave (B1).

- Tagging and stocking of 300 razorback suckers from the Willow Beach NFH (B2) into Reach 2 lakeside rearing ponds.

- Tagging and stocking of 885 razorback suckers and 1,685 bonytail from the Achii Hanyo Native Fish Rearing Facility (B3).

- Tagging and stocking of 6,540 bonytail from the Center and maintenance of the bonytail broodstock that is held at this facility (B4).

- Transfer of 60,000 larval razorback suckers to the Bubbling Ponds Fish Hatchery from the Center (B4).

- Tagging and stocking of 12,112 razorback suckers from the Bubbling Ponds Fish Hatchery (B5).

- Tagging and stocking of 3,101 razorback suckers and 4,157 bonytail from the Lake Mead Fish Hatchery (B6). The hatchery also received 4,500 bonytail from the Center and 7,380 razorback sucker larvae from Lake Mohave.

- Stocking 300 razorback suckers into lakeside rearing ponds (B7).

- Funding was provided to maintain the alternate bonytail broodstock (refuge population) at the Mora National Fish Hatchery (B12) and to support renovation of half of the isolation system.

FY18 Activities

Fish augmentation actions will continue in order to support rebuilding of lost hatchery stocks and to provide fishes for meeting augmentation goals.

Approximately 30,000 razorback sucker larvae will be captured from Lake Mohave and distributed to the Willow Beach NFH and Lake Mead Fish Hatchery. The Willow Beach NFH will transfer approximately 9,000 fingerling razorback suckers to the Achii Hanyo Native Fish Rearing Facility ponds for further grow-out.

The Willow Beach NFH will work toward meeting the current rearing strategy of 8,000 razorback suckers with an average length of > 400 mm TL available per year. Based on the fish currently on station, approximately 1,000 will be available for repatriation into Lake Mohave in FY18.

Production numbers at the Center in FY18 are expected to be approximately 8,000 bonytail. The facility will continue to supply bonytail fingerlings to the Lake Mead Fish Hatchery and the Achii Hanyo Native Fish Rearing Facility and fingerling razorback suckers to the Bubbling Ponds Fish Hatchery.

The Bubbling Ponds Hatchery will produce approximately 12,000 razorback suckers for augmentation in Reaches 3–5. The LCR MSCP and Arizona Game and Fish Department have drafted a Memorandum of Understanding (MOU) that provides a good faith commitment to rearing razorback suckers at the Bubbling Ponds Fish Hatchery for the life of the LCR MSCP. Confirmation of the MOU will help to secure long-term, annual production of razorback suckers and would allow for incremental additions and improvements to this hatchery. Funding in future years may increase as necessary improvements are identified.

The Lake Mead Fish Hatchery is expected to produce approximately 4,000 bonytail and 4,000 razorback suckers toward annual augmentation goals. It will continue to expand razorback sucker production for a goal of 6,000 per year. Funds will be obligated in FY18 to assist with expanding the electrical capabilities at the hatchery, which will support an increase in razorback sucker larval rearing capacity. The hatchery will also expand bonytail production with a target number of > 4,000 fish annually. A number of bonytail donated from the Wahweap State Fish Hatchery in FY14 have reached stocking size. These fish will likely be used to support experimental stockings beginning in FY19–20 if there are sufficient numbers of stockable-sized bonytail produced from all facilities. The Nevada Department of Wildlife and LCR MSCP will draft a MOU in FY18 that will establish the commitment of both parties to rear native fish species at the Lake Mead Fish Hatchery for the life of the LCR MSCP. This MOU will determine partner responsibilities and secure native fish rearing and production for LCR MSCP fish augmentation through 2055. Hatchery improvements and increased annual production of fishes will require additional funding for operations and a corresponding increase in budget expenditures in FY18 and out-years.

Renovation of the isolation tanks holding the bonytail broodstock refuge population at the Mora National Fish Hatchery will be completed in FY18. The LCR MSCP will provide funding to assist in maintaining this refuge population. Costs in FY18 may vary depending on contributions made through other recovery and conservation programs.

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 the conditioned fishes will continue. If these treatments show improvements in the post-stocking survival of stocked native fishes and are cost effective, they may be implemented as regular stocking practices.

Proposed FY19 Activities

Routine fish augmentation plans for FY19 will include repeating the activities conducted in previous years of the LCR MSCP and are described in Work Tasks B1–B8 and B12. Fish rearing facility infrastructure repairs, improvements, and expansion may be necessary to secure current production and to meet increases in augmentation goals to support experimental stockings. Potential locations for these actions will be evaluated based on feasibility and cost effectiveness.

Experimental stocking of both razorback suckers and bonytail in Reaches 4 and 5 may commence in FY19. 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) inform 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), which 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 razorback suckers, bonytail, and flannelmouth suckers (under Work Task G4) and will assist in further identifying these data gaps and help to prioritize and redefine research topics.

FY17 Accomplishments

Fish research work tasks presented in this section detail the accomplishments for FY17. Much of the research performed under Section C represents long-term research studies. In many cases, research under Section C has been ongoing; several years of recontact data may be necessary to adequately detect trends. Some of the more significant findings from FY17 were:

Fish Augmentation and Distribution Research

- Ongoing work in Reach 2 conducted under Work Task C64 indicated that sonic-tagged razorback suckers routinely move between lake zones, often traveling more than 30 miles within relatively short periods of time (5 days – 2 months). 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. Additional sonic-tagged razorback suckers were released into Reach 2 in FY17 to continue informing the program on species habitat use. Monthly tracking of these individuals will assist in targeting sampling locations for larvae

and adults of the species, which will support future augmentation and provide opportunities to monitor the genetic component of the adult population. Under the same work task, 59 sonic-tagged bonytail have been released into Reach 2 since FY16. Monitoring of these fish provides an opportunity to evaluate post-stocking survival and habitat use within the lake and is conducted concurrently with razorback sucker work for efficient use of project resources. Results from bonytail monitoring have been somewhat different. Tracking of these fish was more difficult despite similar efforts, and initial contact rates were low. Both active and passive contacts suggested that post-stocking survival of bonytail was lower than the sonic-tagged razorback suckers and that movements of bonytail from the initial stocking location were much more restricted than those of razorback suckers.

- Research in Reaches 4 and 5 conducted under Work Task C64 provided additional contact data for native fish species. Sampling was completed primarily using remote passive integrated transponder (PIT) scanners and resulted in contacting 279 bonytail and 443 razorback suckers. Native fishes were scanned in nearly every backwater in the study area and throughout the main river channel. Native fishes stocked in this area appear to be persisting through use of off-channel habitat. Scanners detected 142 razorback suckers that had been at large for more than 1 year post-release; a single bonytail at large for more than 1 year was also contacted.

- Scanning of known bird roosts immediately following stocking events was conducted in FY17 under Work Task C65. Avian predation monitoring was initiated following the stocking of razorback suckers and bonytail at the IPCA. Pole-mounted scanners were deployed within each pond and allowed to operate for 10 days post-stocking. Avian point counts were also completed three times per day in conjunction with the scanning. No piscivorous birds were observed in or around the ponds during this time, and no tags were detected on the pole-mounted scanners following the 10-day survey. Continuous avian scanning for 10 days following releases of bonytail in Laughlin Lagoon showed that no PIT tags of 852 bonytail released in May were recorded on pole-mounted scanners; however, 5 PIT tags from previous stockings were recorded during this same scanning period. Four of these tags were from bonytail stocked in April. This study has continued to confirm that bird predation on stocked fishes is occurring. Although the percentage of confirmed, initial post-stocking predation appears low, sampling efforts are likely underrepresenting bird predation mortality. Evidence of bird predation on fishes from previous releases (roost-scanned PIT tags) suggests that predation pressure from birds may be continuous. Additional longer-term scanning efforts will be necessary to clarify if continuous predation is occurring.

General Species Research

- Research conducted under Work Task C25 came to a close in FY17. All ponds at the IPCA were stocked with native fishes, and future monitoring efforts will be covered under Work Task F5 (BONY5 and RASU6). Ponds 1, 3, and 4 were stocked with razorback suckers in December 2016, and Ponds 2, 5, and 6 were stocked with bonytail in March 2017. The ponds were stocked with 300 adults in an even ratio of males and females. Each fish was PIT tagged, and a tissue sample was collected to aid in genetic monitoring. The ponds were equipped with a minimum of two solar-powered PIT-tag scanners that were programmed to monitor continuously. Fish population estimates were calculated biweekly using the PIT scanner data. Larval fish monitoring and minnow traps were used to search for signs of recruitment in each of the ponds. In April, larval bonytail were detected in Pond 2, and thousands of young fish could be observed along the shoreline for the remainder of the year. No larvae or young-of-year fish were detected in the other ponds. At the end of FY17, population estimates for each pond were: Pond 1 – 199 razorback suckers, Pond 2 – 142 bonytail, Pond 3 – 185 razorback suckers, Pond 4 – 224 razorback suckers, Pond 5 – 273 bonytail, and Pond 6 – 219 bonytail.

- Research conducted under Work Task C32 during FY17 focused on evaluating threshold salinity concentrations for juvenile bonytail and razorback sucker survival. Fingerling fishes were exposed to salinity concentrations of 10,000–20,000 microsiemens per centimeter (μS/cm) in replicate treatments for a minimum of 15 days at 25 °C. Fish were acclimated to experimental salinities over a period of 3 weeks prior to trial initiation. Control replicates for each species were also maintained at approximately 1,000 μS/cm for the duration of each trial. Control replicates represent similar conditions to those found in the LCR main river channel. Limited mortality (2–9 %) was observed for juvenile bonytail exposed to 10,000–17,500 μS/cm during a 20-day trial period. Mortality increased noticeably to 69% for fish exposed to 20,000 μS/cm for the same duration. Juvenile razorback suckers exposed to the same conditions over a 15-day period displayed higher survival overall. Zero mortality was observed in 10,000–17,500 μS/cm treatments, and only 3% mortality was observed at 20,000 μS/cm. These observations are similar to those previously recorded for razorback sucker larvae.

The following research projects were closed in FY17:

- *Work Task C25 – Imperial Ponds Native Fish Research*: Research focused on native fish survival and habitat use was completed in six native fish refugia ponds located at the IPCA. Native fish populations and population genetics will be monitored under Post-Development Monitoring (Section F) following FY17. Any changes in pond management will be assessed and implemented through the adaptive management process (Section G).

- *Work Task C32 – Determination of Salinity, Temperature, pH, and Oxygen Limits for Bonytail and Razorback Sucker*s: Research conducted on water quality thresholds for native fishes has provided guidance for water quality management of LCR MSCP created backwaters. This work task closed in FY17. If additional water quality research needs are identified in the future, the work task may be reopened.

FY18 Activities

Research in FY18 will continue to focus on genetics, post-stocking survival, and habitat use and needs of native fishes. Much of this work represents ongoing long-term efforts. Because recontact rates for stocked fishes are low, multi-year studies are typically needed to adequately assess stocking treatment effects.

Research work tasks that assess the genetics of razorback suckers and bonytail (C31 and C40) will continue. Because Lake Mohave is being managed as the genetic broodstock for razorback suckers in 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 inform management of native fish populations. 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. An independent review of genetic requirements for the LCR MSCP will be carried out under the Adaptive Management Program (Section G) in FY17–18.

Part of the work initiated under Work Task C40 will be moved to the IPCA. Spawning of razorback suckers and bonytail of known genetic makeup will be monitored, and larvae and young-of-year fish will be sampled to assess the adult contribution of genetic material to the next generation. Information gleaned from these assessments will assist with modeling the population structure within these isolated habitats over subsequent generations and to predict at what frequency genetic material needs to be exchanged between habitats.

Alternate stocking treatments will also continue to be evaluated in FY18, as will flow-conditioning research and predator avoidance trials (C61, C63). Assessments of riverine habitat use by razorback suckers and bonytail (C64) and field investigations of immediate post-stocking mortality (C65) will also continue.

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 FY18.

A number of Section C work tasks will close at the end of FY18. It is expected that some of the research under these work task will be completed and that questions have been answered adequately enough to inform management decisions. Study results will either warrant the implementation of new practices or will indicate that further investment in the research or implementation of new practices would not be worthwhile. In some cases, a portion of the sampling conducted under a research work task will be continued as a monitoring effort under Section D or Section F. Long-term study results may also be covered under a different Section C work task. The following work tasks are expected to be closed in FY18:

- *Work Tasks C31 – Razorback Sucker Genetic Diversity Assessment and Work Task C40 – Genetic and Demographic Studies to Inform Conversation Management of Razorback Suckers and Bonytail in Off-Channel Habitats*: Genetics research conducted under these work tasks will provide the necessary information to build and inform a genetics monitoring program that is implemented at the appropriate level for the LCR MSCP. Future genetics monitoring efforts for the main stem LCR will be carried out under System Monitoring (Section D) after FY18.

- *Work Task C61 – Evaluation of Alternative Stocking Methods for Fish Augmentation*: Research on stocking and conditioning treatments for native fishes will be completed in FY18. Development and initial assessment will have been completed to the point in which their expected effectiveness will inform implementation of each of these treatments. Long-term assessment of these treatments in terms of differences in post-stocking survival in the LCR will be recorded through subsequent years' recapture data provided under Work Tasks C64 and D8.

- *Work Task C63 – Evaluation of Habitat Features that May Influence Success of Razorback Suckers and Bonytail in Backwater Environments*: Refinements in configurations and initial testing/deployment of artificial habitats will be completed in FY18. Differences in long-term post-stocking survival will be assessed under Work Task F5 for artificial habitats deployed in created backwaters and under Work Task C64 for artificial habitats deployed at other stocking locations within the LCR.

- *Work Task C65 – Evaluation of Immediate Post-Stocking Survival of Razorback Suckers and Bonytail*: Assessments of immediate post-stocking mortality will be completed in FY18. The impacts of handling stress on stocking mortality will be evaluated to establish when additional measures will need to be employed during handling and transport of stocked native fishes. Bird predation research will be completed in FY18. Data from this research will suggest the relative magnitude of impact that piscivorous birds are having on stocked native fishes and may suggest alternate strategies (stocking in seasons with lower bird abundance) to minimize these impacts. Any changes in these protocols or practices will be assessed and implemented through the

adaptive management process (Section G). Long-term assessments of the effectiveness of these changes will be recorded through subsequent years' recapture data provided under Work Tasks C64 and D8.

Proposed FY19 Activities

The efforts in FY19 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 species needs to help inform backwater creation and management. 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. Genetic research will continue in FY19 in order to provide guidance for long-term management of both the Lake Mohave genetic broodstock and created backwater populations. A portion of existing genetic research will transition into monitoring and will be conducted under Section D and Section F work tasks. The appropriate level of effort and long-term needs for monitoring razorback sucker genetics in Lake Mohave as well as the other LCR reaches and created backwater habitats will be informed by the independent genetic review scheduled to be completed in FY18.

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 Work Tasks C64, D8, and F5.

FY17 Accomplishments

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

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

Population estimates for razorback suckers reported in FY17 are provided in table 1-11. These population estimates are currently calculated differently for each reach based on their particular situation. Reach 1 (Lake Mead) population estimates are calculated based on a mark-recapture estimator using multi-year netting captures only. The remaining reaches (Reaches 2–5) use PIT scanning to provide the population estimates reported in table 1-11. In all reaches, the population estimates use a mark-recapture estimator, which requires that a set of fish be marked and recaptured during a designated period. The actual population estimate is for the time period preceding the reporting date (FY17) and is based on the mark-recapture period (table 1-11).

Table 1-11.—Population estimate for razorback suckers by LCR MSCP river reach in FY17

Reach	Mark-Recapture Period	Razorback Sucker Population Estimate
Reach 1 (Lake Mead)	07/01/2015 to 06/30/2017	421
Reach 2 (Lake Mohave)	03/01/2016 to 08/31/2017	3,815
Reach 3	11/01/2016 to 08/31/2017	5,337
Reaches 4 and 5	N/A*	N/A*

* Insufficient numbers of captures were available to provide a population estimate for this reach.

Monitoring of the Lake Mead adult razorback sucker population continued in FY17. Trammel netting conducted during the spawning season resulted in the capture of 53 razorback suckers: 12 from Las Vegas Bay, 14 from Echo Bay, 15 from the Muddy River/Virgin River inflow, and 12 from the Colorado River inflow area. Of the 53 razorback suckers captured, 27 were recaptured fish. The remaining fish were untagged and presumed to be wild-spawned individuals. The ages of wild razorback suckers captured from long-term monitoring areas in FY17 ranged from 2 to 14 years old. The razorback sucker population in Lake Mead was estimated at 421 individuals (see table 1-11) (95% confidence interval [CI] from 305 to 615) for the 2015–17 data collection period. Larvae and juvenile fish were observed along with active spawning in four separate areas in the lake. A total of 402 larvae were captured throughout the season. The majority of larvae 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 FY17 field season. A small subset of larvae were taken to the Lake Mead Fish Hatchery for grow-out and future genetic analyses. These fish will be returned to the lake in future years. No bonytail were contacted in FY17, and they are considered absent from Reach 1.

Annual Lake Mohave razorback sucker roundups were conducted in December and March. During these efforts, a combined 100 razorback suckers were captured using trammel nets. Ten additional razorback suckers were captured during an April sampling event, and electrofishing surveys conducted in the river

section above the Willow Beach National Fish Hatchery resulted in the capture of 11 razorback suckers. Remote sensing efforts also continued in FY17, recording a total of 71,434 PIT tag contacts throughout the lake. In the river section of Lake Mohave, 10,393 hours of scan time resulted in 29,939 total contacts representing 2,182 unique PIT tags. In the basin section, 30,958 hours of scan time resulted in 41,056 contacts representing 1,770 unique PIT tags. Supplemental scanning in other areas of the lake (13,499 hours of scan time) resulted in 439 total contacts representing 111 unique PIT tags. After duplicate PIT tags contacted in multiple lake sections were removed from analyses, 3,707 unique fish were contacted in 54,850 hours of scan time during FY17. This is slightly higher than the 3,128 PIT tags contacted in 36,944 hours of scan time in 2016 and a 17.5% increase in unique contacts compared to those made in 2015 (3,059 PIT tags contacted in 23,008 hours of scan time).

Based on 2016–17 remote PIT scanning data, the Lake Mohave repatriate population was estimated at 3,815 individuals (95% CI from 3,573 to 4,073). This population estimate is slightly higher than the FY16 estimate of 3,656 repatriated razorback suckers (2015–16 remote PIT scanning data).

A study comparing the traditional use of trammel netting versus remote PIT scanning during the March razorback sucker roundup continued. 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; however, traditional sampling methods continue to provide demographic and genetic information from adult populations that cannot be obtained through remote PIT scanning. The data acquired through this and other efforts have underscored the importance of using multiple sampling methods to monitor native fish populations.

Capture and contact data for Reach 3 were acquired through multiple work tasks, 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. Bonytail contacts are still rare and typically occur only for the first few weeks to months post-release. All survey methods conducted in Reach 3 in FY17 resulted in the capture or contact of 3,306 unique razorback suckers, 728 bonytail, and 12 flannelmouth sucker contacts. Based on 2016–17 data, Reach 3 had a razorback sucker population estimate of 5,337 (95% CI from 5,043 to 5,633), which is a slight increase from the previous estimate of 4,923.

A total of 6,519 razorback suckers and 6,687 bonytail were stocked into Reaches 4 and 5 during FY17; all fishes were released with a PIT tag. Monthly PIT scanning was initiated in October 2016, and electrofishing surveys occurred throughout the year to monitor released fish. A total of 443 unique razorback

suckers and 279 unique bonytail were captured or contacted in FY17. Additional investigations of post-stocking distribution and survival in these reaches is being conducted under Work Task C64.

FY18 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.

Proposed FY19 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 in order to help identify additional locations where native fishes might persist in these reaches. A portion of backwater and main-channel fish population genetic monitoring will be assumed under system monitoring (D8).

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 Big Bend Conservation Area (BBCA), Beal Lake Conservation Area (BLCA), and beginning in FY18, the IPCA.

FY17 Accomplishments

Routine monitoring at the BBCA continued in FY17. Netting resulted in the capture of two razorback suckers and seven bonytail. Remote PIT scanning resulted in the contact of one razorback sucker and six bonytail. All bonytail contacted via netting and scanning were from an April 2017 release in Laughlin Lagoon. Larval razorback suckers and flannelmouth suckers were

captured at rates higher than in FY16, but the rates were similar to those observed prior to FY15. Water quality parameters remained below threshold values for all native fishes.

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 2,200 μS/cm following the initiation of routine wedge-wire screen maintenance. No golden algae have been detected in Beal Lake since May 2013. No fisheries activities were conducted at Beal Lake due to the lack of available fishes in the hatcheries.

FY18 Activities

The BBCA will be monitored at a level similar to that in FY17; however, additional mobile remote PIT scanners will be deployed in an effort to increase scanning contacts for all species.

Monitoring activities of Beal Lake will be focused on water quality. Limited fish monitoring is expected in FY18. Golden algae sampling will not be conducted in FY18, as none were detected during the previous 4 years of sampling (FY14–17). Beginning in FY18, 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. Fisheries activities at Beal Lake are expected to resume following dredging.

Research at the IPCA was moved from Work Task C25 following FY17. Monitoring at the ponds will include population monitoring via remote PIT scanners, annual winter surveys using a variety of capture gear, monitoring of larval and young-of-year fish through the spring and summer, and continuous water quality monitoring. Water quality data will be used to evaluate the effectiveness of the water delivery schedule designed to maintain water quality suitable for native fishes. Genetic analyses of native fish pond stocks will be included under Work Task F5.

The initial winter surveys for the Imperial ponds were completed in December 2017. These surveys included hoop netting, minnow trapping, electrofishing, and trammel netting. Adults were captured from each pond, and all fishes exhibited good growth and appeared healthy, with little to no signs of disease or parasites. Subadult bonytail were contacted in Ponds 2, 5, and 6, indicating a successful spawn in each of the bonytail ponds. The recruits in Pond 2 were more abundant and much smaller in size compared to the few recruits that were contacted in Ponds 5 and 6. This is likely related to the magnitude of the spawn and an increased density of young fish in Pond 2.

Proposed FY19 Activities

Fisheries monitoring at conservation areas is expected to be similar to FY18 efforts.

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.

Beal Lake water quality will be monitored using permanently deployed multi-parameter instruments. Fisheries activities will be postponed until dredging is complete and adequate numbers of fish are available for stocking.

Activities at the Imperial ponds will include population monitoring via remote PIT scanners, annual winter surveys using a variety of capture gear, larval/young of year monitoring through the spring and summer, and continuous water quality monitoring. Genetic monitoring will continue in order to provide guidance for long-term management of fish populations in created backwater habitat. This information will help model population structures within isolated habitats and inform how often genetic material needs to be exchanged between habitats.

Adaptive Management Program (Section G)

Under the 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 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 for designing 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 information can be readily accessed and used to inform management decisions. Native fish stocking and tagging data developed by 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.

FY17 Accomplishments

The native fish databases continued to be maintained in their current formats (G1). These include the LCR Native Fish Database, which is used to store tagging, stocking, and recontact information for individual fish, and the Remote Scanning Database, which is used to store recontact information obtained through remote PIT scanning activities. Improvements to the online Remote Scanning Database began in FY17.

The CEM developed for the razorback sucker in FY14 was updated to reflect new information about the species (G6).

FY18 Activities

During this fiscal year, an expanded independent review of specific fisheries genetic research and monitoring activities will be initiated. It is expected to provide specific recommendations regarding the appropriate level of effort and long-term needs for monitoring razorback sucker genetics in Lake Mohave as well as the other LCR reaches and created backwater habitats as required to satisfy LCR MSCP goals.

Updates to the remaining native fish CEMs will be completed. The CEMs are being used to identify knowledge gaps that will be addressed in the next iteration of the *Five-Year Monitoring and Research Priorities* report that is being developed in FY18 under Work Task G4.

During FY18, fish research and monitoring projects will continue to be evaluated to determine if 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 are needed. Data dictionaries or mobile electronic field forms (MEFFs) continue to be developed for fish projects on a priority basis. Maintenance of the fish augmentation database will continue.

Proposed FY19 Activities

In FY19, technical, independent, and peer reviews of fisheries projects, as part of the adaptive management process, will continue under the AMP (G4). CEMs will be used in the adaptive management process to prioritize future research and monitoring as well as to inform management actions. LCR MSCP database structure development and the 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 23 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 by 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 MSCP planning area (Section D).

For some species, fundamental information is lacking, and research projects (Section C) are implemented to fill those data 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 50-year term of the LCR MSCP (Section C and Section G).

Species Research (Section C)

Research is being conducted on covered wildlife species and their habitats to (1) inform 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 and the identification of data gaps. Species research projects will be designed 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 22 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:

- Arizona Bell's vireo
- California black rail
- California leaf-nosed bat
- Colorado River cotton rat
- Colorado River toad
- Elf owl
- Gila woodpecker
- Gilded flicker
- Lowland leopard frog
- MacNeill's sootywing skipper
- Northern Mexican gartersnake
- Pale Townsend's big-eared bat
- Sonoran yellow warbler
- Southwestern willow flycatcher
- Summer tanager
- Vermilion flycatcher

- Western least bittern
- Western red bat
- Western yellow bat
- Yellow-billed cuckoo
- Yuma clapper rail
- Yuma hispid cotton rat

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.

FY17 Accomplishments

In 2017, the LCR MSCP implemented five research projects focused on eight 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 FY17, methods to detect covered and evaluation species with known levels of accuracy were identified and approved for many LCR MSCP terrestrial species. In FY17, research continued in order to improve detection methods for the elf owl (C24), gilded flicker (C52), and the lowland leopard frog and Colorado River toad (C62).

- *Work Task C24 – Avian Species Habitat Requirements*: Field work 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.

- *Work Task C52 – Gilded Flicker Riparian Habitat Use and Seasonal Movement Research*: Exploratory surveys were conducted at eight study sites along the LCR and in Arizona to locate gilded flicker populations in riparian habitat in order to document their behavior and use of riparian land covers and to refine methods for presence surveys and biologist training. The methods enabled biologists to locate gilded flickers in upland Sonoran Desert habitat near riparian areas, but no gilded flickers were detected within riparian habitat. Behaviors observed were similar to

those documented at the Quartzite study site. The developed training methods helped biologists focus their search efforts to detect gilded flickers. It is still unknown if gilded flickers utilize riparian woodlands extensively. Their behavior and large home ranges make them difficult to detect without multiple days of searches in a row at a study area. This study was initiated to improve survey detections of gilded flickers, as few have been recorded during LCR MSCP bird surveys, and to learn more about their habitat characteristics.

- *Work Task C62 – Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study*: The final report was completed. The methods used for detecting egg masses were effective for lowland leopard frogs and Colorado River toads. The habitat characteristics where each species were found breeding were described.

Habitat characteristics in areas occupied by covered and evaluation species were studied under three 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) and the California black rail and Yuma clapper rail (C66).

- *Work Task C62 – Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study*: The final report was completed. Habitat data were collected where egg masses were detected, including the location, associated vegetation, water depth, water temperature, egg mass dimensions, pH, air temperature, and distance to cover and land.

- *Work Task C66 – Marsh Bird Water Depth Analysis*: A study was conducted to analyze existing data to identify the range of water depths in Yuma clapper rail and California black rail breeding sites throughout the breeding season to identify the ranges of daily, monthly, and annual water depth variability that has occurred. In FY17, a literature review was conducted to locate information about California black rail breeding habitat and breeding locations. In the areas outside the United States portion of the LCR, there are much larger populations of this species, and the bird's use of water depths has been fairly well documented. In Yuba County, California, a population of California black rails use areas of irrigated, created marsh that can provide relevant, useful data for LCR MSCP creation and management of California black rail habitat. The birds were detected at water depths averaging 0.83 inch. Researchers recommended shallow water, gently sloping landscapes, and variable water levels when managing created marsh for California black rails.

LCR MSCP funds were provided to the National Park Service (NPS) at the Lake Mead National Recreation Area to support implementation of conservation measures for sticky buckwheat and threecorner milkvetch (C2) in accordance with Conservation Measures STBU1 and THMI1. Sticky buckwheat and threecorner milkvetch population monitoring and invasive species control activities were conducted to protect the populations at the Lake Mead National Recreation Area (supported by Work Task C2 funds).

The following research projects were closed in FY17:

1. *Work Task C52 – Gilded Flicker Riparian Habitat Use and Seasonal Movement Research*: The study to improve survey methods to detect gilded flickers and to learn more about their habitat characteristics. Monitoring gilded flickers will occur under Work Tasks D6 and F2 in the future.

2. *Work Task C62 – Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study*: The study to document lowland leopard frog and Colorado River toad habitat characteristics and measure ecological factors that may limit each species' distribution. Monitoring lowland leopard frogs and Colorado River toads will occur under Work Tasks D12 and F8 in the future.

FY18 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. The study will continue on the elf owl (C24).

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) and the Yuma clapper rail and California black rail (C66).

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

The following projects are scheduled to be completed in FY18:

1. *Work Task C24 – Avian Species Habitat Requirements*: A study to test the elf owl's responsiveness to call-playback at short distances (50–250 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.

2. *Work Task C66 – Marsh Bird Water Depth Analysis*: A study was conducted to analyze existing data to identify the range of water depths in Yuma clapper rail and California black rail breeding sites throughout the breeding season in order to identify the ranges of daily, monthly, and annual water depth variability that has occurred.

In addition, in FY18, accomplishments will be reviewed to identify if additional research is needed. If additional research needs are identified, new work tasks will be initiated.

Proposed FY19 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 implementing conservation measures for sticky buckwheat and threecorner milkvetch (C2) in accordance with Conservation Measures STBU1 and THMI1. The LCR MSCP will provide funds to the NPS at the Lake Mead National Recreation Area to support existing conservation activities.

In addition, in FY19, accomplishments will be reviewed in order to identify additional research needs. If research needs are 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 50-year term of the LCR MSCP as data gaps are filled and as additional conservation areas are developed. In FY14–17, 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 types on the conservation areas without

the need for additional research to inform habitat creation methods. As a result, in FY17, monitoring for bats (D9 and F4), yellow-billed cuckoos (D7), MacNeill's sootywing skippers (F6), and rodents (D10 and F3) focused on documenting presence and, when appropriate, breeding. This level of analysis will continue in FY18 and FY19. 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 FY19.

FY17 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 2017 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. All three covered species were encountered: 55 Yuma clapper rail detections in March, 81 in April, and 76 in May; 21 western least bittern detections in March, 28 in April, and 54 in May; and 1 California black rail detection in March, 0 in April, and 0 in May.

Presence surveys for the southwestern willow flycatcher (D2) were conducted at 44 system-wide sites along the LCR and its tributaries in FY17. System-wide surveys were conducted at Alamo Lake, the Bill Williams River (Bill Williams River National Wildlife Refuge [Bill Williams River NWR] and Planet Ranch), Meadow Valley Wash, the Muddy River, the Pahranagat National Wildlife Refuge (Pahranagat NWR), the Warm Springs Natural Area, and Topock Marsh. Life history studies were conducted at 38 sites and included banding, nest monitoring, habitat threat analyses, and microclimate analyses. A total of 161 resident (observed after migration has ended) or breeding southwestern willow flycatchers were detected, and 98 territories were identified within the following 7 study areas: Alamo Lake, the Bill Williams River NWR, Meadow Valley Wash, the Muddy River, the Pahranagat NWR, Topock Marsh and the Warm Springs Natural Area. Eighty of those territories were confirmed to have breeding southwestern willow flycatchers. In FY17, 19 previously unbanded adults and 44 nestling southwestern willow flycatchers were captured and color banded. Nine banded in previous years were recaptured, an additional 37 banded in previous years were redetected, and 6 individuals were redetected but did not have their color combinations confirmed. The results of 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 yellow-billed cuckoos (D7) was not conducted in FY17, as nesting continues to occur primarily on LCR MSCP conservation areas. In 2017, one of seven yellow-billed cuckoos captured and fitted with a global

navigation satellite system (GNSS) locator in 2015 was recaptured at the PVER; therefore, additional surveys to locate birds with GNSS locators off the conservation areas was not required. An additional three new adults and two other previously banded adults were captured during mist netting. The GNSS locator contained one location in the State of Jalisco Mexico, 31 miles south of Lake Chapala near Guadalajara before the tag failed. This datum, combined with data from six other birds tracked over the previous years, support a fall migration route for this population following the west coasts of Mexico and Central America. 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 two conservation areas using the Monitoring Avian Productivity and Survivorship (MAPS) protocol. During the breeding season, there were 146 captures at the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1) and 151 total captures at the BLCA. 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).

Under Work Task D6, the 2011–15 population trends and habitat use of riparian bird species throughout the LCR MSCP planning area and offsite conservation areas was completed. An evaluation of the monitoring protocol continued to clarify the monitoring questions the data will inform and to improve the accuracy of monitoring methods. No system-wide surveys were conducted in FY17. System-wide surveys will resume after evaluation of the monitoring protocol was initiated to clarify the monitoring questions the data will inform and to improve the accuracy of monitoring methods. Surveys were conducted on LCR MSCP conservation areas in FY17 under Work Task F2. Those results are discussed under "Post-Development Monitoring (Section F)" below.

Under Work Task D9, acoustic monitoring and bat captures were conducted at system-wide monitoring sites, and a foraging distance study of California leaf-nosed bats and pale Townsend's big-eared bats was completed. The five permanent acoustic monitoring stations were operated from June – August to detect bat presence. Western red bats and California leaf-nosed bats were detected at all five acoustic monitoring stations. Western yellow bats were detected at four stations but not detected at the Bill Williams River NWR. No pale Townsend's big-eared bat calls were recorded during FY17. Bat captures were conducted at the 'Ahakhav Tribal Preserve. A total of 116 bats of 10 species

were captured, including 1 Pale Townsend's big-eared bat and 8 California leaf-nosed bats. System-wide monitoring objectives were defined and a monitoring plan developed for FY18–28. The final report was completed for the foraging distance study of pale Townsend's big-eared and California leaf-nosed bats along the LCR. From these results, it is clear that California leaf-nosed bats are capable of flying more than 5 miles (CLNB1) between roost sites and foraging habitat provided by conservation areas (actually they can travel up to 10 miles) and that created habitat within 10 miles of pale Townsend's big-eared bat roosts (PTBB1) can be used for foraging. Roost locations surveyed from FY02 to FY16 are within foraging distance of a number of conservation areas. Not all roosts are known. The acoustic and capture detections reported under Work Task F4 verify that the BLCA, Cibola NWR Unit #1, CVCA, the PVER, and Planet Ranch in Reaches 3–5, as well as Hunters Hole and Yuma East Wetlands in Reaches 6–7, support foraging California leaf-nosed bats and that the BLCA, Cibola NWR Unit #1, the CVCA, Planet Ranch, and the PVER (Reaches 3–5) support foraging pale Townsend's big-eared bats.

Surveys were conducted to document the presence of covered rodent populations (D10) in selected areas of suitable habitat at the Havasu National Wildlife Refuge (Havasu NWR) outside of the BLCA, the Imperial National Wildlife Refuge (Imperial NWR) outside the IPCA, and the Picacho Conservation Area approximately 24 miles north of Yuma, Arizona. No Colorado River cotton rats or Yuma hispid cotton rats were captured at any system-wide monitoring sites. Four desert pocket mice (subspecies not determined) were captured at the Havasu NWR.

The system-wide monitoring study was completed for the lowland leopard frog and Colorado River toad (D12). The results of this study indicate that for Colorado River toads, visual encounter surveys (VES) with a call/response component (VES C/R) and digital automated recorder (DAR) recordings were the most cost-efficient methods of detection. A VES is still the preferred method when rain is not predicted and surveys must be conducted regardless of the weather. VES C/Rs and DARs are only suitable for detecting Colorado River toads after a monsoon event (i.e., when toads are calling). The most cost-effective method for detecting presence of lowland leopard frogs was the VES method due to its low overall cost and high probability of detection. In the trial implementation of this method, efficiency was increased by conducting VESs for shorter periods (30 minutes versus 2 hours) and adding a call/response component.

FY18 Activities

System-wide monitoring of marsh birds, southwestern willow flycatchers, yellow-billed cuckoos, bats, rodents, 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.

System-wide surveys for southwestern willow flycatchers will be conducted at Topock Marsh, the Bill Williams River, Alamo Lake, and the portion of the river below the Cibola National Wildlife Refuge (Cibola NWR) to the Northerly International Border with Mexico, which are conducted once every 3 years. Nest monitoring will be conducted at Topock Marsh. Birds banded in previous years may be resighted, and nests may be found incidentally to these activities. System-wide (D2) and post-development monitoring (F9) will be divided into separate work tasks in FY18.

Yellow-billed cuckoo (D7) presence surveys will continue at LCR MSCP conservation areas but will not be conducted in system-wide existing habitat in FY18, as nesting continues to occur primarily on LCR MSCP conservation areas (F10).

Some multi-species surveys used to monitor other avian species covered under the LCR MSCP will continue in FY18. Under Work Task D5, the MAPS banding stations will continue to operate at Cibola NWR Unit #1 and the BLCA during the breeding season. Color banding of LCR MSCP covered species will continue to be implemented to evaluate the recapture rate.

System-wide breeding bird surveys (D6) will not be conducted in FY18. The protocol will continue to be reviewed, and changes will be made, if necessary, to improve the accuracy of the monitoring methods and to focus the sampling on collecting the presence and trend data needed to inform the program. A 10-year monitoring plan will be developed. System-wide surveys will resume in FY19.

The five bat acoustic monitoring stations will continue to operate in FY18 (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 stations located at LCR MSCP conservation areas (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.

System-wide surveys (D10) will be conducted to detect the presence of Colorado River and Yuma hispid cotton rats within selected areas that have potential habitat along the LCR outside LCR MSCP conservation areas and in occupied portions of conservation areas containing land cover types not creditable to the program under conservation measures CRCR2 and YHCR2. If potential habitat is discovered in areas that can inform LCR MSCP habitat creation, monitoring may be conducted to document their presence and habitat characteristics.

Proposed FY19 Activities

System-wide monitoring of marsh birds, southwestern willow flycatcher, bats, rodent populations, MacNeill's sootywing skippers, and avian productivity along the LCR and adjacent river systems will continue in FY19.

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.

System-wide surveys for southwestern willow flycatchers will be conducted along the LCR, Alamo Lake, and the lower Bill Williams River (D2). Monitoring may include life history studies at the Bill Williams River NWR, Alamo Lake, and Topock Marsh; nest monitoring; and microclimate analyses.

Yellow-billed cuckoo (D7) presence surveys are not scheduled in system-wide existing habitat in FY19, as nesting continues to occur primarily on LCR MSCP conservation areas (F10). Habitat conditions within the Bill Williams River NWR and Topock Marsh will be assessed. Surveys could resume if habitat conditions improves

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. System-wide breeding bird surveys under Work Task D6 will resume in FY19. The protocols will be updated, as needed, following the evaluation in FY16–18.

The 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).

System-wide surveys (D10) will be conducted to detect the presence of Colorado River and Yuma hispid cotton rats within selected areas that have potential habitat along the LCR outside LCR MSCP conservation areas and in occupied portions of conservation areas containing land cover types not creditable to the program under conservation measures CRCR2 and YHCR2. If potential habitat is discovered in other areas that can inform LCR MSCP habitat creation, monitoring may be conducted to document their presence and habitat characteristics.

A new work task will open in FY19. System-wide monitoring for MacNeill's sootywing skippers (D14) will be conducted in occupied portions of conservation areas containing land cover types not creditable to the program under conservation measure MNSW2. If potential habitat is discovered in other areas that can inform LCR MSCP habitat creation, monitoring may be conducted to document their presence and habitat characteristics.

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.

FY17 Accomplishments

In FY17, monitoring for LCR MSCP covered species use was conducted at 13 conservation areas (table 1-12). 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. In addition to the covered species post-development monitoring that took place during FY17, long-term vegetation monitoring was conducted at all conservation areas using light detection and ranging (lidar) technology. These data were processed and analyzed using methods developed under Work Task C60. Conservation area vegetation will be evaluated on a periodic basis to ensure that the habitat is meeting species' requirements. This evaluation used several metrics that are being developed under Work Task C60 that describe vegetation structure throughout the canopy with the ability to identify structural diversity and successional growth stages.

Presence surveys for southwestern willow flycatchers (D2) were conducted at 26 sites on the following LCR MSCP conservation areas in FY17: the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the Laguna Division Conservation Area (LDCA), Planet Ranch, the PVER, and YEW (Yuma East Wetlands). No resident southwestern willow flycatchers were observed at LCR MSCP conservation areas in FY17. Work Task D2 also included system-wide monitoring discussed in "System Monitoring (Section D)" above.

Post-development monitoring for yellow-billed cuckoos (D7) continued in FY17 with presence surveys at the BLCA, the CVCA, Cibola NWR Unit #1, the Middle Bill Williams River NWR, the LDCA, the PVER, and YEW, and attempts were made to locate birds fitted with GNSS locators in previous years in order to retrieve their migration data. A total of 27 confirmed breeding territories and 21 nests and an additional 16 probable and 22 possible breeding territories were

Table 1-12.—LCR MSCP Covered Species Post-Development Monitoring Conducted in FY17

Conservation Area	Marsh Birds	Southwestern Willow Flycatcher	Yellow-billed Cuckoo	Other Covered Riparian Birds	Bats	Rodents	MacNeill's Sootywing Skipper
Beal Lake Conservation Area	X	X	X	X	X	X	NS
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	NS
Hart Mine Marsh	X	NS	NS	NS	NS	NS	NS
Hunters Hole	NS*	X	NS	X	X	X	NS
Imperial National Wildlife Refuge	X	NS	NS	NS	NS	NS	NS
Laguna Division Conservation Area	X	X	X	X	NS	X	NS
Palo Verde Ecological Reserve	NS	X	X	X	X	X	NS
Parker Dam Camp	NS	NS	NS	X	NS	NS	NS
Planet Ranch and Middle Bill Williams River National Wildlife Refuge	NS	X	X	X	NS	NS	NS
Pretty Water Conservation Area	NS	NS	NS	X	NS	NS	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.

detected. There were 25 confirmed breeding territories and 19 nests at the PVER (Phases 3–7), 2 confirmed territories and 2 nests at Cibola NWR Unit #1 (Crane Roost and Hippy Fire). In 2017, one of seven yellow-billed cuckoos captured and fitted with a GNSS locator in 2015 was recaptured at the PVER and data retrieved. An additional three new adults and two other previously banded adults were captured during mist netting.

Four LCR MSCP listed species were captured and color banded during the MAPS season (D5). Two Bell's vireos, one Gila woodpecker, two Sonoran yellow warblers, and three summer tanagers were captured at the BLCA, and two Gila woodpeckers and one Sonoran yellow warbler were captured at Cibola NWR Unit #1. One Bell's vireo and one Gila woodpecker were banded at the BLCA. There were recaptures at the BLCA of two Sonoran yellow warblers (their initial captures were in 2015 and 2016) and three summer tanagers (a pair from 2016 and one male from 2011) that were all initially banded at the BLCA.

In addition, a Bell's vireo originally banded in 2014 was resighted at the BLCA. At Cibola NWR Unit #1, there were two Gila woodpeckers, and one Sonoran yellow warbler banded. 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).

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 planning area and offsite conservation areas. In FY17, 80 plots were surveyed for riparian birds (F2) on conservation areas, recording 31 species, including LCR MSCP covered bird species and other territorial riparian breeding birds:

- BLCA – There were 47 pairs of territorial breeding birds comprising 12 species detected. These included four pairs of Sonoran yellow warblers, five pairs of Arizona Bell's vireos, and one summer tanager pair.

- Cibola NWR Unit #1 – There were 76 pairs of territorial breeding birds comprising 13 species detected. This included one summer tanager pair.

- Middle Bill Williams NWR (E21) – Fifteen area search plots were surveyed at this conservation area. There were 514 pairs of birds comprising 24 species detected. These included 11 pairs of Arizona Bell's vireos, 11 pairs of Gila woodpeckers, 6 pairs of summer tanagers, and 34 pairs of Sonoran yellow warblers.

- CVCA – There were 116 pairs of territorial breeding birds comprising 18 species detected. These included three pairs of Arizona Bell's vireos.

- Hunters Hole – There were 15 pairs of territorial breeding birds comprising 10 species detected. No LCR MSCP covered species were detected.

- LDCA – Thirteen area search plots were surveyed at this conservation area. There were 195 pairs of territorial birds comprising 12 species detected. No LCR MSCP covered species were detected.

- Parker Dam Camp – There were 44 pairs of birds comprising 15 species detected. These included two pairs of Gila woodpeckers.

- PVER – There were 125 pairs of territorial breeding birds comprising 19 species detected. These included two pairs of Sonoran yellow warblers, two pairs of Arizona Bell's vireos, and two pairs of summer tanagers.

- Pretty Water Conservation Area (PWCA) – There 64 pairs of territorial birds comprising 13 species detected. No LCR MSCP covered species were detected.

- YEW – There were 109 pairs of territorial breeding birds comprising 16 species detected. These included two pairs of Arizona Bell's vireos and one pair of Gila woodpeckers.

Avian pre-development monitoring was conducted at proposed conservation areas that have not yet been developed. The following proposed conservation areas were surveyed: Planet Ranch, PVER-South, and Three Fingers Lake. LCR MSCP covered bird species and other territorial breeding birds were documented at each proposed conservation area:

- Planet Ranch – Nine area search plots were surveyed at this proposed conservation area. There were 109 pairs of territorial breeding birds comprising 22 species detected. These included 2 pairs of Sonoran yellow warblers, 15 pairs of Arizona Bell's vireos, 3 pairs of Gila woodpeckers, and 3 pairs of vermilion flycatchers.

- PVER-South – Two area search plots were surveyed at this proposed conservation area. There were 29 pairs of territorial breeding birds comprising 9 species detected. No LCR MSCP covered species were detected.

- Three Fingers Lake – Nine area search plots were surveyed at this proposed conservation area. There were 165 pairs of territorial breeding birds comprising 12 species detected. No LCR MSCP covered species were detected.

Pre-construction and compliance activities related to the Migratory Bird Treaty Act were also conducted at the MVCA (F2).

Live trapping surveys to detect Colorado River and Yuma hispid cotton rats (F3) were conducted in fall 2016 and spring 2017. Surveys were conducted at the BBCA, the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the LDCA, the PVER, and YEW to detect the presence of cotton rats. Colorado River cotton rats were captured at the BBCA, the PVER, the CVCA, and Cibola NWR Unit #1; none were captured at the BLCA. Yuma hispid cotton rats were captured at YEW and Hunters Hole; none were captured at the LDCA.

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. Western red bats, western yellow bats, and California leaf-nosed bats were detected at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, YEW, and Hunters Hole. One pale Townsend's big-eared bat call was

recorded at the CVCA during August 2017. The analysis of acoustic monitoring data from FY15 to FY16 was completed. Bat capture surveys were conducted at four LCR MSCP conservation areas (BLCA, PVER, CVCA, and Cibola NWR Unit #1). Seven California leaf-nosed bats were captured at the BLCA. One western red bat, one western yellow bat, and four California leaf-nosed bats were captured at the PVER. Three western red bats, one western yellow bat, and one California leaf-nosed bat were captured at the CVCA. Six California leaf-nosed bats were captured at Cibola NWR Unit #1.

MacNeill's sootywing skippers were monitored (F6) at the BBCA and PWCA. They were detected at the PWCA; none were detected at the BBCA.

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 the BLCA, Hart Mine Marsh, the IPCA, the LDCA, and YEW. Yuma clapper rails were detected at the BLCA (both at Beal Lake and Willow Marsh), Hart Mine Marsh, Field 18 in the IPCA, the LDCA and YEW. One California black rail was detected at Field 18 in the IPCA 18 on the April 27 survey. This was the only detection of a California black rail at a conservation area in FY17.

FY18 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 southwestern willow flycatchers (F9), yellow-billed cuckoos (F10), avian species (F2), small mammals (F3), bats (F4), insects (F6), marsh birds (F7), and reptiles and amphibians (F8). MAPS banding stations (D5) will continue to operate at Cibola NWR Unit #1 and the BLCA during the FY18 breeding season. Pre-development surveys will be conducted for any new conservation areas.

Long-term vegetation monitoring will continue in FY18 using lidar technology (F1). Data will be processed and analyzed to provide metrics for vegetation structure analyses.

Three new work tasks will open in FY18 (F8, F9, and F10). Post-development monitoring for northern Mexican gartersnakes and lowland leopard frogs and Colorado River toads (F8) will be started to fund presence surveys for northern Mexican gartersnakes and their prey (including lowland leopard frogs and Colorado River toads) at marsh habitat sites and nearby cottonwood-willow habitat where these snakes may be present. Post-development monitoring for southwestern willow flycatchers will be moved from Work Task D2 to Work Task F9 to better track monitoring costs and accomplishments. In addition, post-development monitoring for yellow-billed cuckoos will be moved from Work Task D7 to Work Task F10 to better track monitoring costs and accomplishments.

FY19 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 southwestern willow flycatchers (F9), yellow-billed cuckoos (F10), avian species (F2), small mammals (F3), bats (F4), insects (F6), marsh birds (F7), and reptiles and amphibians (F8). MAPS banding stations (D5) will continue to operate at Cibola NWR Unit #1 and the BLCA during the FY18 breeding season. Pre-development surveys will be conducted for any new conservation areas.

Long-term vegetation monitoring will continue in FY19 using lidar technology (F1). Data will be processed and analyzed to provide metrics for vegetation structure analyses.

Adaptive Management Program (Section G)

Under the 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 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.

FY17 Accomplishments

The data standardization protocols developed in previous years continued to be applied to all collection and storage of data for species and their habitat. Automated and electronic data collection techniques were used where appropriate

to reduce errors and to improve workflow efficiencies using MEFFs. Database module development and management continued in FY17 for most wildlife research and monitoring projects.

Field data collection alternatives were evaluated during FY17. As a result of this evaluation, a new field data collection platform was chosen based on its ability to (1) integrate with current LCR MSCP systems including the enterprise system mentioned above, (2) provide almost immediate access to data using cloud-based storage systems, and (3) be used on a wide variety of devices due to its cross-platform support. MEFFs developed using this new system will be considered second-generation MEFFs. Field testing took place using this new platform for small mammals (D10 and F3) and breeding bird surveys (F2).

A scientific peer review was conducted for approximately 30 reports that were subsequently posted on the LCR MSCP Web site in FY17. These reviews were accomplished through the peer review process, which ensures that all research and monitoring complies with the LCR MSCP science strategy and the U.S. Department of the Interior Code of Scientific and Scholarly Conduct. This process also ensures that research and monitoring meets the needs of the LCR MSCP as outlined in the HCP and other program documents.

The LCR MSCP completed reviews on study plan designs and statistical analyses, and made changes to the LCR MSCP technical and scientific writing standards. When appropriate, this information was shared with external partners to assist in their research, monitoring, and report writing activities.

FY18 Activities

The field data collection processes continue to be updated and/or maintained. During FY18, several projects are being transitioned to the second generation MEFF platform and include the southwestern willow flycatcher (D2 and F2), yellow-billed cuckoo (D7 and F2), small mammals (D10 and F3), bat surveys and research (D9 and F4), and the MacNeill's sootywing skipper (F6).

An independent evaluation of all data management processes was conducted during FY17. Recommendations from this evaluation are being reviewed and evaluated for potential implementation. If deemed feasible and beneficial, recommendations will be scheduled for implementation.

Research and monitoring activities continue to be reviewed and evaluated internally as well as through independent, external reviewers. During FY18, an evaluation of the system-wide riparian bird monitoring protocol will be completed. A new 5-year monitoring and research priorities report will be finalized using information from the CEMs completed in FY16.

Funding is available for emerging research needs under Work Task G3.

FY19 Proposed Activities

In FY19, technical, independent, and peer reviews of wildlife projects and habitat monitoring will continue under the AMP.

Any wildlife field data collection project not using current MEFFs will be updated to second-generation MEFFs during FY19.

Recommendations from the data management evaluation that took place during FY17 will continue to be implemented as appropriate.

Funding will be 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 by 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 fishes 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 by 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 (closed).

Conservation areas that are being developed primarily as disconnected backwaters for native fishes prioritize (1) delivery of non-native fish-free replacement water and (2) the ability to completely drain and renovate ponds without the use of piscicides. There is also value in connected backwaters, and the 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 flannelmouth suckers. Restoration research priorities for backwater development are expected to include researching the screening of water to exclude non-native fishes, 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 planning 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 of future habitat creation projects.

FY17 Accomplishments

Coordination with resource agencies and attendance at planning meetings was similar to that of previous years.

Hydraulic Dredge: A 20-inch hydraulic cutter suction dredge and support tender were acquired for $2.2 million to complete the backwater creation requirement in a timely fashion. Delivery is scheduled for FY18 and will be put into service at the MVCA.

Cadastral Surveys: FY17 funding was used to evaluate a location for a new backwater in Reach 3 that appeared to be on Reclamation withdrawn land. The area evaluated is within Township 8N, Range 23E, Section 26, San Bernardino Meridian within the State of California. At the conclusion of each investigation, the Bureau of Land Management (BLM) provides a written summary to support the basis of the findings and a land status map demonstrating landowners within the subject area. The report and map are scheduled for delivery in FY18.

Yuma Meadows Conservation Area: A 433-acre parcel of land within the Laguna Division on Reclamation withdrawn lands within the State of California has been identified as an ideal candidate for the creation of backwaters. The property also contains an office and warehouse complex known as the Laguna Field Office. The site has a shallow water table, is currently closed to the public, and is owned and managed by Reclamation. Preliminary investigations and the drafting of the Yuma Meadows Conservation Area Restoration Development and Monitoring Plan was completed.

Proposed Conservation Areas:

Dennis Underwood Conservation Area: An agreement in principle has been reached with the landowner, the Metropolitan Water District, to utilize up to 635 acres for development of cottonwood-willow and honey mesquite. This conservation area is located south of Blythe, California, within the Palo Verde Irrigation District. Initial investigations included an evaluation of available soils data and a conceptual layout for restoration. The Federal appraisal began through the Office of Evaluation Services of the U.S. Department of the Interior. Simultaneously, an environmental assessment/negative declaration was drafted to satisfy both the National Environmental Policy Act and California Environmental Quality Act.

PVER-South: PVER-South is expected to become a conservation area in FY18 after the Land Use Agreement is signed. The project will be tracked under Work Task E37.

Three Fingers Lake: Three Fingers Lake is expected to become a conservation area in FY18 after the Land Use Agreement is signed. The project will be tracked under Work Task E38.

Potential Conservation Areas:

Backwaters and Marsh Within Reach 4: Reach 4 has the highest potential for establishment of marshes and backwaters in California based on the needs of the LCR MSCP. An agreement has been signed with the BLM cadastral team to conduct research and determine the land status. FY17 efforts are focused on Reach 3 as described above. In FY18 the land status for Reach 4 will be initiated as described below.

FY18 Activities

Coordination with resource agencies will continue.

Reach 3 Cadastral Surveys: The report and maps provided by the cadastral team indicate the area within Township 8N, Range 23E, Section 26, San Bernardino Meridian within the State of California being evaluated is on Reclamation withdrawn land, and the surrounding land is managed by the BLM. The parcels appear to be large enough to create 21 acres of backwater that would be located within the State of California. Based on these findings, additional investigation, such as obtaining topographic data, soil sampling, and installation of groundwater wells, will be initiated.

Reach 4 Cadastral Surveys: The BLM has initiated record searches for an area within Reach 4 that may be suitable for either a backwater or marsh complex.

The task is to identify land status within Township 95, Range 22F, Sections 5, 7, and 8, San Bernardino Meridian within the State of California. The final report and map are scheduled for delivery in FY19.

Screening and Evaluation of Potential Conservation Areas, Step 1; Trip Reports: In August 2017, LCR MSCP managers met with USFWS managers from the four national wildlife refuges located along the LCR and with staff from the USFWS Phoenix Ecological Services Field Office. Areas with the potential for restoration as a conservation area were discussed, and site visits were planned to evaluate their inclusion into the LCR MSCP as conservation areas. The trip reports, completed in December 2017, recommended expansion of two existing conservation areas and additional investigations at other conservation areas on the refuges.

BLCA Expansion: The habitat creation concept includes expanding the existing BLCA by establishing approximately 300-400 acres of additional cottonwood-willow, honey mesquite, and marsh land cover types to be managed for LCR MSCP covered species. This would include areas that can be flood irrigated as well as areas that would take advantage of the relatively high water table. Honey mesquite, in addition to cottonwood-willow areas planted in low densities, would typically only be irrigated until their roots can reach the water table. Cottonwood-willow areas planted in high density would typically be flood irrigated to create moist soil conditions for nesting birds.

Cibola NWR Unit #1 Expansion: The habitat creation concept includes expanding the existing Cibola NWR Unit #1 Conservation Area by establishing approximately 1,200 acres of additional cottonwood-willow, honey mesquite, and marsh land cover types on lands immediately south of the existing conservation area. The restored acreage would include areas that can be flooded and areas which would utilize the water table after establishment. Honey mesquite, in addition to cottonwood-willow areas planted in low densities, would typically only be irrigated until their roots reach the water table. Cottonwood-willow areas planted in high density would typically be flood irrigated to create moist soil conditions for nesting birds.

Proposed Conservation Areas:

Yuma Meadows Conservation Area: The Yuma Meadows Conservation Area is within the Laguna Division on Bureau of Reclamation withdrawn lands. The property also contains an office and warehouse complex, which the LCR MSCP will occupy, known as the Laguna Field Office. The *Yuma Meadows Conservation Area Restoration Development and Monitoring Plan* was drafted and sent to the CDFW. Implementation of the conservation area will serve as partial fulfillment of the LCR MSCP's 360-acre backwater acreage goal. The project will create a series of disconnected backwaters, totaling 123 acres, managed for native fishes – specifically bonytail and razorback suckers.

Development of this site will satisfy partial fulfillment of habitat requirements and CESA Incidental Take Permit No. 2081-2005-008-06. The conservation area will consist of three to four large disconnected backwaters (referred to as refugia ponds) ranging in size from 20 to 50 acres, totaling 111 acres, and smaller disconnected backwaters (referred to as grow-out ponds) ranging in size from 1–4 acres, totaling 12 acres. Both types of ponds are considered disconnected backwaters and, when completed, are expected to provide 123 acres of the backwater land cover type to the program. Development of the project is intended to satisfy both the LCR MSCP Habitat Conservation Plan requirements and a portion of CESA Incidental Take Permit No. 2081-2005-008-06. A MOU with Reclamation's Yuma Area Office was signed to allow the property to be developed as a conservation area.

FY19 Proposed Activities

Less coordination with resource agencies will be needed as habitat acquisition goals are reached. It is anticipated that all cadastral surveys will be completed and enough land will have been identified that Work Task E16 will likely close at the end of FY21.

Reach 4 Cadastral Surveys: The reports and maps on land status for areas identified as potential backwaters or marsh in Reach 4 are expected to be complete. Based on the findings of the report and the needs of the program, additional investigations may occur. The data collection normally includes the drilling and instrumentation of ground water wells, collection of digital elevation data, and soil sampling.

Refuge Trip Report: As a result of the trip reports conducted in FY18, additional investigations, funded under Work Task E16, are occurring at the Imperial and Cibola NWRs. The investigations are as follows:

Hart Mine Marsh Expansion: An evaluation of drainage options, crop production, and management of salinity will be initiated.

Imperial Ponds Expansion: An evaluation of drainage options, crop production, and management of salinity will be initiated.

Figure 1-1 depicts the geographical distribution of 14 established conservation areas as well as four proposed conservation areas (PVER-South, Three Fingers Lake, the Dennis Underwood Conservation Area, and the Yuma Meadows Conservation Area). Figures 1-2 through 1-15 depict each conservation area. Figures 1-16 through 1-21 depict the proposed expanded boundary of existing conservation areas or the proposed boundary of new conservation areas. 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.

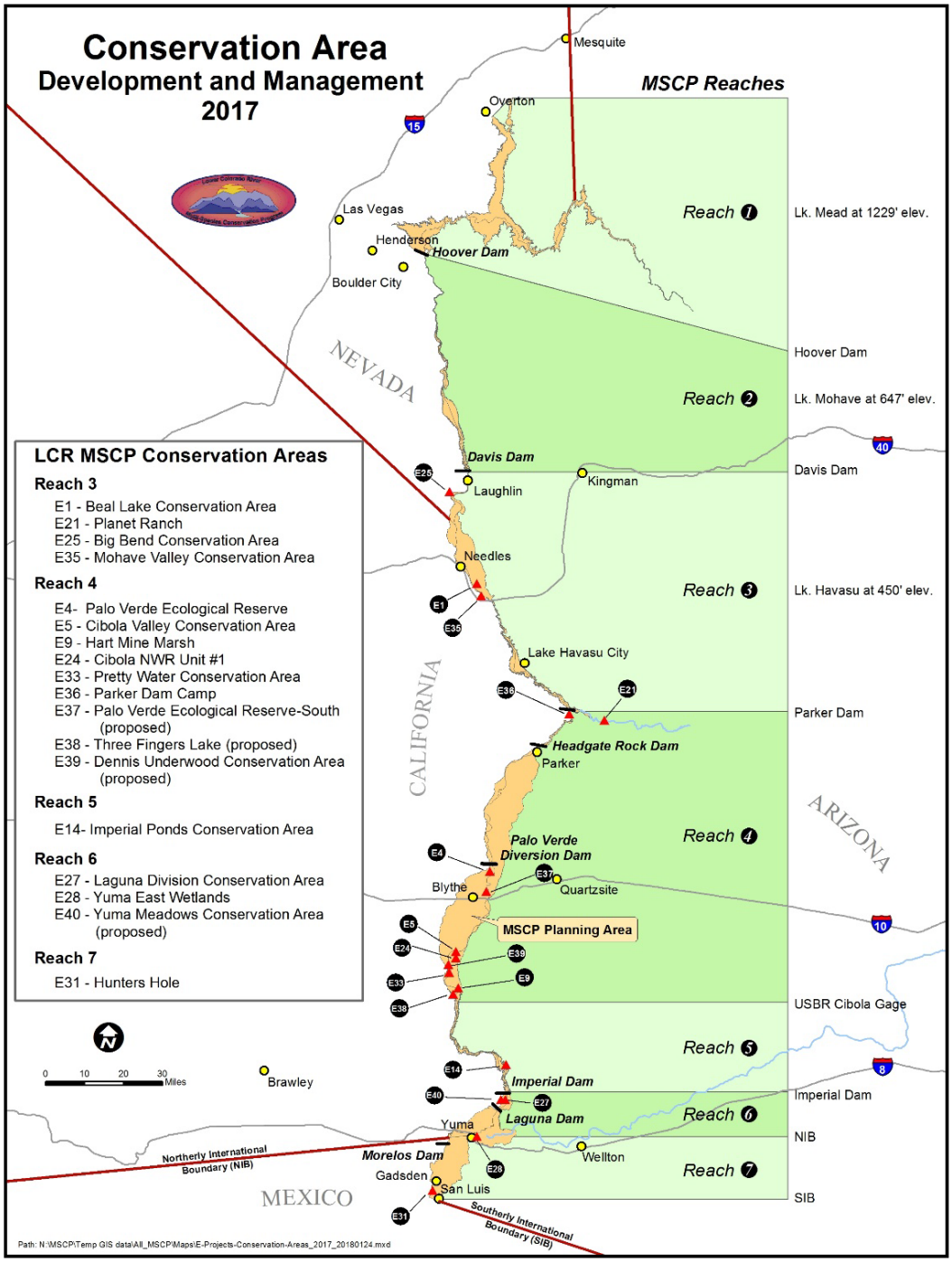
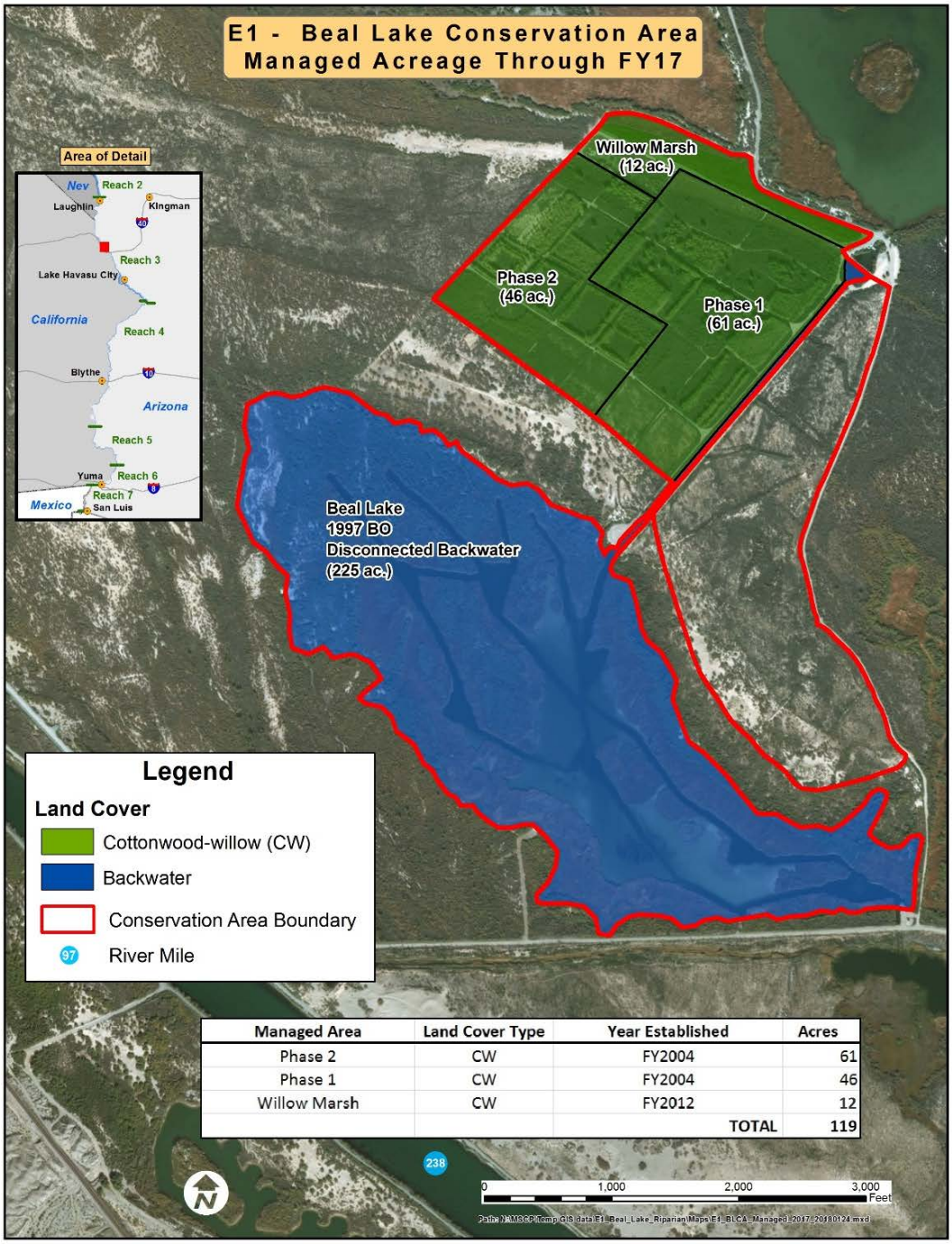
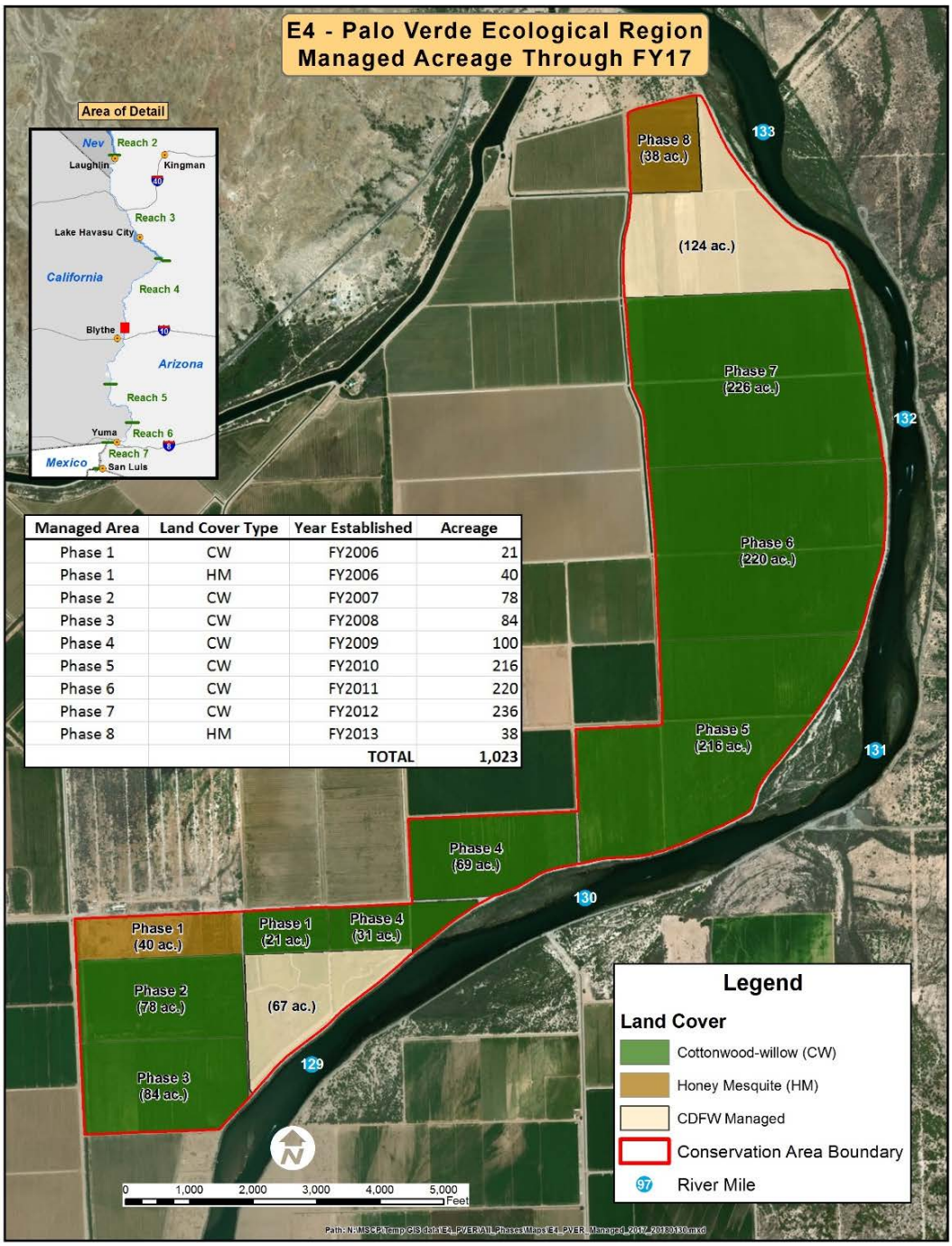


Figure 1-1.—Conservation area development and management, 2017.



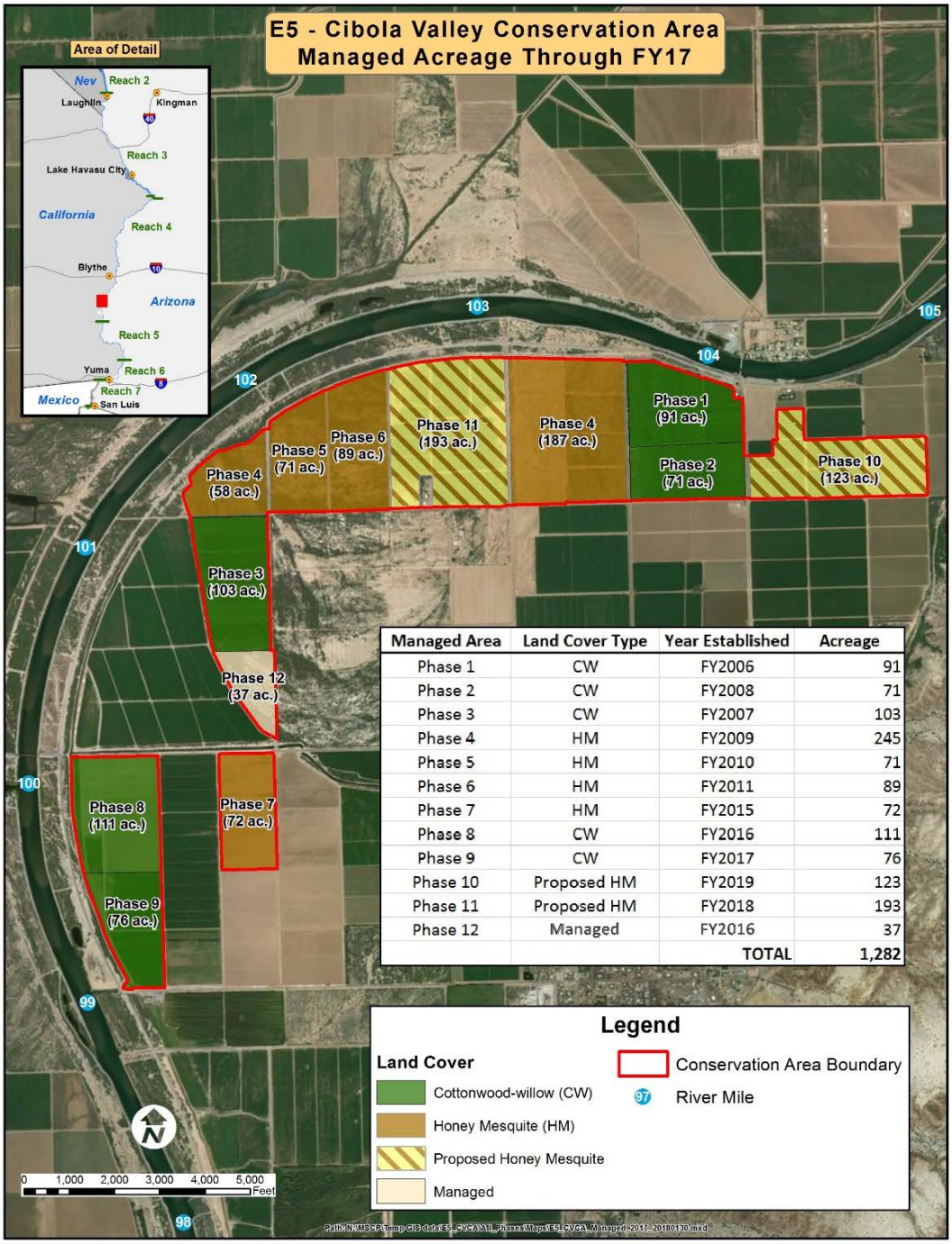
Managed Area	Land Cover Type	Year Established	Acres
Phase 2	CW	FY2004	61
Phase 1	CW	FY2004	46
Willow Marsh	CW	FY2012	12
		TOTAL	119

Figure 1-2.—E1 – Beal Lake Conservation Area managed acreage through FY17.



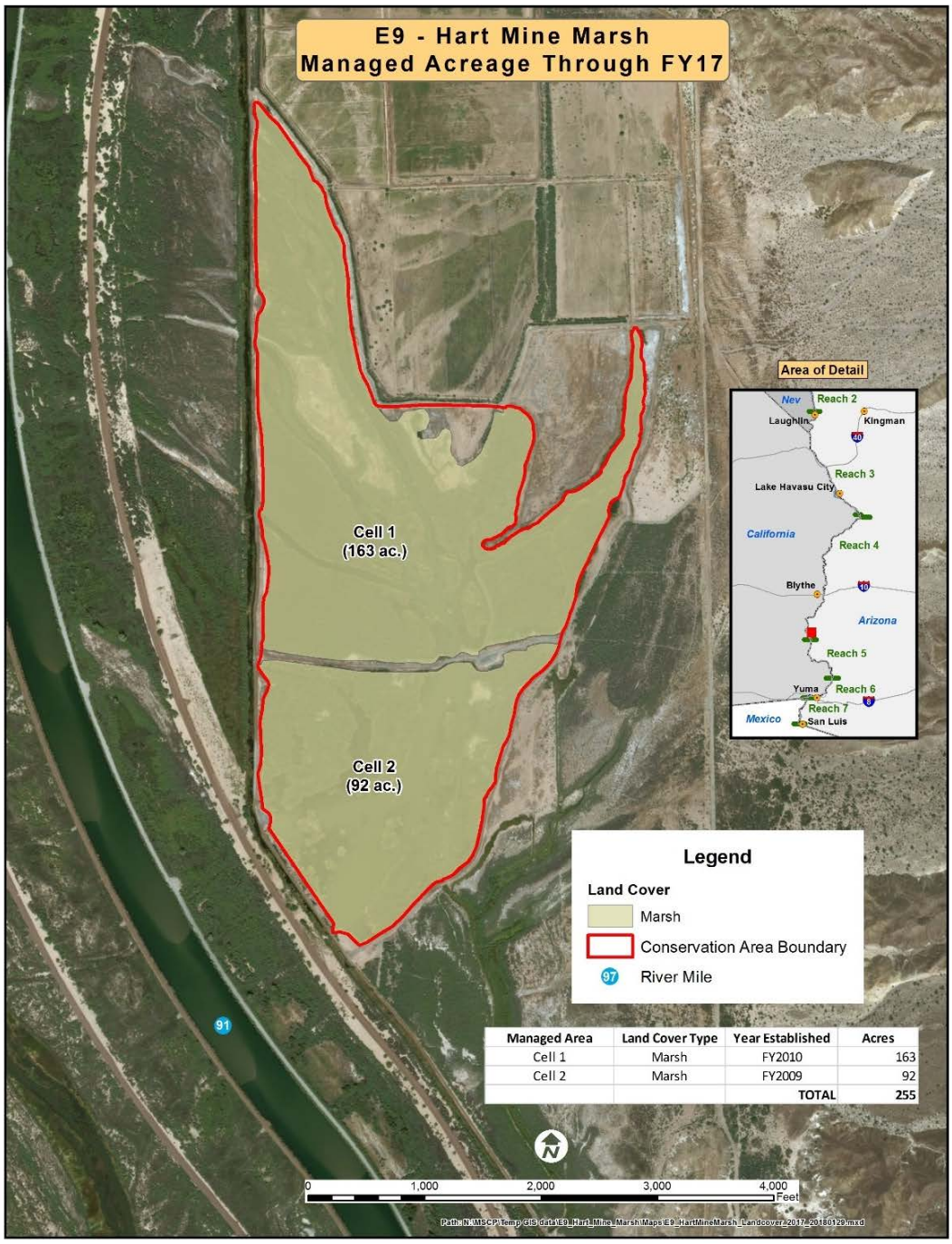
Managed Area	Land Cover Type	Year Established	Acreage
Phase 1	CW	FY2006	21
Phase 1	HM	FY2006	40
Phase 2	CW	FY2007	78
Phase 3	CW	FY2008	84
Phase 4	CW	FY2009	100
Phase 5	CW	FY2010	216
Phase 6	CW	FY2011	220
Phase 7	CW	FY2012	236
Phase 8	HM	FY2013	38
		TOTAL	1,023

Figure 1-3.—E4 – Palo Verde Ecological Reserve managed acreage through FY17.



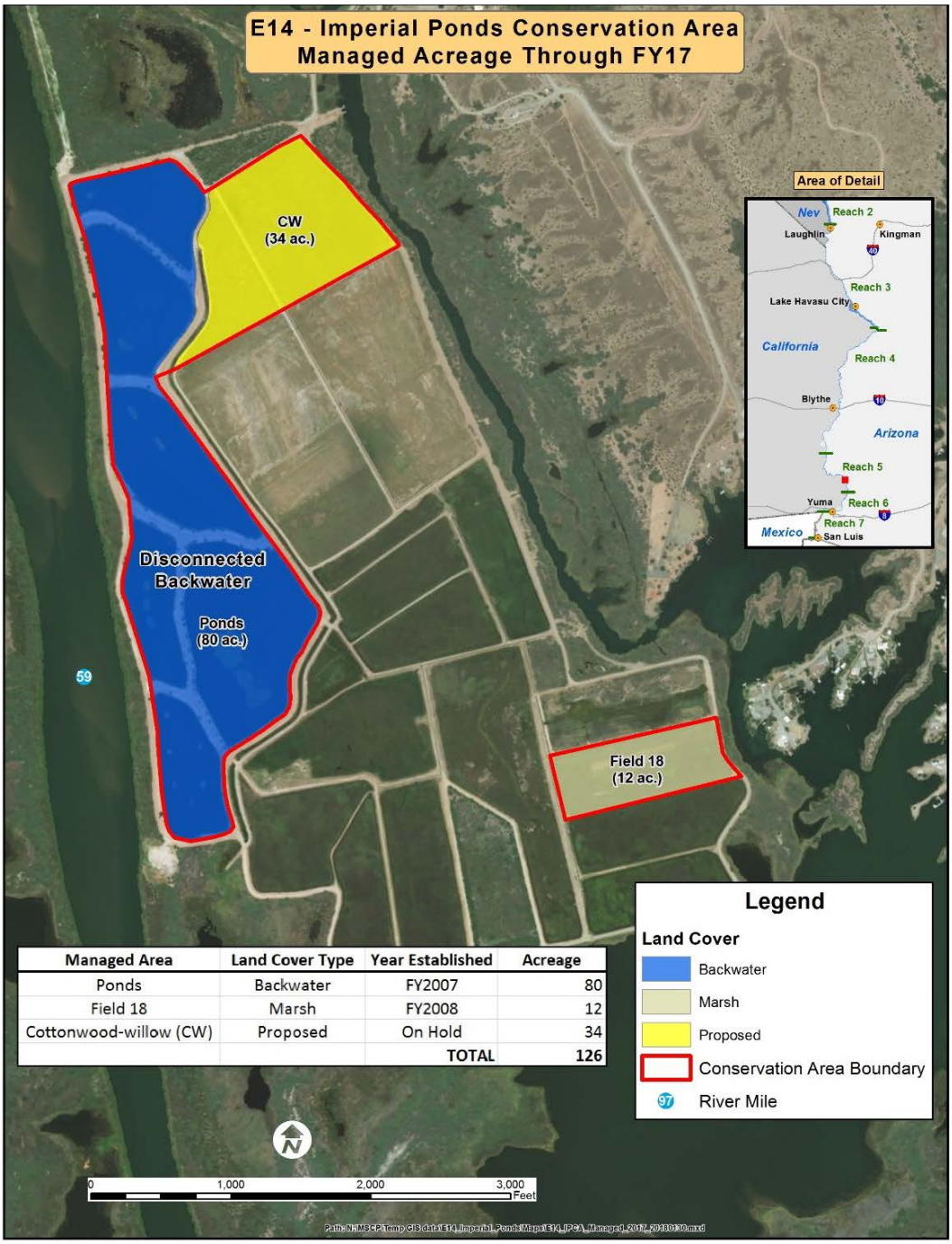
Managed Area	Land Cover Type	Year Established	Acreage
Phase 1	CW	FY2006	91
Phase 2	CW	FY2008	71
Phase 3	CW	FY2007	103
Phase 4	HM	FY2009	245
Phase 5	HM	FY2010	71
Phase 6	HM	FY2011	89
Phase 7	HM	FY2015	72
Phase 8	CW	FY2016	111
Phase 9	CW	FY2017	76
Phase 10	Proposed HM	FY2019	123
Phase 11	Proposed HM	FY2018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

Figure 1-4.—E5 – Cibola Valley Conservation Area managed acreage through FY17.



Managed Area	Land Cover Type	Year Established	Acres
Cell 1	Marsh	FY2010	163
Cell 2	Marsh	FY2009	92
		TOTAL	255

Figure 1-5.—E9 – Hart Mine Marsh managed acreage through FY17.



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

Figure 1-6.—E14 – Imperial Ponds Conservation Area managed acreage through FY17.

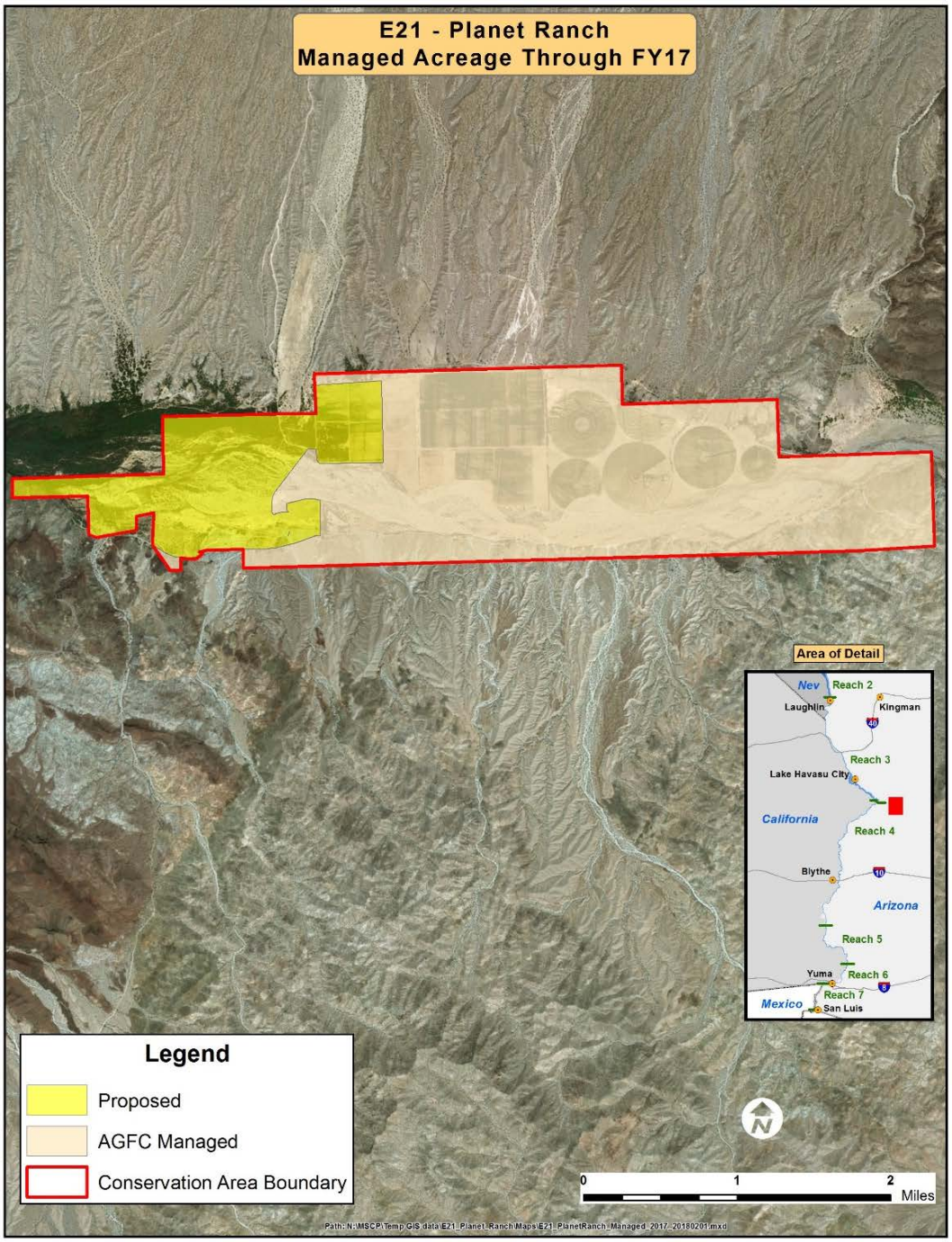
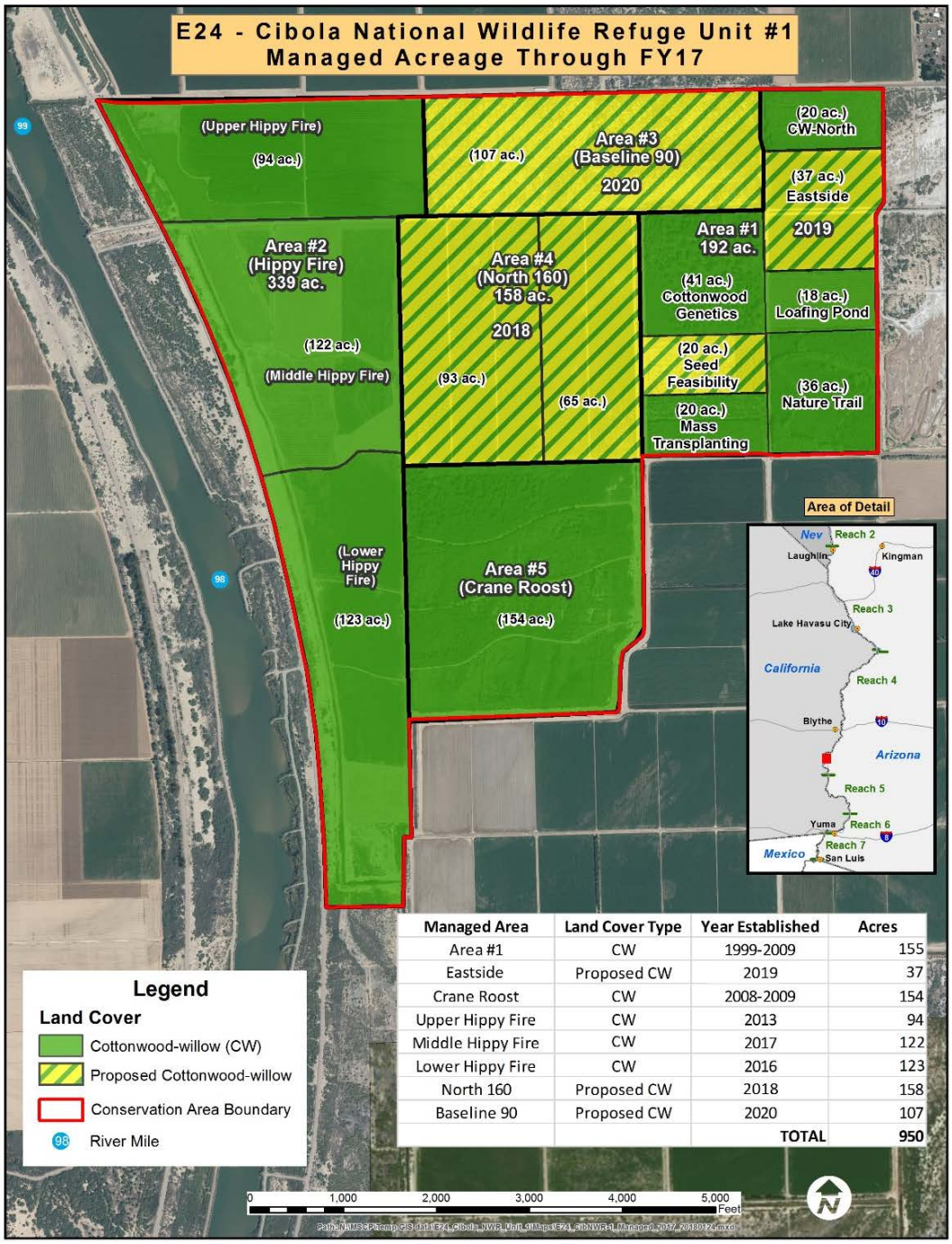


Figure 1-7.—E21 – Planet Ranch managed acreage through FY17.



Managed Area	Land Cover Type	Year Established	Acres
Area #1	CW	1999-2009	155
Eastside	Proposed CW	2019	37
Crane Roost	CW	2008-2009	154
Upper Hippy Fire	CW	2013	94
Middle Hippy Fire	CW	2017	122
Lower Hippy Fire	CW	2016	123
North 160	Proposed CW	2018	158
Baseline 90	Proposed CW	2020	107
		TOTAL	950

Figure 1-8.—E24 – Cibola National Wildlife Refuge Unit #1 Conservation Area managed acreage through FY17.

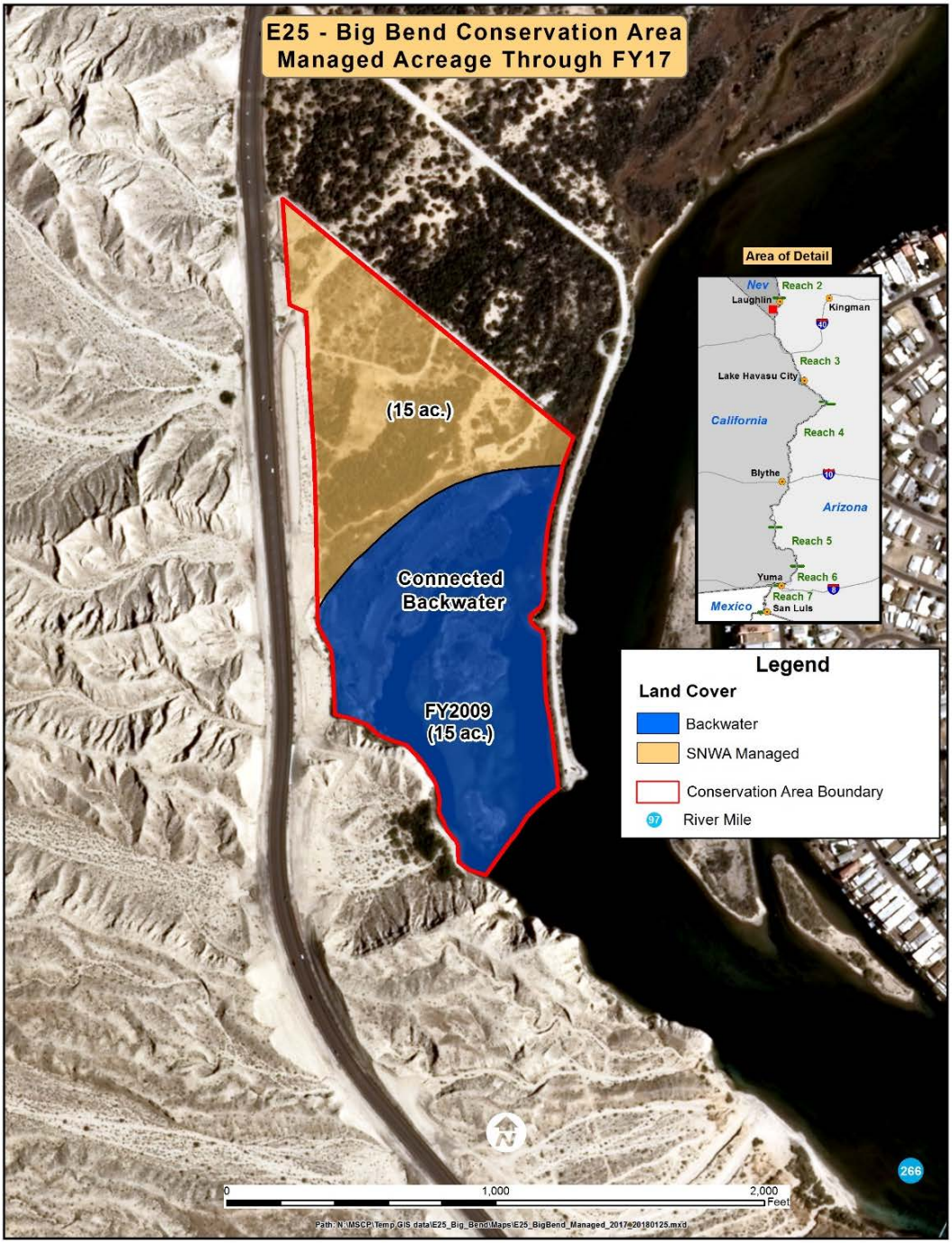
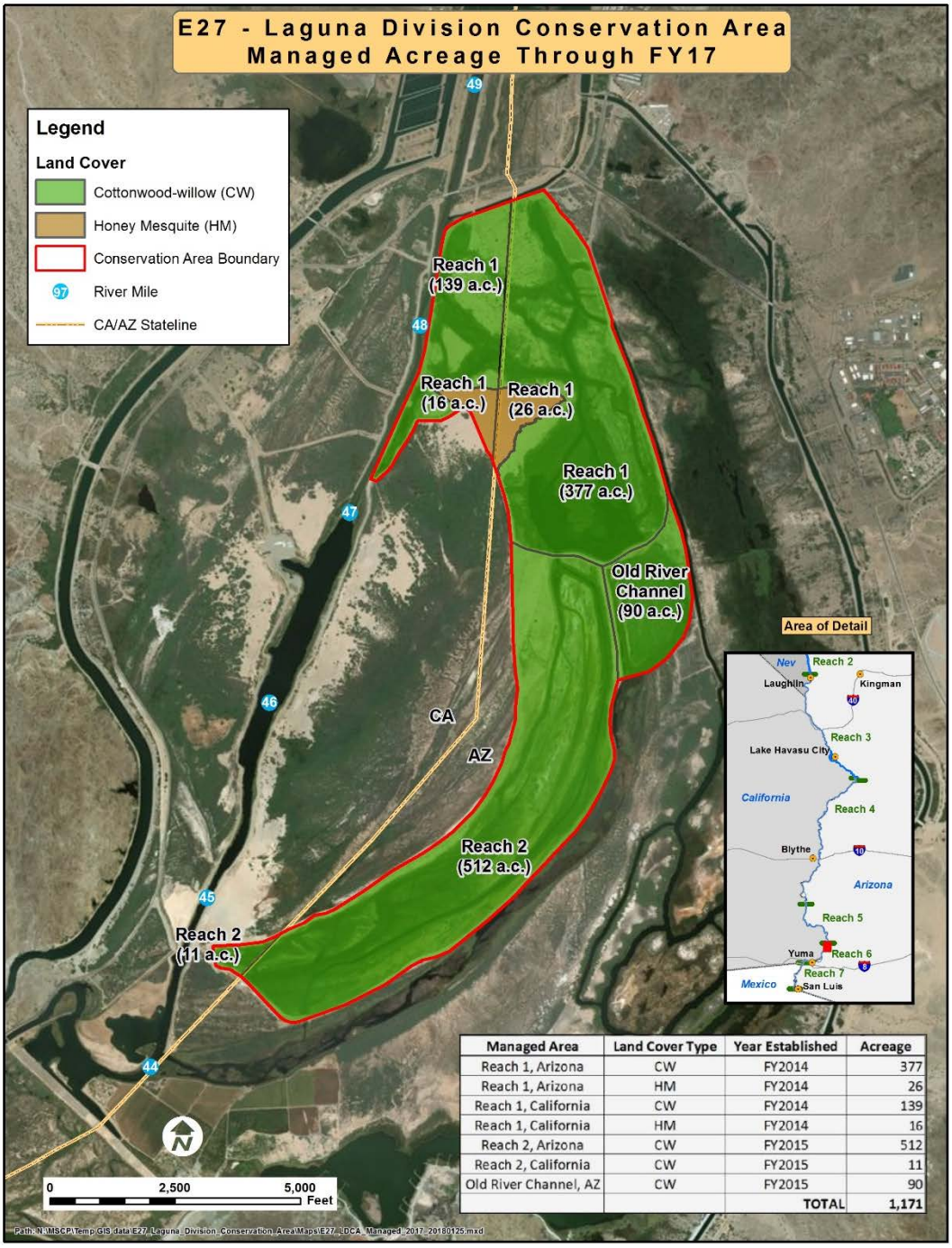
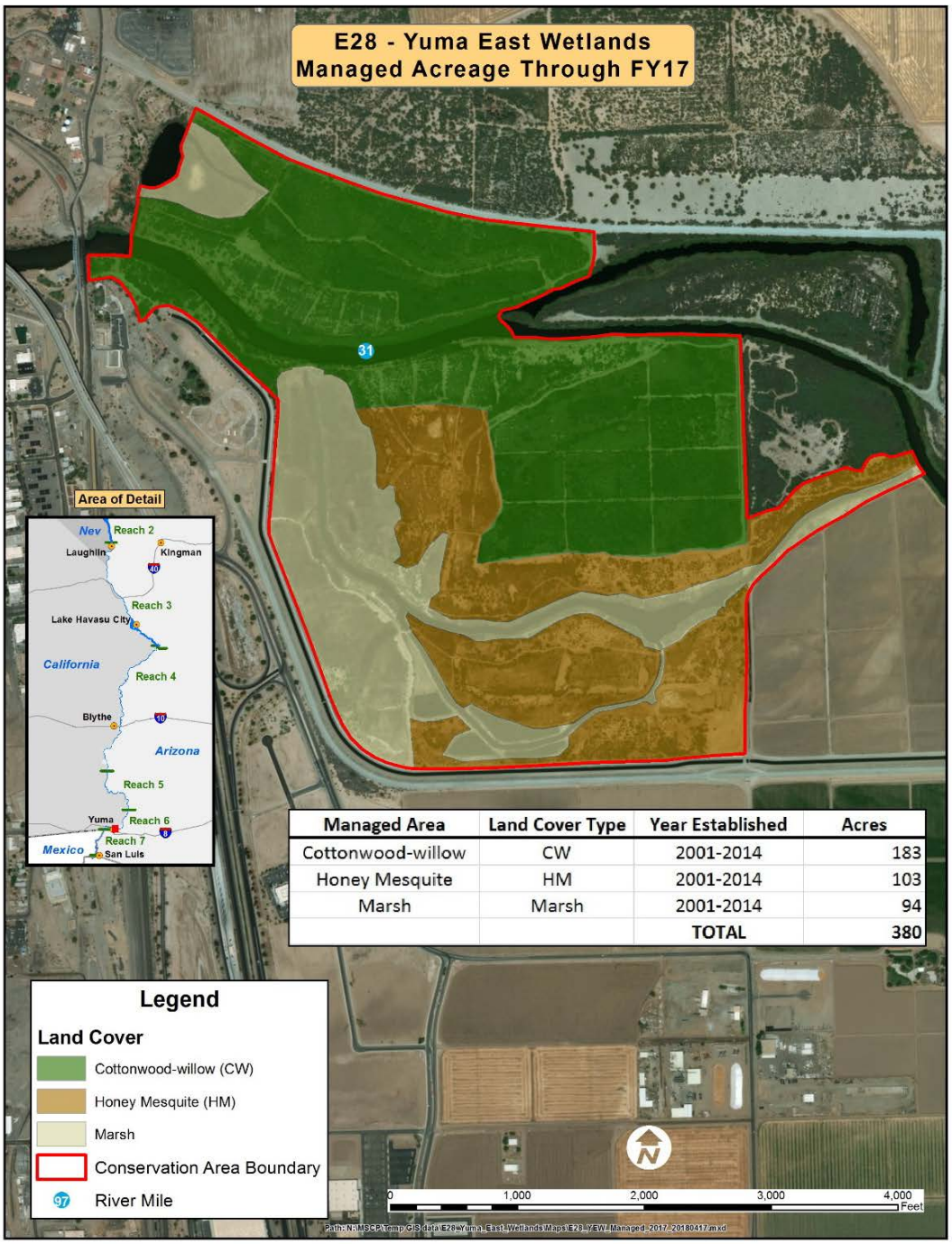


Figure 1-9.—E25 – Big Bend Conservation Area managed acreage through FY17.



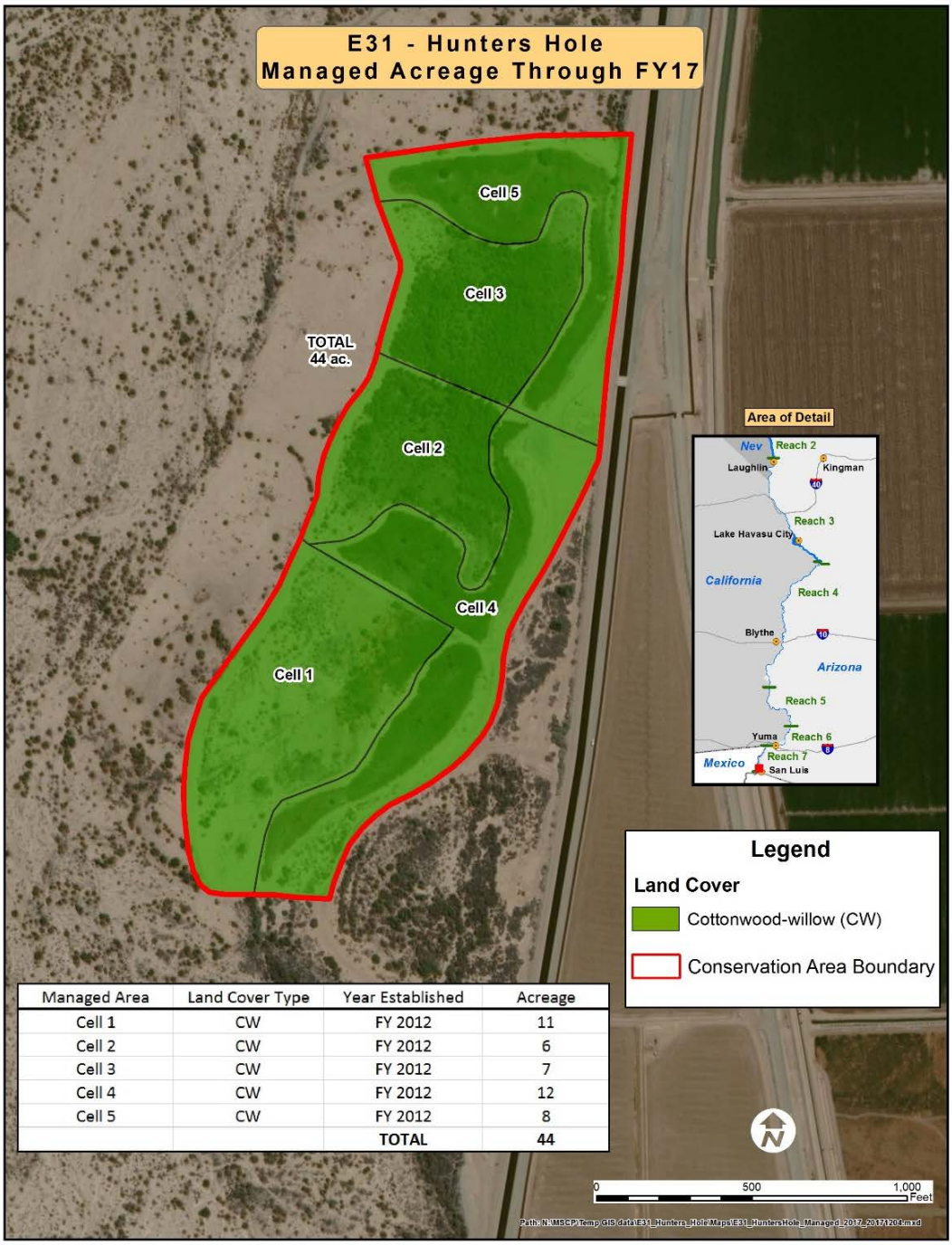
Managed Area	Land Cover Type	Year Established	Acreage
Reach 1, Arizona	CW	FY2014	377
Reach 1, Arizona	HM	FY2014	26
Reach 1, California	CW	FY2014	139
Reach 1, California	HM	FY2014	16
Reach 2, Arizona	CW	FY2015	512
Reach 2, California	CW	FY2015	11
Old River Channel, AZ	CW	FY2015	90
		TOTAL	1,171

Figure 1-10.—E27 – Laguna Division Conservation Area managed acreage through FY17.



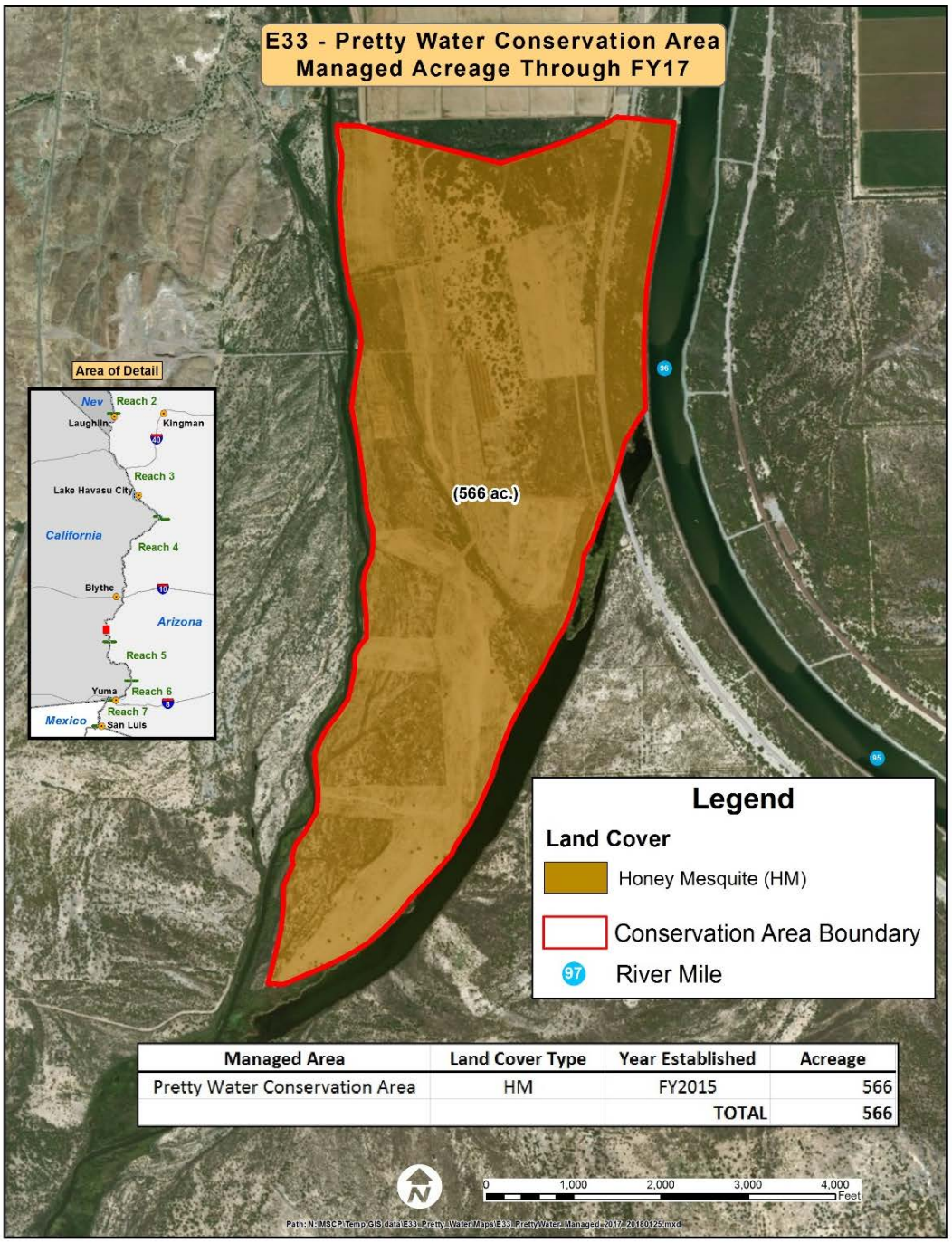
Managed Area	Land Cover Type	Year Established	Acres
Cottonwood-willow	CW	2001-2014	183
Honey Mesquite	HM	2001-2014	103
Marsh	Marsh	2001-2014	94
		TOTAL	380

Figure 1-11.—E28 – Yuma East Wetlands managed acreage through FY17.



Managed Area	Land Cover Type	Year Established	Acreage
Cell 1	CW	FY 2012	11
Cell 2	CW	FY 2012	6
Cell 3	CW	FY 2012	7
Cell 4	CW	FY 2012	12
Cell 5	CW	FY 2012	8
		TOTAL	44

Figure 1-12.—E31 – Hunters Hole managed acreage through FY17.



Managed Area	Land Cover Type	Year Established	Acreage
Pretty Water Conservation Area	HM	FY2015	566
		TOTAL	566

Figure 1-13.—E33 – Pretty Water Conservation Area managed acreage through FY17.

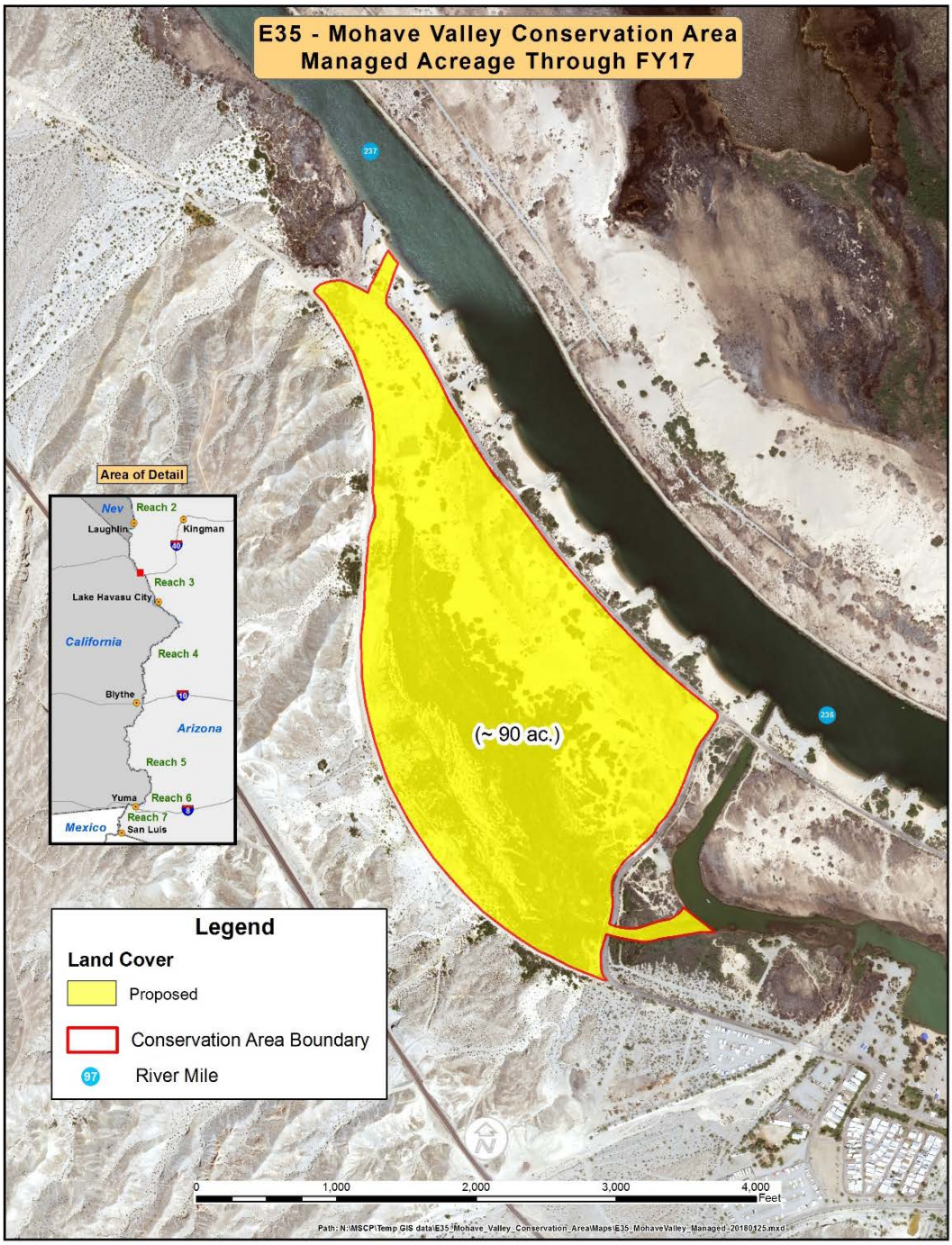


Figure 1-14.—E35 – Mohave Valley Conservation Area managed acreage through FY17.

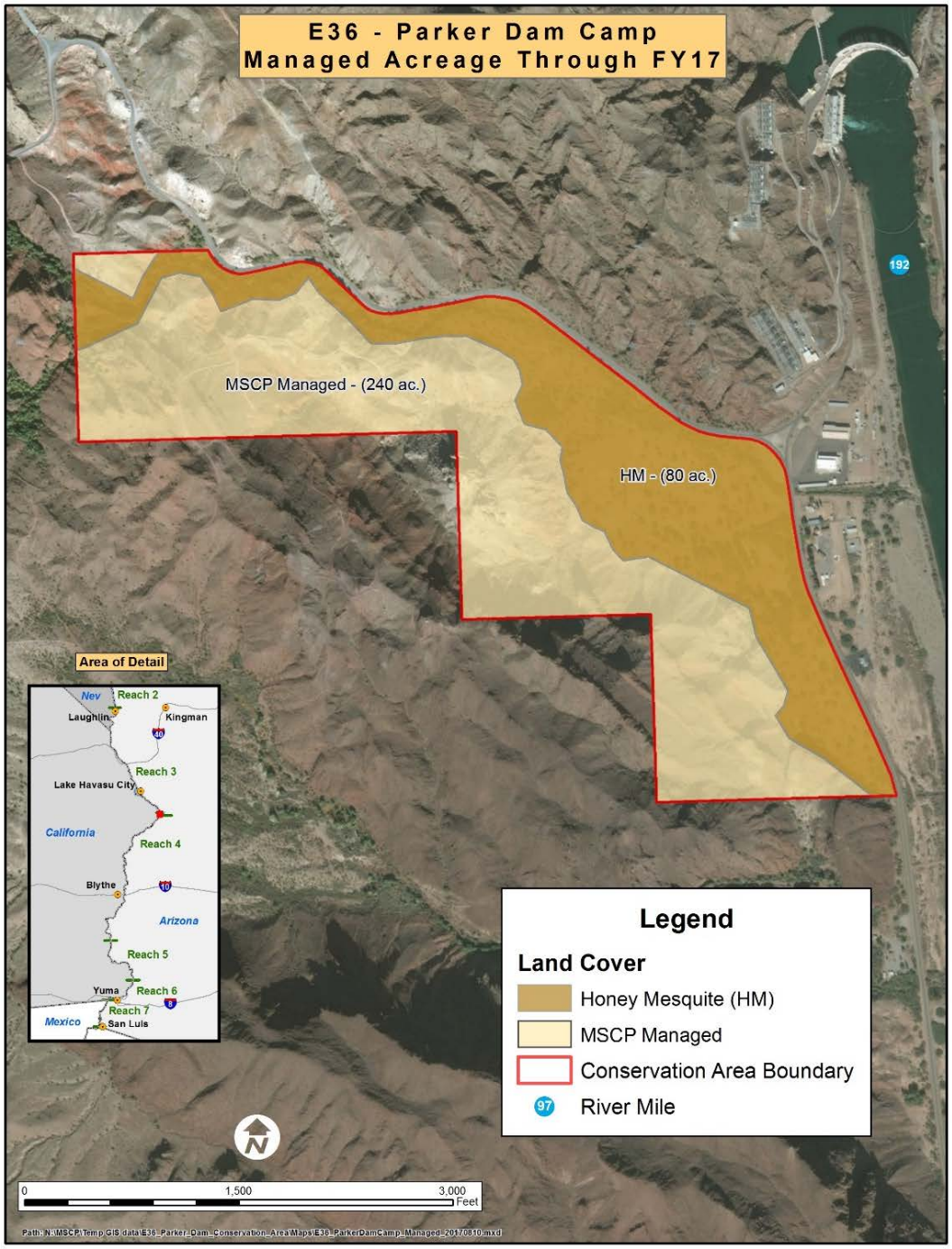


Figure 1-15.—E36 – Parker Dam Camp managed acreage through FY17.

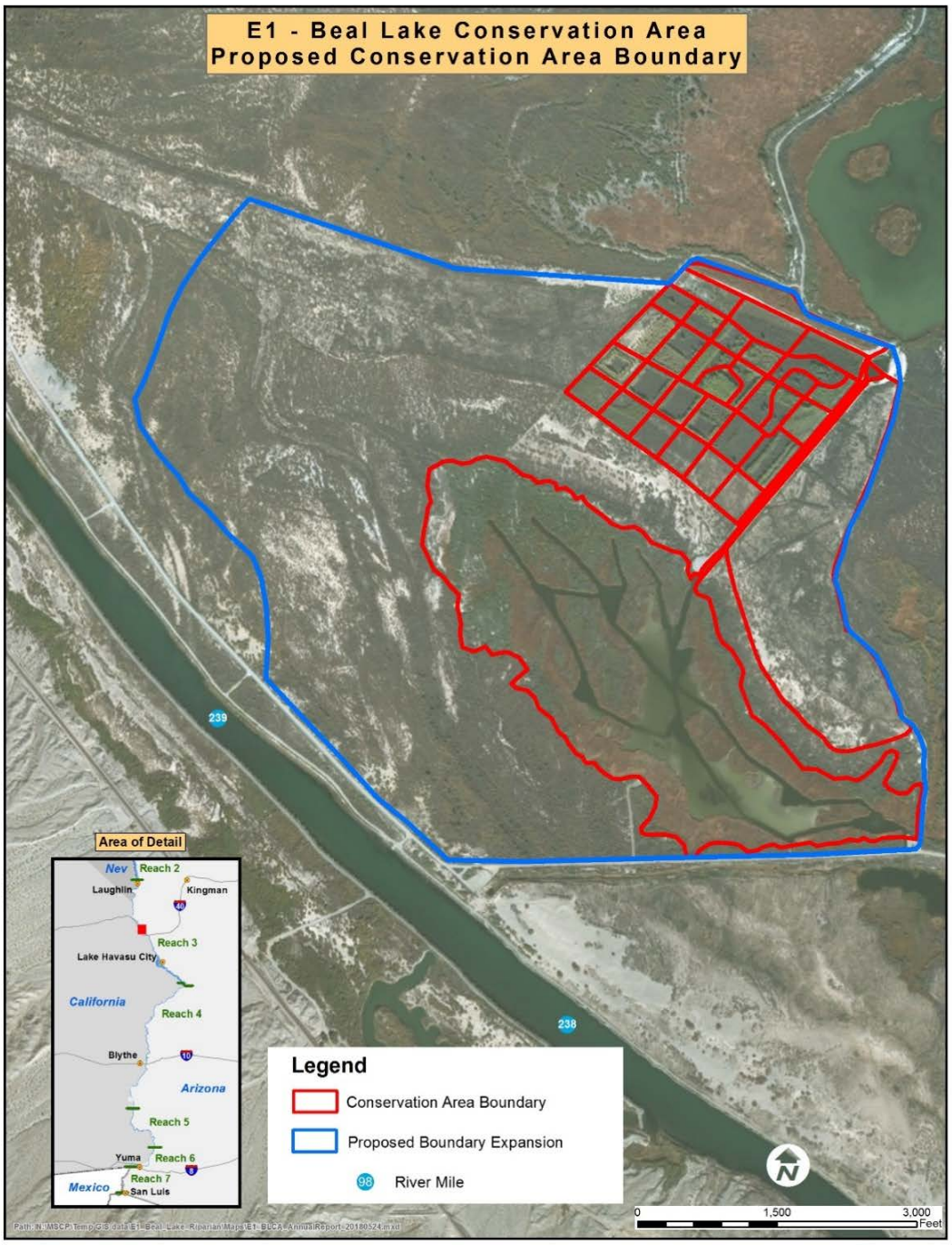


Figure 1-16.—E1 – Beal Lake Conservation Area proposed boundary expansion.

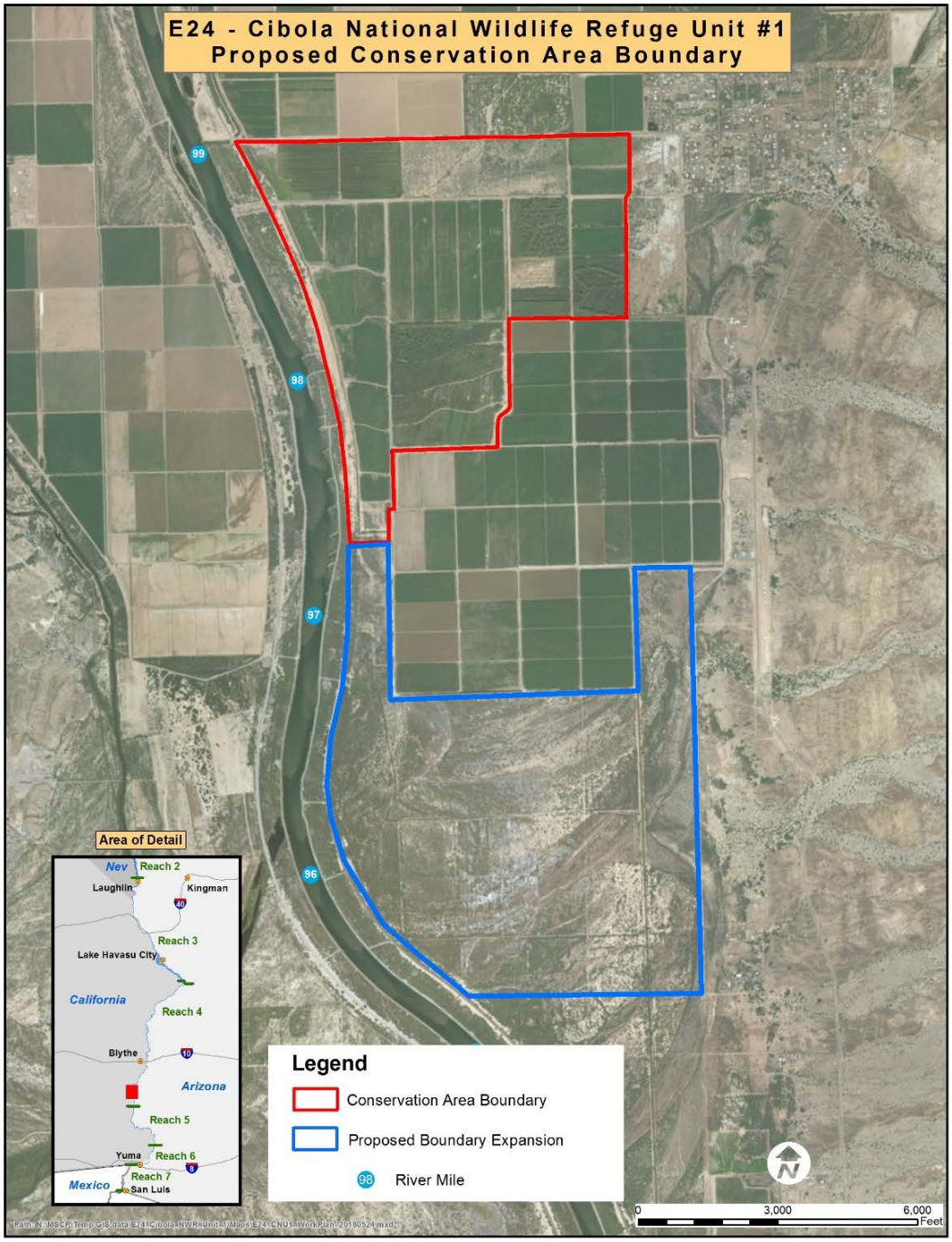


Figure 1-17.—E24 – Cibola National Wildlife Refuge Unit #1 Conservation Area proposed boundary expansion.

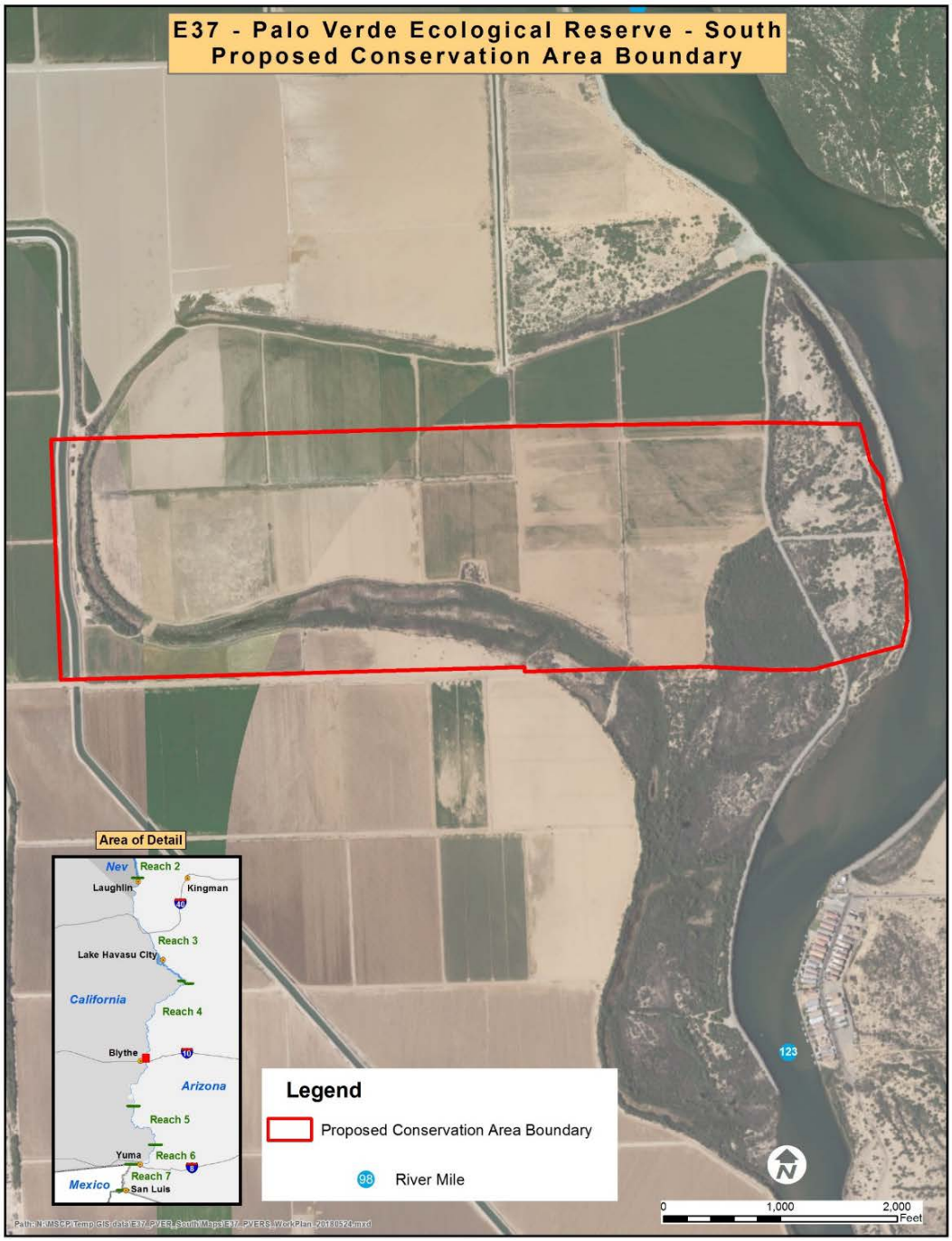


Figure 1-18.—E37 – Palo Verde Ecological Reserve-South proposed conservation area boundary.

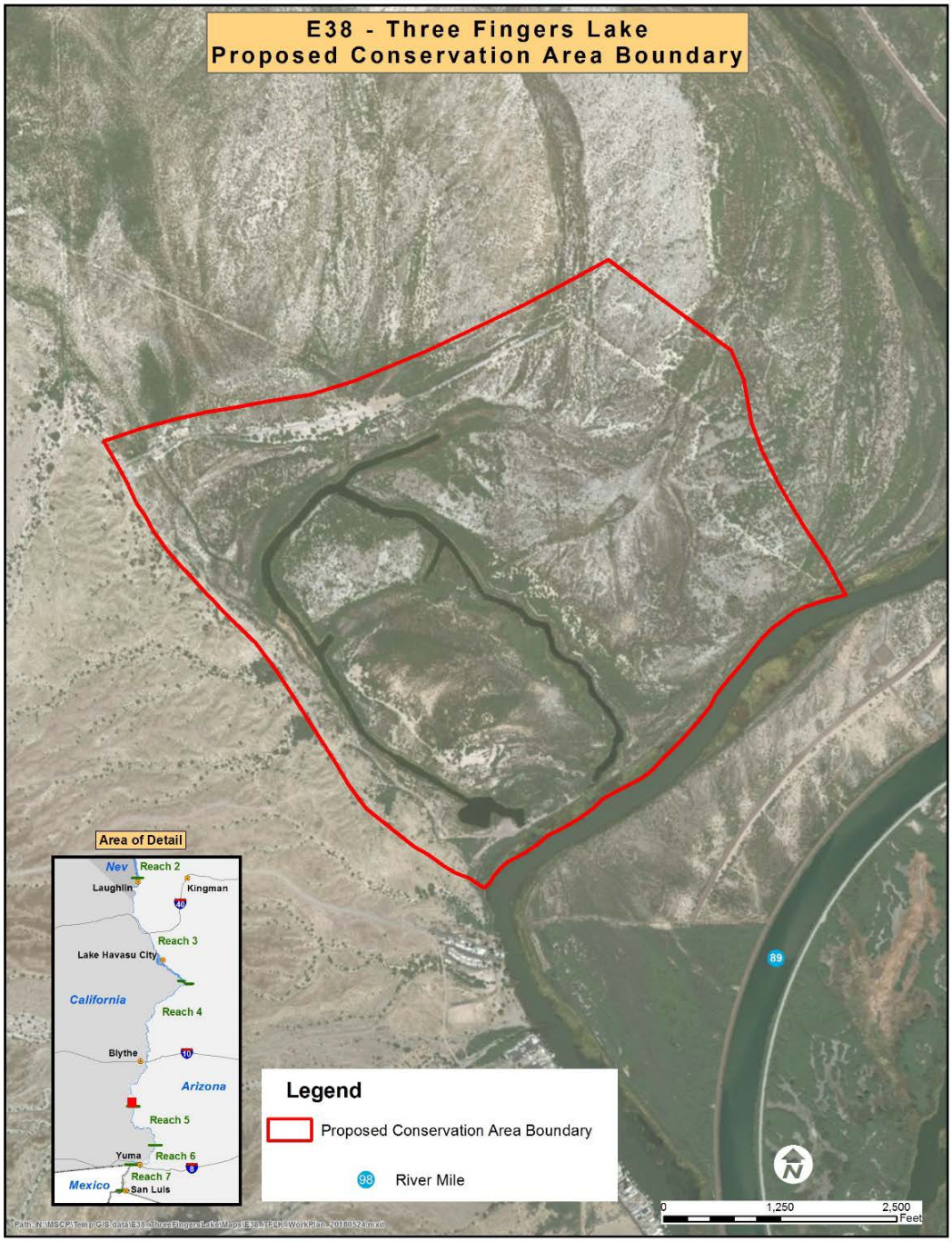


Figure 1-19.—E38 – Three Fingers Lake proposed conservation area boundary.

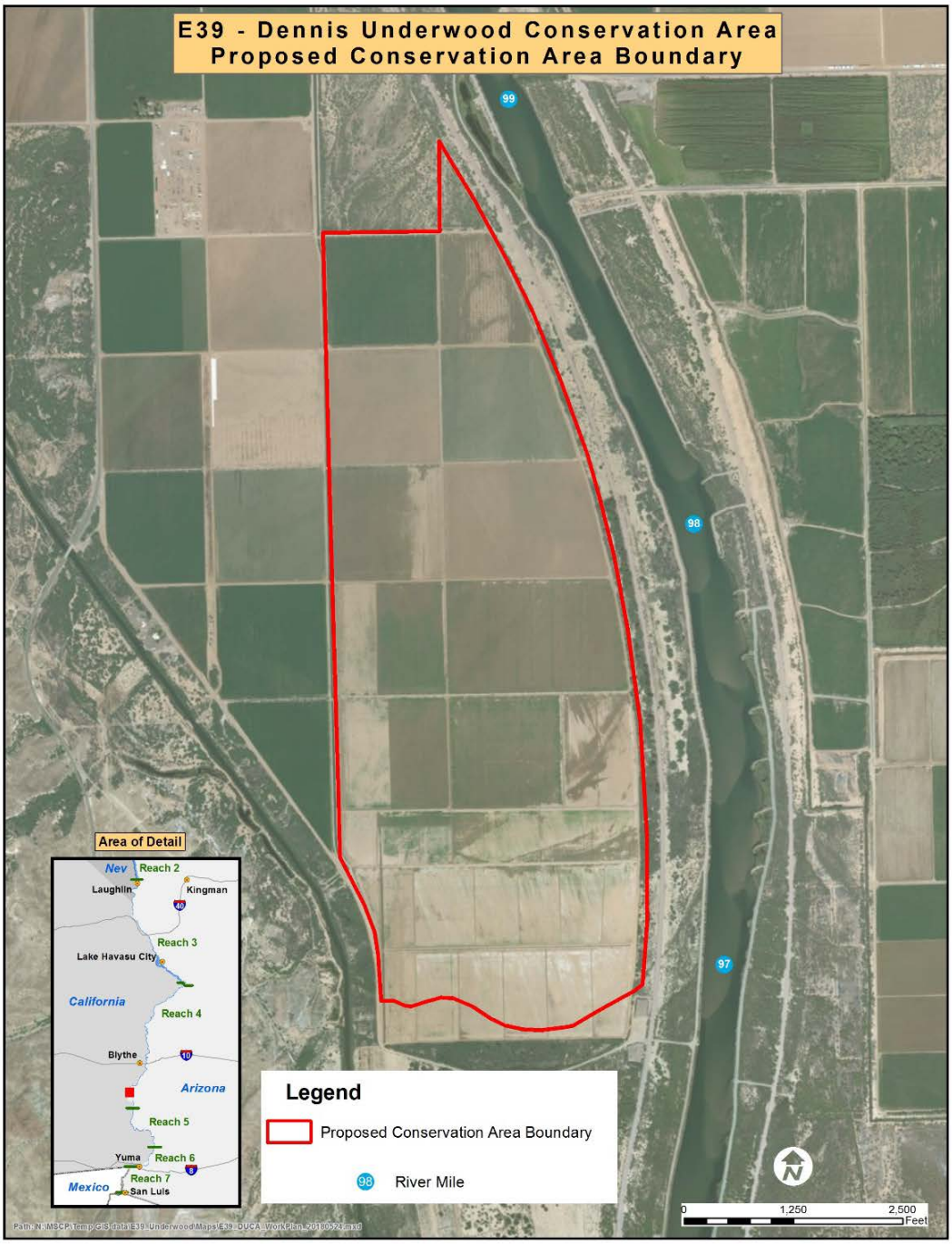


Figure 1-20.—E39 – Dennis Underwood Conservation Area proposed conservation area boundary.

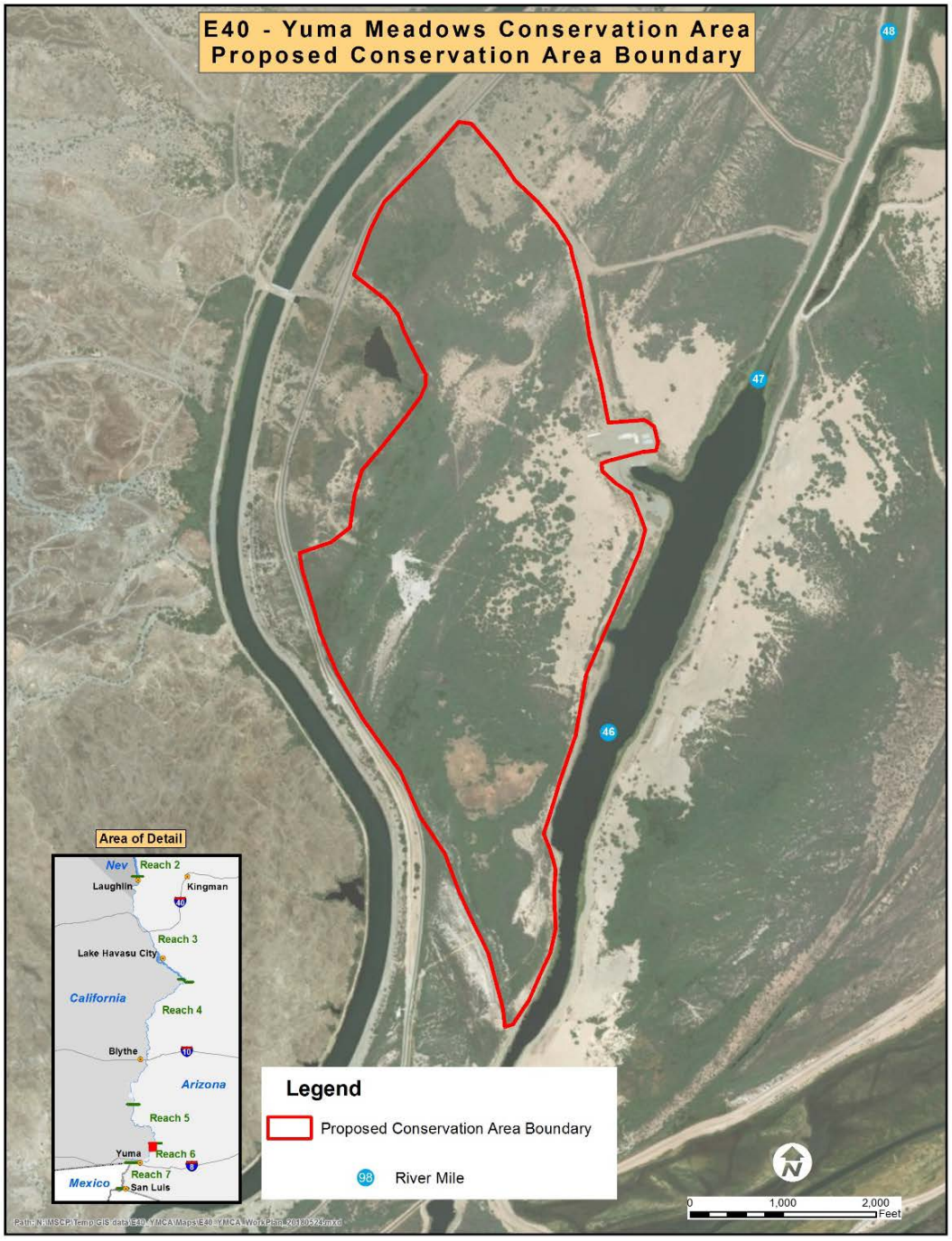


Figure 1-21.—E40 – Yuma Meadows Conservation Area proposed conservation area boundary.

Development and Maintenance

Habitat development and maintenance are strongly connected. Created habitat is achieved through the process of development, establishment, and modification of a 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.

Each site, whether identified as a 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 2016–21, restoration has occurred or is expected to occur at (1) Cibola NWR Unit #1, (2) the CVCA, (3) the MVCA, (4) Planet Ranch, (5) PVER-South, (6) Parker Dam Camp, (7) Three Fingers Lake, (8) the Dennis Underwood Conservation Area, and (9) the Yuma Meadows Conservation Area. 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.

FY17 Accomplishments

The focus of development in FY17 was completion of the planting of cottonwood-willow at Phase 9 of the CVCA, planting of cottonwood-willow at middle Hippy Fire at Cibola NWR Unit #1, maintaining water rights at Planet Ranch, and construction of a backwater at the MVCA.

Cibola Valley Conservation Area

Seventy-six acres of cottonwood-willow were established in Phase 9. To date, 452 acres of cottonwood-willow and 477 acres of honey mesquite have been established at the CVCA. Annual plantings are expected to continue through FY19, with complete development projected in 2019 of the CVCA.

Cibola National Wildlife Refuge Unit #1 Conservation Area

The middle Hippy Fire area was planted and established 122 acres of cottonwood-willow. Of the available 950 acres, 628 acres of cottonwood-willow have been established. Annual plantings are projected, with complete development projected in 2020 of Cibola NWR Unit #1.

Planet Ranch

To ensure the viability of water rights associated with this property, over 1,000 acres of alfalfa were grown as pasture from December 16, 2016, through December 15, 2017, and 5,549 acre-feet of water was diverted. Water usage, when combined with acreage being farmed, documented the beneficial use of water on the property. The entrance gates along the main north-south access road through Planet Ranch were reopened to the public after 32 years of closure in January 2017; they provide a travel corridor between La Paz and Mohave Counties.

Mohave Valley Conservation Area

Construction activities began in January 2017 with all land-based equipment clearing and excavating below groundwater to a minimum depth of 4 feet. By the end of the fiscal year, approximately 860,000 cubic yards of material had been excavated. Construction and planting will continue through spring 2019, and acreage will be credited based on an as-built survey conducted after construction.

The total number of acres 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 FY17, has 9,868 acres of land available for the program, of which 9,745 acres (table 1-13) 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.—Acreage by Conservation Area Through FY17

Conservation Area	Established Land Cover[1]	LCR MSCP Managed Acreage[2]	Available Acreage[3]	Total Conservation Area Acreage[4]
Beal Lake Conservation Area (Arizona)	119	434	119	434
Big Bend Conservation Area (Nevada)	15	15	15	15
Cibola National Wildlife Refuge Unit #1 Conservation Area (Arizona)	628	950	950	950
Cibola Valley Conservation Area (Arizona)	929	1159	1,245	1,309
Hart Mine Marsh (Arizona)	255	255	255	255
Hunters Hole (Arizona)	44	44	44	44
Imperial Ponds Conservation Area (Arizona)	92	126	126	126
Laguna Division Conservation Area (Arizona and California)	1,171	1,171	1,171	1,171
Palo Verde Ecological Reserve (California)	1,023	1,023	1,023	1,352
Parker Dam Camp (California)	80	204	80	204
Planet Ranch Conservation Area (Arizona)	396*	3,418**	660	3,418***
Pretty Water Conservation Area (California)	566	566	566	566
Yuma East Wetlands (Arizona)	380	380	380	380
Total	**5,698**	**9,745**	**6,634**	**10,224**

[1] **Established Land Cover** is the acreage restored as either the cottonwood-willow, honey mesquite, marsh, or backwater land cover type.

[2] **LCR MSCP Managed Acreage** is the acres of land controlled by the LCR MSCP. Not all managed acres can be converted to a land cover type.

[3] **Available Acreage** is the acreage anticipated to be restored as a land cover type.

[4] **Total Conservation Area Acreage** is the total acreage of all conservation areas combined regardless if they are managed by the LCR MSP or by a partner.

* The LCR MSCP receives credit for 396 acres of the cottonwood-willow land cover type at the Middle Bill Williams NWR.

** This is 3,418 acres during FY17, as this acreage was being farmed. The total managed acres are anticipated to decrease in the future, when the LCR MSCP turns a portion of the farmed acres over to Arizona Game and Fish Department management.

** This total does not include acreage at the Middle Bill Williams NWR.

Table 1-14.—Land Cover Type by Reach and State Through FY17

	Cottonwood-Willow	Honey Mesquite	Marsh	Backwaters	TOTAL
Arizona					
Reaches 1 and 2	0	0	0	0	0
Reach 3	515	0	0	0	515
Reach 4	1,080	477	255	0	1,812
Reach 5	0	0	12	80	92
Reach 6	1,162	129	94	0	1,385
Reach 7	44	0	0	0	44
Total	**2,801**	**606**	**361**	**80**	**3,848**
California					
Reaches 1 and 2	0	0	0	0	0
Reach 3	0	0	0	0	0
Reach 4	945	724	0	0	1,669
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**	**740**	**0**	**0**	**1,835**
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	**3,896**	**1,346**	**361**	**95**	**5,698**

Of the 9,745 acres being actively managed by the LCR MSCP, the four land cover types have been established on approximately 5,698 acres. Establishment of one of the four land cover types is projected on 6,634 acres. The total number of acres on all existing conservation areas is 10,244 acres. Acreages at conservation areas still in the planning phase, or for which there were no signed Land Use Agreements in FY17, such as at PVER-South, Three Fingers Lake, the Dennis Underwood Conservation Area, and the Yuma Meadows Conservation Area, are not included in the tables 1-13 or 1-14 at this time. The MVCA acreage of approximately 90 acres will be included when construction is complete.

FY18 Activities

Planting at the CVCA and Cibola NWR Unit #1 and the continued construction at the MVCA are planned.

Cibola Valley Conservation Area

Planting of Phase 11 with the honey mesquite land cover type is expected to increase the established acreage at this conservation area by 193 acres.

Cibola National Wildlife Refuge Unit #1 Conservation Area

Planting of portions of the North 160 with cottonwood-willow is expected to increase the established land cover types at this conservation area by 158 acres.

Mohave Valley Conservation Area

Land based excavation and construction of the inlets and outlets is expected to be complete. Dredging is scheduled to begin in April.

Planet Ranch

Irrigation of the alfalfa stopped on December 15, 2017. The process of dismantling the irrigation system has begun. Groundwater wells, used for irrigation of the alfalfa, have received “lock-out/tag-out” protection, and the Arizona Game and Fish Department (AGFD) have been asked if they wish to excess or use the system on another property.

A Land Use Agreement between Reclamation and the AGFD has been drafted. A Restoration Development and Monitoring Plan, which would inform development of the conservation area, has been drafted.

A value planning study was completed on the draft restoration design concept. A value engineering study is also anticipated but is not expected until late FY18 or

FY19. Compliance, including coverage for the northern Mexican gartersnake, was not completed until FY18; therefore, construction activities will be limited and will result in obligations less than were approved.

Modeling efforts and digital elevation surfaces have been discussed and shared with the U.S. Army Corps of Engineers to assist them in releases from Alamo Dam. Releases from the dam are their responsibility. Existing Bill Williams River hydrologic models have been updated with new topographic and hydrologic information to provide a tool to assist future management decisions by the U.S. Army Corps of Engineers and the Bill Williams River Corridor Steering Committee regarding releases from Alamo Dam.

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 as long as they are coordinated with activities associated with the construction of Planet Ranch. Coordination with both the USFWS and U.S. Army Corps of Engineers will continue.

FY19 Proposed Activities

Planting of cottonwood-willow and honey mesquite will continue at the CVCA and Cibola NWR Unit #1 and begin at the Dennis Underwood Conservation Area. Construction at the MVCA will continue and construction of Planet Ranch will begin.

Cibola Valley Conservation Area

Planting of Phase 10 with honey mesquite is expected to increase the established land cover types at this conservation area by 123 acres. Planting of Phase 10 completes development of the CVCA.

Cibola National Wildlife Refuge Unit #1 Conservation Area

Planting of cottonwood-willow in the North 160 is expected to increase the established land cover types at this conservation area by 158 acres.

Dennis Underwood Conservation Area

Planting of approximately 400 acres of mesquite is anticipated pending approval by the Steering Committee.

Mohave Valley Conservation Area

Dredging will be conducted to achieve desired depths for native fishes. Once dredging has been completed, the new backwater will be surveyed to obtain final acreage numbers for the created backwater. When complete, the conservation area 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 habitat.

Planet Ranch

Construction for erosion control and disconnected backwaters for native fishes will be initiated. Due to the size of the project, erosion control and two to three backwaters will be the focus in FY19 and FY20.

Adaptive Management Program (Section G)

Restoration research and demonstration projects help supply new information to adaptively manage habitat creation projects, making 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 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 management and future selection and implementation of habitat creation projects.

FY17 Accomplishments

Salinity and Soil Moisture Monitoring Network

The salinity and soil moisture monitoring network provides data to be used for making habitat management decisions related to (1) the soil moisture needs for

avian habitat requirements and (2) vegetation health requirements – sufficient soil moisture to meet evapotranspiration needs and maintain soil and groundwater salinity levels within established thresholds.

Soil moisture data were collected under Work Task F1 (Habitat Monitoring at Conservation Areas) and Work Task C60 (Habitat Manipulation) during FY17 and will be used with lidar vegetation monitoring data to evaluate the habitat conditions at sites with and without observed southwestern willow flycatcher breeding. Soil moisture data were collected at the Rockhouse Riparian Demonstration Project (near Roosevelt Lake, Arizona), three study areas on the Middle Rio Grande in New Mexico, and the PVER. A scope of work was developed to expand the monitoring network to additional conservation areas for salinity and soil moisture monitoring.

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.

Work continued for the riparian forest component of this work task, including collection of additional vegetation structure data (lidar) and soil moisture data. Lidar data were collected at LCR MSCP conservation areas (with the cottonwood-willow land cover type) and at occupied southwestern willow flycatcher sites along the LCR and throughout the southwestern United States.

One of the marsh habitat manipulation techniques identified in the literature review was tested at Hart Mine Marsh in cooperation with the USFWS. Mechanical disturbance was performed at Hart Mine Marsh, and baseline vegetation data were collected using unmanned aerial systems (UASs) equipped with multispectral and photographic sensors. The data from the sensors were used to create three-dimensional models of the vegetation to describe structure and species composition.

FY18 Activities

Salinity and Soil Moisture Monitoring Network

The salinity and soil moisture monitoring network was expanded to include monitoring at six conservation areas. Instrumentation includes shallow groundwater monitoring stations to monitor the groundwater level and groundwater salinity and soil monitoring stations that will monitor soil salinity and moisture.

Habitat Manipulation

Methods to process and analyze lidar data to describe vegetation structure are being automated to facilitate future processing. Once the automated procedure is complete, lidar data collected at LCR MSCP conservation areas (with the cottonwood-willow land cover type) and southwestern willow flycatcher-occupied sites throughout the southwestern United States will be processed and analyzed. The data from the southwestern willow flycatcher-occupied sites will be used to develop ranges for each of the vegetation metrics. A similar process will be used for evaluating soil moisture requirements; ranges will be developed using data from the southwestern willow flycatcher-occupied sites. LCR MSCP conservation areas will then be evaluated against these ranges to make recommendations on whether some level of habitat manipulation is warranted or not.

Vegetation structure data using photographic and multispectral sensors will be collected at Hart Mine Marsh to monitor the vegetation response from the mechanical disturbance that was performed in FY17. Additional monitoring techniques (UAS-mounted lidar) are being investigated to evaluate whether these techniques can penetrate the canopy and provide additional data on the vegetative structure of riparian marsh vegetation.

FY19 Proposed Activities

Salinity and Soil Moisture Monitoring Network

The soil salinity and soil moisture monitoring network will continue to operate at the six conservation areas and will be expanded as needed to include all conservation areas where these parameters are of concern for evaluating species' habitat requirements and maintaining vegetation health.

Habitat Manipulation

Lidar data will continue to be acquired in FY19 and will be processed and analyzed using the techniques developed in FY17. The long-term monitoring under this research work task will help inform the LCR MSCP about what level of active habitat manipulation is necessary. If habitat manipulation is deemed necessary, appropriate riparian forest habitat manipulation techniques will be

identified. Habitat manipulation tests at select LCR MSCP conservation areas will be considered, with the goal of evaluating techniques for inclusion in the long-term riparian forest habitat manipulation toolbox.

Vegetation response monitoring will continue at Hart Mine Marsh using data acquired with UASs. This monitoring will continue to inform the LCR MSCP about whether mechanical disturbance should continue to be included in the long-term marsh habitat manipulation toolbox. Additional marsh habitat manipulation techniques will also be considered.

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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$1,418,074	$1,196,839.51	$13,305,054.07	$1,435,380	$1,467,956	$1,467,956	$1,467,956

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 and administration staff 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 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 (Boulder City, Nevada) in 2005. The Steering Committee was established in accordance with the Funding and Management Agreement, and the bylaws for the Steering Committee were approved.

FY17 Accomplishments: Under Work Task A1 for FY17, management of the LCR MSCP continued. Ongoing administrative activities included financial, human resources, and other support for the program. The Steering Committee met on October 26, 2016, and April 26, 2017, and had a conference call on June 28, 2017. At the October 26 meeting, the Steering Committee approved Program Decision Document 17-001 Addition of New Covered Species – Northern Mexican Gartersnake. During the June 28 Steering Committee conference call, the Steering Committee approved Resolution 17-001 LCR MSCP Amendment Addition of Northern Mexican Gartersnake. The

Final Implementation Report, Fiscal Year 2018 Work Plan and Budget, Fiscal Year 2016 Accomplishment Report was prepared. Financial tracking of the program continued, and the annual financial work group meeting was held.

FY18 Activities: Under Work Task A1 for FY18, management of the LCR MSCP will continue. Ongoing administration activities will include financial, human resources, and other support for the program. Coordination with the Steering Committee continued with meetings held on October 25, 2017, and April 25, 2018. 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 2019 Work Plan and Budget, Fiscal Year 2017 Accomplishment Report* was prepared. Financial tracking for the program will continue, and the annual financial work group meeting was held.

Proposed FY19 Activities: Under Work Task A1 for FY19, management of the LCR MSCP will continue. Ongoing administration activities will include financial, human resources, and other 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 2020 Work Plan and Budget, Fiscal Year 2018 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 2018 Work Plan and Budget, Fiscal Year 2016 Accomplishment Report* is posted on the LCR MSCP Web site. The *Final Implementation Report, Fiscal Year 2019 Work Plan and Budget, Fiscal Year 2017 Accomplishment Report* will be posted upon completion.

WORK TASKS – SECTION B

Fish Augmentation

Work Task B1: Lake Mohave Razorback Sucker Larvae Collections

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$215,000	$137,699.21	$2,561,900.75	$215,000	$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) and Lake Mead Fish Hatchery 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 boats are captured by net and counted. The larvae are transferred to the Willow Beach NFH and Lake Mead

Fish Hatchery, where they are logged in by date received, number collected, and location. This work occurs 3 to 4 nights per week from late January through late April or early May. Research under Work Task C31 has helped to define larvae collection protocols. In order to maximize the 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, the quagga mussel, was found within the Lake Mead National 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 and Recovery Center in Dexter, New Mexico, or the Bubbling Ponds Fish Hatchery. Therefore, there is no longer a connection with Work Tasks B4 or B5.

FY17 Accomplishments: A target of 33,000 larvae was established for FY17 in coordination with LCR MSCP partner agencies. This quantity was established to replace hatchery stocks at the Willow Beach NFH due to losses experienced in early FY17, provide additional fish as a contingency for other unforeseen events, and to prepare for future increases in razorback sucker augmentation goals. Of these larvae, 29,500 were targeted for rearing at the Willow Beach NFH, and the remaining 3,500 were targeted for rearing at the Lake Mead Fish Hatchery.

A total of 34,541 wild larvae were collected from 4 areas of Lake Mohave. The Willow Beach NFH received 30,161 larvae for further grow-out. The remaining 4,380 were delivered to the Lake Mead Fish Hatchery for further 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, 2017*

Location	January	February	March	April	May	Total
Nine Mile	1,184	2,023	4,272	540	0	8,019
Tequila	738	4,116	2,453	282	0	7,589
Yuma	768	3,326	3,994	4,572	0	12,660
Above Owl Point	1325	1,572	1,250	2,025	101	6,273
Total	**4,015**	**11,037**	**11,969**	**7,419**	**101**	**34,541**

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

In FY17, an additional safety measure associated with collecting larvae was implemented, which included the use of check-in/check-out protocols with National Park Service radio dispatch to ensure nighttime crews were off the water safely.

Obligations in FY17 were lower than expected due to additional collection efforts completed by the National Park Service, Nevada Department of Wildlife, and the U.S. Fish and Wildlife Service. These additional efforts were completed to ensure successful capture of an increased number of larvae needed to rebuild hatchery stocks following the losses that occurred at the Willow Beach NFH in early FY17.

Expansion of hatchery stocks and rearing capacity at the Lake Mead Fish Hatchery continued, providing a safeguard against other unforeseen events and to prepare for future increases in razorback sucker augmentation. Obligations for this work task are expected to return to approved and proposed estimates in FY18–21 to support additional larvae collection needed for these efforts.

FY18 Activities: A target of 28,000 larvae has been established for FY18 in coordination with LCR MSCP partner agencies. Distribution of the 28,000 larvae will be as follows: 3,500 larvae will be delivered to the Lake Mead Fish Hatchery for further grow-out, and the Willow Beach NFH will receive 24,500 larvae. Of these 24,500 larvae, 10,000 will remain on station for rearing, 5,500 will be transferred to the Lake Mead Fish Hatchery following initial rearing, and the remaining 9,000 will be delivered to the Achii Hanyo Native Fish Rearing Facility. In an effort to better represent the Lake Mohave riverine subpopulation in hatchery stocks, up to 5,000 larvae will be collected from areas upstream of the Willow Beach NFH. Increasing the collection effort in this area may provide a better representation of the total genetic composition of razorback suckers within Lake Mohave.

Proposed FY19 Activities: Razorback sucker larvae collections will continue. The target level for FY19 is expected to be 25,000–30,000 larvae.

Pertinent Reports: The status report titled *Five-Year Summary of Razorback Sucker (Xyrauchen texanus) Larval Collections on Lake Mohave*: *2015–2019* will be posted on the LCR MSCP Web site upon completion.

Work Task B2: Willow Beach National Fish Hatchery

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$325,000	$299,717.05	$3,886,639.94	$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: BONY3, BONY4, RASU3, RASU4, and RASU5

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. Some of these fishes are transferred to the Achii Hanyo Native Fish Rearing Facility (B3) for rearing. 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 and Recovery Center (Center) in Dexter, New Mexico (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 Center for further rearing and eventual repatriation into Lake Mohave, and provide juvenile bonytail and razorback suckers 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 fishes 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% 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. No razorback suckers have been delivered to waters outside the lower Colorado River corridor since that time. 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 fishes.

FY17 Accomplishments: Early in FY17, an outbreak of the parasite Ich was discovered at the Willow Beach NFH. The infestation moved quickly through all razorback sucker raceways on station and resulted in high mortality of nearly every year-class. Prior to the outbreak, the numbers of razorback suckers on station totaled over 46,000 fish (table 1).

Following the outbreak of Ich, the Willow Beach NFH reported losses of over 32,000 razorback suckers. Approximately 13,500 fish remained on station after the outbreak and included approximately 3,500 razorback suckers in the 2014 year-class and approximately 10,000 razorback suckers in the 2016 year-class (table 1).

Table 1.—Year-Class and Number of Razorback Suckers on Station at the Willow Beach NFH Early in FY17 Before and After the Outbreak of Ich

Year-Class	Number Prior to Ich Outbreak	Approximate Number Remaining
2013	10,403	0
2014	15,111	3,500
2015	10,224	0
2016	10,542	10,000
Total	**46,280**	**13,500**

Approximately 300 razorback suckers from the 2014 year-class were stocked into the lakeside backwaters on Lake Mohave in support of ongoing research projects. All of these razorback suckers were fin clipped for genetic samples and marked with passive integrated transponder tags prior to stocking. No additional razorback suckers were stocked from the Willow Beach NFH in FY17.

The Willow Beach NFH received 30,161 razorback sucker larvae from Lake Mohave in FY17, and it will continue to rear and distribute razorback suckers for LCR MSCP fish augmentation. No bonytail were reared at the Willow Beach NFH in FY17.

A project was completed to improve flow rates for well number 3. This included drilling through the existing well to add an additional 100 feet and changing the pump and motor to use the available water.

FY18 Activities: At the start of FY18, the Willow Beach NFH had approximately 1,000 year-class 2014 razorback suckers, 10,000 year-class 2016 razorback suckers, and 13,000 year-class 2017 razorback suckers on station. The Willow Beach NFH will receive approximately 28,000 year-class 2018 razorback sucker larvae from Lake Mohave and rear and distribute razorback suckers for the LCR MSCP Fish Augmentation Program. Bonytail received from the Center may be temporarily housed at the Willow Beach NFH before transfer to other facilities. Lake Mohave backwaters will be stocked with approximately 300 subadult razorback suckers from the Willow Beach NFH, and approximately 1,000 razorback suckers will be stocked into Lake Mohave to augment the existing population.

Minor hatchery improvements will be implemented in FY18 and will include the purchase and installation of steel grating and four fiberglass tanks. The steel grating will span a set of raceways, providing a platform for the fiberglass tanks.

These tanks will replace the rearing space of one set of recirculation raceways, providing enhanced water reuse and the ability to filter and isolate individual tanks.

Proposed FY19 Activities: The Willow Beach NFH will continue to receive razorback sucker larvae from Lake Mohave and rear and distribute razorback suckers for the LCR MSCP Fish Augmentation Program. Bonytail may be temporarily housed at the Willow Beach NFH before transfer to other facilities.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B3: Achii Hanyo Native Fish Rearing Facility

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$50,000	$19,643.79	$1,528,072.43	$170,000	$170,000	$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: BONY3, BONY4, RASU3, and RASU4

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 in Reaches 2–5 of the lower Colorado River

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

Project Description: This project supports both the development and maintenance of the Achii Hanyo Native Fish Rearing Facility (a satellite facility managed by the Willow Beach NFH). This facility is used for the production of razorback suckers and bonytail to meet a portion of the augmentation goals of the LCR MSCP and as a grow-out station for razorback suckers (Lake Mohave origin larvae transferred from the Willow Beach NFH) and bonytail (supplied from the Center). The numbers of razorback suckers and bonytail reared at this facility are adjusted 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 Center in winter. In most cases, these fish are first held at the Willow Beach NFH before being transferred to the Achii Hanyo Native Fish Rearing Facility. Razorback suckers are delivered from the Willow Beach NFH in early spring. These fish are fed through spring and summer. In fall, the ponds are drained, and fishes are harvested, tagged, and stocked. Fishes under target size (< 300 millimeters [mm] total length [TL]) are returned to a pond for continued rearing. New fishes are then brought on station, and the process is repeated.

Previous Activities: In cooperation with the U.S. Fish and Wildlife Service, upgrades to this facility have occurred since FY04. The work completed includes the construction of a metal tank house and fiberglass fish tanks, an office, a feed storage room, and restrooms; electrical upgrades; aeration system upgrades for fish tanks in the tank house; and the purchase of a backup generator.

FY17 Accomplishments: At the start of the year, 1,200 year-class 2012 bonytail, 10,999 year-class 2014 bonytail, 12,000 year-class 2016 bonytail, and 1,280 year-class 2013 razorback suckers were on station. In December 2016, fishes were harvested and passive integrated transponder tagged; 617 razorback suckers were stocked into Reach 2, and 268 razorback suckers and 1,685 bonytail were stocked into Reach 3.

In FY17, Ponds 2, 3, and 4 were drained and dried out in order to make improvements. Pond A was reshaped, disked, and packed. The drainage system was cleaned of obstructions and debris. A concrete pad was poured for the new tool shed. Protective netting was placed over Ponds A, B, C, 5, and 6. Approximately 9,000 razorback suckers were transferred from the Willow Beach NFH to the Achii Hanyo Native Fish Rearing Facility in April and May. The fish were stocked at approximately 60 mm TL, and at the end of FY17 they had grown to an average of 175 mm TL. The facility also received 10,000 bonytail in June at an average TL of 20 mm. By the end of FY17, they averaged 75 mm TL.

Funds to accomplish FY17 activities were obligated in FY16. Obligating two years of funding in FY16 allowed for flexibility to complete pond improvements, as needed, in preparation of increased razorback sucker production scheduled to begin in FY18–19. The FY17 budget estimate was reduced accordingly. Funding in future years will be delivered through annual obligations and will support facility maintenance and native fish production.

FY18 Activities: In December 2017, 413 bonytail from the Achii Hanyo Native Fish Rearing Facility were stocked into Reach 4.

Permanent netting structures will be placed over all large ponds (Ponds C, 2, 3, and 4) prior to fish stocking. Pond 6 will be dried, disked, and graded to aid future harvests. Levee roads will be graded, and pond slopes will be graded for erosion control. Brush will be cleared from the pond drainage system in order to facilitate harvest.

Approximately 9,000 razorback suckers will be transferred from the Willow Beach NFH to the facility in April and May. Bonytail will be brought on station from the Center either as larvae or fingerlings to support bonytail production goals. Delivery of approximately 10,000 bonytail from the Center is expected in late winter.

Proposed FY19 Activities: Increased production of razorback suckers is anticipated at the Achii Hanyo Native Fish Rearing Facility in FY19. These fish will supplement augmentation, due to the loss of available fishes following the outbreak of the parasite Ich at the Willow Beach NFH, and provide increased redundancy in hatchery stocks for future years. Razorback suckers and bonytail left on station from previous years will continue to be reared to target size. Additional fish of both species will be delivered from the Willow Beach NFH and the Center.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B4: Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$260,000	$236,605.59	$2,541,864.43	$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: BONY3, BONY4, RASU3, and RASU4

Location: Dexter, New Mexico

Purpose: To support operation and maintenance at the Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico (Center), support maintenance of the bonytail broodstock, and to 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 Center will be delivered to the Willow Beach National Fish Hatchery (Willow Beach NFH), Achii Hanyo Native Fish Rearing Facility, and the Bubbling Ponds Fish Hatchery. Fish rearing research activities may also be conducted at the Center similar to work outlined in Work Tasks C10 (closed), C11 (closed), C14, and C30 (closed). A humpback chub refugium has been established at the Center as a safeguard in case of catastrophic events in the wild (C14).

Project Description: The Center is managed and operated by the U.S. Fish and Wildlife Service. It maintains one of only two refuge populations of bonytail in the world and has the only broodstock maintained and managed for bonytail production. The Center also retains a backup broodstock of razorback suckers. Funds provided will be used to maintain the extant broodstock, annually produce fingerling bonytail for distribution to other hatcheries, and to annually rear bonytail for distribution within Reaches 2–5. The Center plans to target a

305 millimeter (mm) total length (TL) for all bonytail stocked in FY16–18; however, fishes with TLs of 300 mm or larger may be stocked into Reach 3. Fishes stocked into Reaches 4 and 5 will be 305 mm TL or larger.

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

FY17 Accomplishments:

Bonytail: The Center maintained approximately 2,800 adult bonytail as broodstock that comprised six year-classes of Lake Mohave origin fish. Adult broodfish were hormonally induced to spawn, and 26 bonytail females successfully produced 322,000 eggs. Approximately 44,000 larvae were transferred to other stations for grow-out and research during FY17. The Center harvested, tagged (with passive integrated transponders), hauled, and stocked 1,334 subadult bonytail (300+ mm TL) into Reach 3 and 5,206 subadult bonytail (305+ mm TL) into Reach 4. Approximately 43,100 bonytail were maintained on station for future stocking (table 1).

Table 1.—Year-Class and Number of Bonytail on Station at the Center in FY17

Year-Class	Approximate Number
2014	18,000
2015	4,000
2016	6,100
2017	15,000
Total	**43,100**

Razorback Suckers: The Center maintained a broodstock of 950 adult razorback suckers that comprised 9 year-classes of Lake Mohave origin fish. Adult broodfish were hormonally induced to spawn, and 14 adult razorback sucker females successfully produced 312,000 eggs. Approximately 60,000 razorback sucker larvae were transferred to the Bubbling Ponds Fish Hatchery for grow-out and future stocking into the lower Colorado River.

FY18 Activities: The bonytail broodstock will be maintained, and the hatchery will produce approximately 100,000 larvae or fingerling bonytail for distribution to the Willow Beach NFH, Achii Hanyo Native Fish Rearing Facility, Lake Mead Fish Hatchery, and the Aquatic Research and Conservation Center at Bubbling Ponds. The Center will rear 12,000–13,000 bonytail to

305 mm TL in FY18 for distribution within the lower Colorado River. From October – December 2017, 3,664 bonytail were stocked into Reach 3, and 3,204 were stocked into Reach 4.

Proposed FY19 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, including the Aquatic Research and Conservation Center at Bubbling Ponds, Lake Mead Fish Hatchery, Willow Beach NFH, and the 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.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B5: Bubbling Ponds Fish Hatchery

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$330,000	$162,031.14	$3,515,792.26	$330,000	$475,000	$475,000	$475,000

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 Bubbling Ponds Fish Hatchery 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 and Recovery Center in Dexter, New Mexico (Center). A portion of the fish rearing and predator-conditioning research activities outlined in Work Tasks C10 (closed) and C11 (closed) were conducted at the research center (Aquatic Research and Conservation Center at Bubbling Ponds) associated with this hatchery.

Project Description: The Bubbling Ponds Fish Hatchery is managed and operated by the Arizona Game and Fish Department (AGFD). This is a warm-water rearing facility that is supplied by a continuous, year-round, 0.28-cubic-meter-per-second spring flow of 20-degree Celsius water. The hatchery 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, hatchery operation and maintenance, and delivery of fish. Production goals are 12,000 razorback suckers of 305 millimeters (mm) minimum total length (TL) 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 lower Colorado River as required by two Biological Opinions (1997 and 2001).

FY17 Accomplishments: A total of 60,000 fry were received for rearing from the Center in April. During FY17, 12,112 razorback suckers were harvested, tagged (with passive integrated transponders), and stocked into the lower Colorado River. A total of 6,727 razorback suckers were stocked into Lake Havasu (Reach 3), and 5,385 were stocked below Parker Dam (Reach 4). Minor infrastructure repairs, upgrades, and equipment purchases were also completed.

Obligations in FY17 were less than budgeted as (1) negotiations concerning future activities at the Bubbling Ponds Fish Hatchery were ongoing with AGFD, and (2) funding contributed in FY16 provided for rearing fish and replacing the spring source pipeline that supplies water to the Bubbling Ponds Fish Hatchery. This water supply infrastructure is in critical disrepair and may threaten the water supply to the hatchery if not replaced. The AGFD is also providing funds for this project to cover any remaining costs for the replacement of this pipeline. Engineering plans, associated shape files, and consultations began in FY17.

FY18 Activities: The Bubbling Ponds Fish Hatchery began FY18 with approximately 78,000 razorback suckers on station (table 1). All razorback suckers were supplied by the Center as fry or fingerlings.

Table 1.—Razorback Sucker Year-Class and Corresponding Number of Fish Estimated on Station at the Start of FY18

Year-Class	Approximate Number
2014	2,500
2015	8,200
2016	25,000
2017	42,000
Total	**77,700**

The Bubbling Ponds Hatchery will produce approximately 12,000 razorback suckers for augmentation in Reaches 3–5. As of November 2017, 879 razorback suckers with a TL of 300 mm or greater were stocked in Reach 3, and 1,840 razorback suckers with a TL of 305 mm or greater were stocked in Reach 4.

Regulatory compliance activities are expected to be completed for the spring source pipeline replacement project.

The LCR MSCP and AGFD have drafted a Memorandum of Understanding (MOU) that provides a good faith commitment to rear razorback suckers at the Bubbling Ponds Fish Hatchery for the 50-year term of the LCR MSCP. Confirmation of the MOU will help to secure long-term, annual production of razorback suckers and would allow for incremental additions and improvements to this hatchery. Funding for hatchery improvements in future years will be contingent upon an established MOU.

Proposed FY19 Activities: Razorback sucker larvae will continue to be received from the Center. Razorback suckers from the 2016, 2017, and 2018 year-classes will continue to be reared. Approximately 12,000 razorback suckers greater than 305 mm TL are expected to be produced at the Bubbling Ponds Fish Hatchery for the LCR MSCP in FY19. The increased funding proposed for FY19–21 will cover additional administrative costs for managing the cooperative fish rearing agreement with the AGFD. Annual administrative progress reports and production numbers will also be provided.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B6: Lake Mead Fish Hatchery

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$325,000	$280,966.59	$1,316,858.04	$400,000	$350,000	$400,000	$400,000

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

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Fish augmentation

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

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. This includes closed work tasks, including B11, C13, C39, C41, C49, and C57, as well as ongoing work tasks: C32, C53, C61, C63, C64, and D8.

Project Description: The Lake Mead Fish Hatchery is managed and operated by the Nevada Department of Wildlife (NDOW). The LCR MSCP and the NDOW are cooperatively rearing bonytail and razorback suckers at this hatchery in support of the LCR MSCP Fish Augmentation Program. Bonytail for this work task are produced and supplied by the Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico (Center), and razorback suckers are wild-caught individuals from Lakes Mead and Mohave. Funds from this work task provide for the salaries, equipment, feed, and chemicals necessary to rear these fishes. Fishes 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, have been brought into the Lake Mead Fish Hatchery for rearing. Subsequently, these fish have been transferred to

ponds at the Overton Wildlife Management Area 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 bonytail, flannelmouth suckers, and razorback suckers. 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 had been reared here. The additional rearing capacity now available at the Lake Mead Fish Hatchery will continue to be necessary in future years when the number of fishes stocked annually into Reaches 3–5 is expected to increase.

FY17 Accomplishments: During FY17, the Lake Mead Fish Hatchery continued rearing the approximately 22,000 bonytail and 16,000 razorback suckers that were on station from previous years. The hatchery received approximately 4,500 fingerling bonytail during FY17, bringing the total number of bonytail on station to approximately 26,000. The hatchery's razorback sucker stocks were also augmented in FY17 with 4,380 razorback sucker larvae and approximately 3,000 razorback sucker fingerlings, all from Lake Mohave, bringing the number of razorback suckers on station to just over 23,000.

A number of stockings occurred in FY17 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 684 bonytail and 468 razorback suckers were stocked into Reach 2 as part of complementary sonic telemetry studies being conducted under Work Task C64. Twenty bonytail and 15 razorback suckers from these cohorts received sonic tags prior to stocking and were tracked throughout the year. A total of 1,992 bonytail were stocked into Reach 3 in FY17. Approximately one-half of these individuals were flow conditioned prior to release, and post-stocking survival for this cohort will be evaluated under Work Task C61. A total of 1,499 razorback suckers were also stocked into Reach 3 in order to investigate latent mortality, relative survival, and dispersal of fish stocked using traditional and soft release techniques (C65). Reach 4 received 1,466 bonytail and 1,121 razorback suckers in support of new research monitoring the population status and distribution of both species in the lower Colorado River between the Palo Verde and Imperial Diversion Dams. Twenty fish of each species received sonic tags prior to stocking, and approximately 600 razorback suckers were flow conditioned prior to release. Post-stocking distribution and survival will be evaluated through Work Tasks C61 and C64. In summary, a total of 4,142 bonytail and 3,088 razorback suckers were stocked from the Lake Mead Fish Hatchery in FY17.

In late FY17, the Lake Mead Fish Hatchery experienced an extended water outage due to a lightning strike at the adjacent Basic Water Company. This company is the water utility and supplier for the Lake Mead Fish Hatchery, and as a result of the lightning strike, was unable to provide water to the hatchery for approximately 14 hours. Due to the outage, approximately 3,500 bonytail and 4,350 razorback suckers were lost as raceway water quality deteriorated. No additional losses were reported following the event. At the end of FY17, approximately 34,000 native fishes from multiple year-classes remained on station. These fishes will be stocked or made available for research purposes as needs are identified.

In an effort to increase fish production numbers at the Lake Mead Fish Hatchery, bids were received for the planned electrical upgrade. This upgrade will allow for an expansion of the larval rearing portion of the hatchery and will support the additional power requirements for rearing more fishes. This work was slated to begin in FY17, but was postponed due to delays and the late summer water outage. Postponement of this work resulted in reduced funding obligations for this work task in FY17.

FY18 Activities: The NDOW will continue to operate the Lake Mead Fish Hatchery for bonytail and razorback sucker production, and in support of flannelmouth sucker research. Continuing operations will include grow-out and stocking of native fishes from the 2013–18 year-classes, and receiving and rearing up to 9,000 additional razorback suckers from Lake Mohave and 6,000 additional fingerling bonytail from the Center. It is also anticipated that the hatchery will stock approximately 4,500 bonytail and 4,000 razorback suckers toward fish augmentation goals in FY18.

Expansion of the rearing capacity at Lake Mead Fish Hatchery is expected to result in increased costs. Funding will support the planned electrical upgrade beginning in FY18; expansion of larval rearing; use of additional raceways, electrical and associated pumping costs; increases in feed, chemicals, and supplies for additional fishes on station; and staff time. Funding increases are reflected in the estimated budgets for FY18–21.

The NDOW and LCR MSCP will draft a Memorandum of Understanding in FY18, which will establish the commitment of both parties to rear native fish species at the Lake Mead Fish Hatchery for the 50-year term of the LCR MSCP. This memorandum will determine partner responsibilities and secure native fish rearing and production for LCR MSCP fish augmentation through 2055.

Proposed FY19 Activities: Rearing and stocking of native fishes from previous year-classes will continue. The Lake Mead Fish Hatchery will also receive and rear up to 9,000 additional razorback suckers from Lake Mohave and 6,000 additional fingerling bonytail from the Center. Adult and subadult fish will be stocked into the lower Colorado River or delivered to off-channel grow-out sites as necessary.

Pertinent Reports: Annual activities reports are available upon request.

Work Task B7: Lakeside Rearing Ponds

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$200,000	$174,790.62	$2,388,129.07	$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: BONY3, BONY4, BONY5, RASU3, RASU4, RASU5, and RASU6

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 (Willow Beach NFH) and the Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico. 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 as a reregulation 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, lakeside ponds form at many of these washes. The Bureau of Reclamation and its partners in the Lake Mohave Native Fish Work Group have been using these lakeside 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). The LCR MSCP monitors and

manages the ponds throughout the growing season. This work includes periodic monitoring of plankton production, removal of weeds and debris, 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 fishes from these ponds are then released back into Lake Mohave. The LCR MSCP 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 over 33,000 razorback suckers have been reared and repatriated into Lake Mohave. In an effort to expedite development of the 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/or fall. The LCR MSCP began using the current passive integrated transponder (PIT) tag technology in 2006 and has released over 6,000 pond-reared fish into Lake Mohave since that time. Beginning in 2012, surplus in situ spawned fish were harvested and fin clipped and/or PIT tagged and transferred to Reach 3 below Davis Dam.

FY17 Accomplishments: Four backwaters were stocked at the beginning of the year with juvenile razorback suckers. These fish were originally collected from Lake Mohave as larvae and then reared at the Willow Beach NFH. 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 were supported work under Work Task B7, two of the backwaters were also used to conduct concurrent species research work tasks. Specifically, the Nevada Egg and Willow backwaters were stocked solely in support of Work Task B7. The Arizona Juvenile (AJ) and Dandy backwaters were stocked as part of Work Task C40. These backwaters received 50, 50, 100, and 100 2014 year-class razorback suckers, respectively, for a total of 300 razorback suckers stocked into Lake Mohave backwaters in FY17 (table 1). The Nevada Egg and Willow backwaters were each stocked with a single sex of the species to assess growth in the absence of reproductive behavior.

In FY17, 85 razorback suckers were harvested from all the previously stocked backwaters and repatriated into Lake Mohave. The mean TL for all backwater fish during this harvest was 437 mm, with a range of 418–468 mm (table 1). All fish were PIT tagged prior to initial stocking into the backwaters; however, harvested fish were rescanned at the time of harvest, and a new tag was inserted if the original PIT tag was not detected.

Table 1.—2017 Stocked Adult Razorback Suckers Repatriated into Lake Mohave from Lakeside Rearing Ponds

Backwater		Number Stocked		Mean TL at Stocking (mm)		Number Harvested		Mean TL at Harvest (mm)		Percent Harvested from 2017 Stocking
Nevada Egg		50		364		0		N/A		0.0
Willow		50		402		40		468		80.0
Arizona Juvenile		100		374		29		424		29.0
Dandy		100		371		16		418		16.0
Total or Overall Mean Value	**Total**	**300**	**Mean**	**376**	**Total**	**85**	**Mean**	**437**	**Mean**	**28.3**

Harvest efforts can be variable from year to year depending on fish survival and other contributing factors. Known avian predators were observed at all backwaters shortly after they were stocked in early February 2017. While no fishes were harvested from the Nevada Egg backwater in FY17, and total backwater repatriation numbers were low, lake-wide monitoring has consistently shown higher long-term contact rates for backwater-reared versus hatchery-reared fish in Lake Mohave. Backwater rearing provides an opportunity for fish to attain larger sizes prior to release into the lake, and contact data suggest that this larger size may improve post-stocking survival. Through FY17, over 20% of backwater-reared fish released into Lake Mohave after 2006 have been contacted.

Backwaters supporting research conducted under Work Task C40 were also sampled during harvest events. Two razorback suckers (mean TL = 523 mm) that had been stocked as adults and 17 razorback sucker recruits (mean TL = 433 mm) were netted from the Yuma Cove backwater in FY17. All newly captured recruits received a PIT tag, and genetic (tissue) samples were collected as part of ongoing research (C40). All captured fish were returned to the Yuma Cove backwater. An additional 3,607 in situ-produced fish with a range of 100–211 mm TL (recruits from reproduction) were captured from the AJ backwater. Because these recruits did not reach the minimum release target size (300 mm TL) requirements of the LCR MSCP for Reach 3, all were transferred to Davis backwater for further grow-out. Genetic samples were collected from 330 of these fish as part of Work Task C40.

FY17 obligations were less than anticipated, as labor costs were covered under ongoing research tasks (C40 and C63) and partners provided in-kind participation for backwater maintenance.

FY18 Activities: Lakeside ponds are again being used for razorback sucker broodstock maintenance and development. Genetic and demographic data related to Work Task C40 will continue to be gathered in the AJ, Yuma, and Dandy backwaters, and in situ voluntarily spawned fish will continue to be

harvested and released into downstream locations in Reach 3 below Davis Dam. Voluntarily spawned fish transferred from the AJ to Davis backwater in FY17 will be monitored.

Stocking densities will again be reduced in FY18 due to the limited number of fishes available from the Willow Beach NFH following the outbreak of the parasite Ich at that facility in early FY17. The AJ and Dandy backwaters will be stocked with 100 individuals each in support of activities associated with Work Task C40. The Nevada Egg and Willow backwaters will each receive 50 razorback suckers. Sex ratios in the Willow and Nevada Egg backwaters will be manipulated to evaluate the role reproductive behavior has on growth in these closed-system environments. The Nevada Egg backwater will be stocked at a later date than the other backwaters for the purpose of testing bird predation impacts on survivability. The Yuma Cove backwater will not be augmented in FY18 based on monitoring activities associated with Work Task C40.

Remote sensing technology will continue to be expanded to all fish-stocked 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.

Proposed FY19 Activities: Lakeside ponds along the shoreline of Lake Mohave will be operated and maintained for native fishes. Stocking densities will continue at approximately 100 individuals per location. Experimental stocking regimes will continue to be explored in the current non-research Davis, Nevada Egg, North Nine Mile, North Chemehuevi, and Willow backwaters. All ponds will be monitored regularly to ensure 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 the water quality of various ponds in past years. Voluntarily spawned fish from backwaters will continue to be transported and stocked downstream from Davis Dam.

Pertinent Reports: N/A

Work Task B8: Fish Tagging Equipment

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$135,000	$130,604.88	$1,095,900.17	$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 fishes to be released for research and augmentation stockings

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

Location: N/A

Purpose: To mark fishes 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. Fishes 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 LCR MSCP anticipates the need for fish tags and tagging equipment throughout the 50-year term of the program.

Previous Activities: Fishes 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, the LCR MSCP began using 134.2-kHz frequency PIT tags. These tags have a greater detection range than the previously used tags (12 versus 2 inches away from fish) and allow for testing and deployment of remote listening stations within spawning areas and other locations along the LCR. Purchase of the PIT tags, tag readers, and antennas began in 2006.

FY17 Accomplishments: PIT tags, tagging equipment, and tag readers were purchased as needed to mark fishes for monitoring and research. A total of 16,401 razorback suckers and 12,382 bonytail were PIT tagged and released into the LCR during FY17. These reported numbers of tagged fishes represent the total number of fishes implanted with tags and not the number of fishes repatriated and credited under the LCR MSCP Fish Augmentation Program. They include fishes used for research, smaller volunteer spawned fishes that have been translocated into other areas, and fishes that have been retagged due to tag loss or replacement of older frequency tags.

FY18 Activities: PIT tags, tagging equipment, and tag readers will be purchased as needed to mark fishes for monitoring and research. The budget estimates reflect the increased fish number goals and the need for additional supplies and equipment to support ongoing tagging and remote sensing research and monitoring efforts.

Proposed FY19 Activities: PIT tags, tagging equipment, and tag readers will continue to be purchased as needed to mark fishes for monitoring and research.

Pertinent Reports: N/A

Work Task B12: Maintenance of Alternate Bonytail Broodstock

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$65,000	$76,778.77	$144,281.93	$65,000	$70,000	$70,000	$70,000

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

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

Project Description: Bonytail are federally listed as endangered under the Endangered Species Act; they are considered functionally extirpated from their historical range, and their persistence in the Colorado River Basin now relies entirely on stocking. Prior to 2016, the Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico (Center) maintained the only bonytail broodstock in the world. To guard against a catastrophic event and to secure the species' genetics, a second broodstock was developed and moved to the Mora NFH in March 2016. 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 benefit 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 Center. The budget estimates will reflect the LCR MSCP cost share in the relocation and maintenance of the new broodstock.

Previous Activities: In 2011, a multi-agency meeting was held to prioritize the creation of new refuge populations for Colorado River fishes to safeguard species against catastrophic events. Given that the only bonytail broodstock population was maintained at a single facility, and no wild population exists to provide founders for a new population, development of an additional bonytail refuge population was prioritized. The Center developed the second bonytail broodstock population during FY12–14.

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

FY17 Accomplishments: Survival of the second bonytail broodstock was 99.3% through the end of FY17. Bonytail continue to be maintained in six 6-foot-diameter circular tanks. The bonytail grew approximately 11 millimeters in 2017 on a maintenance diet of 0.5% of total body weight at an average water temperature of 12 degrees Celsius. Half of the isolation system the bonytail are reared in was renovated in 2-D Naturalistic rearing vail material.

FY18 Activities: Bonytail will be moved into the renovated tanks so that renovation can occur on the remaining tanks. Razorback sucker diets will be transitioned fully to Bio-Oregon grower diets to improve removal of fecal material in the recirculating systems. Funds will be supplied to the Mora NFH to help cover the costs of maintaining the refuge bonytail broodstock population. This cost may vary depending on contributions made through other recovery and conservation programs.

Proposed FY19 Activities: Funding will be provided to help support maintenance of the alternate bonytail broodstock at the Mora NFH. The proposed estimates for FY19–21 have been increased based on actual obligations from FY16 to FY17; however, annual costs 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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$11,000	$10,844.47	$128,007.16	$11,000	$11,000	$11,000	$11,000

Contact: Carolyn 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 for an ongoing conservation program or to another 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 2016, the National Park Service (NPS) monitored select populations of sticky buckwheat and threecorner milkvetch within the Lake Mead National Recreation Area. Monitoring included presence/absence surveys from 2008 to 2016 and invasive weed removal in 2013 to 2016 at select sites.

A minor modification to the conservation measures for both plants was 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."

FY17 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 235 of the 471 plots surveyed contained threecorner milkvetch, with 4,475 plants recorded overall. Additional habitat surveys documented 270 threecorner milkvetch plants outside the plots at Sandy Cove, 366 threecorner milkvetch plants in a 17-acre survey area at Ebony Cove, 2 threecorner milkvetch plants at Lime Cove in a 20-acre survey area, and 450 plants at Middle Point in an 8-acre survey area. Sticky buckwheat populations located at Lime Cove and Glory Hole were monitored on established transects. A total of 97 sticky buckwheat plants were documented at Lime Cove and 2 at Glory Hole. Additional habitat surveys documented 18 sticky buckwheat plants at Lime Cove in a 20-acre survey area. Invasive Sahara mustard weeds were removed from 9.95 acres of the 59 acres of dunes/sandy areas and surrounding beaches at Sandy Cove.

FY18 Activities: Funds in the amount of $10,000 will be transferred to the NPS per the above-described agreement to implement conservation activities for sticky buckwheat and threecorner milkvetch. An annual report will be provided to the Bureau of Reclamation that summarizes the achievements made toward the conservation goals for these two plant species.

Proposed FY19 Activities: Funds in the amount of $10,000 will be transferred to the NPS per the above-described agreement to implement conservation activities for sticky buckwheat and threecorner milkvetch. An annual report will be provided to the Bureau of Reclamation that summarizes the achievements made toward the conservation goals for these two plant species.

Pertinent Reports: The report titled *Surveys of Threecorner Milkvetch* (*Astragalus geyeri* var. *triquetrus*) *and Sticky Buckwheat* (*Eriogonum viscidulum*) *in Fiscal Year 2017 – Lake Mead National Recreation Area* is posted on the LCR MSCP Web site.

Work Task C14: Humpback Chub Program Support

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$57,000	$229.50	$288,216.61	$57,000	$1,000	$1,000	$1,000

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 and Recovery Center in Dexter, New Mexico (Center).

Project Description: A total of $500,000 over the 50-year term of the LCR MSCP 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: A captive broodstock/refugium population of Grand Canyon humpback chubs was established at the Center during FY12–14. During FY14 and FY15, the Center successfully maintained 1,024 humpback chubs from the Little Colorado River, Grand Canyon.

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 AMP, in coordination with the USFWS, identifies appropriate maintenance activities or research needs for the funds.

FY17 Accomplishments: The humpback chub refugium stock was inventoried on August 24, 2017, and found to have 95% survival. No research or support needs were provided during FY17.

FY18 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. At this time, no activities have been identified; therefore, future funding will be maintained at a minimal level until conservation activities are identified.

Proposed FY19 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

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$340,000	$349,373.16	$2,317,424.51	$150,000	$0	$0	$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 (BEVI, BLRA, CLRA, ELOW, GIFL, GIWO, LEBI, SUTA, VEFL, WIFL, YBCU, and YWAR)

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 the Arizona Bell's vireo, California black rail, elf owl, gilded flicker, Gila woodpecker, Sonoran yellow warbler, southwestern willow flycatcher, summer tanager, vermilion flycatcher, western least bittern, 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 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 under Work Tasks F2, F7, and F10 that target covered bird species and system-wide monitoring of avian species under Work Tasks D1, D6, and D7. Information gained from this work task will be incorporated into Conservation Area Development and Management (Section E) work tasks and adaptive management (Section G).

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 Fremont cottonwood-Goodding's 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 FY14, habitat data were collected and summarized. This included collection of vegetation measurements to detect vegetation differences where birds did and did not nest. An audit of the data from FY11 to FY14 was conducted to verify its completeness and quality.

Restoration of Managed Marsh Units to Benefit California Black Rail and Other Marsh Birds: In 2009, vegetation surveys were conducted, water depth data were monitored at wells, and biweekly marsh bird surveys for California black rails, Yuma clapper rails, and western least bitterns were conducted throughout the breeding season at the Imperial National Wildlife Refuge in Fields 16 and 18. In 2011, a final report was prepared, giving recommendations on the creation of marshes for both California black rails and Yuma clapper rails. Further research on marsh bird habitat requirements will be conducted under Work Tasks C60 and C66.

Elf Owl: A study was initiated in FY14 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 conservation areas. 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 nest boxes should be installed on conservation areas. In FY15, approximately 550 elf owls were detected in all 9 major Arizona watersheds and in mesic riparian vegetation in 7 of the watersheds. Generalized linear mixed models were developed to investigate the importance of riparian vegetation to elf owls and assess whether certain environmental characteristics could explain the locations of this subspecies. In FY16, responsiveness surveys

and habitat assessments were conducted on elf owl breeding pairs in or near riparian habitat at four study areas along the Santa Cruz watershed (Cienega Creek, Posta Quemada Canyon, Rincon Creek, and Tumamoc Hill Washes), one study area along Arivaca Creek in the Buenos Aires National Wildlife Refuge, and three study areas along the Bill Williams River watershed (Bill Williams River, Santa Maria River, and Date Creek). A total of 89 elf owl pairs were confirmed breeding, and a total of 54 elf owl nests were located.

FY17 Accomplishments:

Elf Owl: Surveys were conducted to locate elf owl breeding pairs in or near riparian habitat at two study areas along the San Pedro watershed (Upper San Pedro and Lower San Pedro), one study area along Aravaipa Creek, and three study areas along the Bill Williams River watershed (Bill Williams River, Santa Maria River, and Big Sandy River). Call-playback discovery surveys, emergence surveys, nest searching, and territory surveys were used to confirm that pairs were breeding. A total of 62 elf owl pairs were confirmed breeding.

Responsiveness surveys were conducted during the first 3 hours after sunset at distances of 50 meters (m), 100 m, 150 m, 200 m, and 250 m from confirmed breeding individuals in obstructed conditions in five vegetation volume categories: 5–20%, 21–40 %, 41–60%, 61–80%, and > 80%. A total of 52 nests were found. The height and species of the nest tree or cactus, the cavity height, and the cavity orientation were recorded for each nest, and photographs were taken of the nest tree and surrounding habitat. The core territory was delineated for breeding pairs when individuals were observed at enough locations during radio telemetry surveys, territory surveys, nest searching, or emergence surveys.

Habitat assessments were conducted for all 62 confirmed pairs in a 75-m radius around the nest; if the nest was not found, the activity center was used instead. Vegetation patches of the six community types (mesic riparian, xeric riparian, exotic riparian, desert woodland, desert shrubland, and arborescent desert scrub) within each core territory or fixed-radius circle were delineated. Lower midstory volume, midstory volume, canopy height, canopy cover, number of saguaros, number of snags, distance to riparian habitat, and riparian habitat width were estimated within each core territory or fixed-radius circle. Data management, processing, and analysis occurred for data collected from FY15 to FY17.

FY18 Activities:

Elf Owl: Data management, processing, and analysis will continue. Final reports for the project will be completed. Available microclimate data for conservation areas data will be analyzed to identify portions of conservation areas where

temperature and humidity may be suitable for elf owls to nest. The work task will close in FY18. Any remaining data management activities or detection surveys will take place under Work Tasks D6 and F2.

Proposed FY19 Activities: The work task was closed in FY18.

Pertinent Reports: The elf owl final report will be posted on the LCR MSCP Web site upon completion.

Work Task C25: Imperial Ponds Native Fish Research

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$200,000	$186,861.08	$2,017,243.48	$0	$0	$0	$0

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

Start Date: FY08

Expected Duration: FY17

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

Conservation Measures: BONY2 and RASU2

Location: Reach 5, Imperial National Wildlife Refuge, Arizona

Purpose: To evaluate six ponds created as backwater habitats at the Imperial National Wildlife Refuge in order 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, and genetic monitoring in the ponds will be completed under Work Task C40. The ponds were developed under Work Task E14, and additional monitoring support will be provided through Work Task F5.

Project Description: The development of native fish refugia in six constructed ponds on the Imperial National Wildlife Refuge 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 and population monitoring was conducted for both bonytail and razorback suckers through FY13. Populations of each species did persist with varying degrees of success. 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 spawning beds and boat ramps during the nominal spawning season that peaked in late winter/spring.

A multi-year 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). The results of this study indicated that water quality management could be achieved with respect to survival of native fishes and 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 a surface water to a groundwater (well) source.

Beginning in FY14, native fish removal efforts were initiated in preparation for the renovation of all six ponds. In Pond 1, 86 razorback suckers were captured: 46 had previously been passive integrated transponder (PIT) tagged, and 40 had no tag data. A total of 145 bonytail were captured from Pond 1; none were PIT tagged.

In FY15, the ponds were treated with rotenone to remove all fish species. Post-renovation sampling was conducted for a 2-year period and included 112 trammel net-nights, 403 hoop net sets, 874 minnow trap sets, and 162 larval light trap sets. Mosquitofish were captured in Pond 5, but no other fish species have been detected in any of the Imperial ponds since the renovation.

A water management schedule was established based on the results of the water management study conducted at the ponds. Each pond received a target volume of water per month. In total, the ponds received approximately 2.5 million gallons of water from January through June and October through December, and about 5.5 million gallons from July through September. Monitored water quality parameters remained within acceptable ranges for native fishes.

FY17 Accomplishments: All ponds were stocked with native fishes in FY17. Ponds 1, 3, and 4 were stocked with razorback suckers in December 2016, and Ponds 2, 5, and 6 were stocked with bonytail in March 2017. Each pond was stocked with 300 adults in an even ratio of males to females. A tissue sample was collected from each fish to aid in genetic monitoring, and all fishes were PIT tagged prior to release.

Each pond was equipped with a minimum of two permanent solar-powered PIT tag scanners that were programmed to run continuously. Population estimates were calculated biweekly using the PIT scanner data. At the end of FY17, population estimates for each pond were: Pond 1 – 199 razorback suckers, Pond 2 – 142 bonytail, Pond 3 – 185 razorback suckers, Pond 4 – 224 razorback suckers, Pond 5 – 273 bonytail, and Pond 6 – 219 bonytail.

Larval fish monitoring and minnow traps were used to search for signs of recruitment in each of the ponds. In April, larval bonytail were detected in Pond 2, and thousands of young fish could be observed along the shoreline for the remainder of the year. Minnow traps confirmed this large spawn with the capture of 799 young-of-year fish in only 15 minnow trap sets. No larvae or young-of-year fishes were detected in the other ponds. A subset of larvae and young-of-year were preserved for genetic analyses being conducted under Work Task C40. Mosquitofish were again detected in Pond 5, but no non-native fish species were detected in any of the remaining ponds. These ponds have been free of non-native fish species since pond renovations were completed.

Water quality probes were deployed to record water quality parameters (temperature, pH, dissolved oxygen, and specific conductivity) at 12-hour intervals. Each pond received a target volume of water per month based on the established water management schedule. Observations in FY17 suggested that pond water management continued to be effective, with all water quality parameters remaining within acceptable ranges for native fishes.

FY18 Activities: This work task closed in FY17. Future monitoring efforts will be covered under Work Task F5.

Proposed FY19 Activities: This work task was closed in FY17.

Pertinent Reports: Associated reports are posted on the LCR MSCP Web site.

Work Task C31: Razorback Sucker Genetic Diversity Assessment

FY17 Estimate	FY17 Actual Obligations	Cumulative Accomplishment Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$160,000	$145,010.65	$877,780.46	$160,000	$0	$0	$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 by the LCR MSCP

Conservation Measures: RASU2, RASU3, RASU5, and RASU6

Location: Reaches 1–5 of the LCR MSCP planning area

Purpose: To develop and maintain a genetic management program for razorback suckers

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 (closed), 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 lower Colorado River 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, the 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 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 inform management of the razorback sucker populations developing in newly constructed flood plain habitats within the LCR MSCP planning 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 planning 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 20 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.

FY17 Accomplishments: Within Lake Mohave, 218 fin clips and 501 larval samples were collected from the main basin and analyzed for levels of molecular variation. There has been a decrease in genetic diversity over the last 2 years; however, diversity is still greater than it was in the mid-2000s. These findings are still consistent with continued maintenance of molecular variation by the current management program. An additional 10 fin clips and 342 larvae were obtained from the area above the Willow Beach National Fish Hatchery. A comparison of mtDNA variation among larval samples indicates significant differences between these two geographic areas of the lake ($P = 0.006$). These differences appear to reflect higher levels of genetic diversity in the Willow Beach Reach, which may reflect sampling differences between regions.

From Lake Mead, 39 adult fin clips and 91 larvae were collected. Samples have been extracted, sequenced, genotyped, and analyzed using genetic software. Samples from Lake Mead exhibit only four of the more common haplotypes found in Lake Mohave and overall exhibit lower levels of genetic diversity.

From Reach 3, 15 adult fin clips and 387 larvae (from 18 spatial and/or temporally distinct samples) were collected. All have been characterized for mtDNA variation but not microsatellites. The larval samples exhibited similar or higher levels of allelic and gene diversity than Lake Mohave, with no samples exhibiting a significant reduction in the expected number of alleles when compared to the original Lake Mohave source population. The few adult samples have a different allele profile than expected relative to Lake Mohave, which may be due to the small sample size.

FY18 Activities: Razorback sucker genetics will continue to be assessed for the lower Colorado River through analyses of razorback sucker fin clips and larvae collected from spawning areas, reservoirs, river reaches, and off-channel habitats within the LCR MSCP planning area. If available, Reach 3 razorback sucker augmentation will include additional fish from the Lake Mohave gene pool. Due to this increase in the proportion of stocked razorback suckers reared from Lake Mohave origin larvae, spatial and temporal genetic monitoring efforts of larvae and adults for Reach 3 will continue and will allow for comparison with razorback sucker genetics of Lake Mohave.

Proposed FY19 Activities: This work task will be closed in FY18. Future genetic monitoring will be conducted under System Monitoring (Section D).

Pertinent Reports: The FY17 annual report 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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$110,000	$117,484.11	$908,080.02	$0	$0	$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: BONY2, BONY3, BONY5, RASU2, RASU3, RASU5, and RASU6

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

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

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

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

Previous Activities: Salinity concentrations evaluated in replicate laboratory experiments indicated that upper salinity tolerances ranged from 11,000 to 12,500 microsiemens per centimeter (µS/cm) for bonytail and razorback sucker embryos. Observations made during replicate larval trials suggested salinity tolerances of 15,000 µS/cm for bonytail and from 23,000 to 27,750 µS/cm for razorback suckers. Salinities greater than 15,000 µS/cm resulted in bonytail

larval mortality of 98–100% at 25 degrees Celsius (°C). Observations of razorback sucker larvae indicated that long-term survival may be possible at salinities as high as 23,000 μS/cm when larvae are properly acclimated.

Replicate laboratory experiments exposing bonytail and razorback sucker embryos to a pH range of 7.0–10.5 suggested that successful development to the larval stage may be expected at pH levels as high as 9.5, and little to no development should be expected at pH levels of 10 and above. Observations from replicate larval trials indicated that short-term (20-day) survival of native fish larvae may be expected at pH levels as high as 10 at moderate temperatures; 98% survival was observed for razorback sucker larvae during these treatments. Observations of juvenile bonytail and razorback suckers indicated that the upper tolerance for this life stage is near pH 10 at both 20 and 30 °C. Survival for both species was low (3–17%) at pH 10, 58–82% at pH 9.5, and over 90% at pH 9.

DO concentrations evaluated in laboratory experiments indicated that the lower DO limit for successful embryo development is near 2 milligrams per liter (mg/L) for bonytail and in the 2.5–3 mg/L range for razorback suckers. All DO concentrations within the experimental range (2–8 mg/L) resulted in successful development to the larval stage; however, embryo success was observed to increase in concentrations above 3 mg/L for both species. Observations from replicate larval trials suggested that short-term (20-day) survival of native fish larvae may occur in DO concentrations as low as 2 mg/L. Bonytail larvae exhibited 93–100% and 46–85% survival at 20 and 25 °C, respectively, across the experimental range. No survival of razorback sucker larvae was observed at 2 mg/L, but survival increased to 99% in each of the remaining experimental concentrations. Observations of juvenile bonytail and razorback suckers indicated that the lower oxygen limit for this life stage may be influenced by temperature. Limited mortality was observed in the 2-mg/L treatment groups at 20 °C, but mortality for these groups increased to 100% for bonytail and 37% for razorback suckers during 30 °C trials.

FY17 Accomplishments: Research during this study year focused on evaluating threshold salinity concentrations for juvenile bonytail and razorback sucker survival. Fingerling fish were exposed to salinity concentrations of 10,000–20,000 μS/cm in replicate treatments for a minimum of 15 days at 25 °C. Fish were acclimated to experimental salinities over a period of 3 weeks prior to trial initiation. Control replicates for each species were also maintained at approximately 1,000 μS/cm for the duration of each trial. Survival was evaluated at 72 hours and after 15–20 days of exposure.

Limited mortality (2–9 %) was observed for juvenile bonytail exposed to salinity concentrations of 10,000–17,500 μS/cm during a 20-day trial period. Mortality increased noticeably to 69% for fish exposed to a salinity concentration of 20,000 μS/cm for the same duration. Observations suggest that 20,000 μS/cm may be near the threshold salinity concentration for juvenile bonytail survival. Juvenile razorback suckers exposed to the same conditions over a 15-day

period displayed higher survival overall. Zero mortality was observed in 10,000–17,500 μS/cm treatments, and only 3% mortality was observed at 20,000 μS/cm. These observations are similar to those previously recorded for razorback sucker larvae, suggesting that salinity is not a limiting factor for razorback sucker survival when other water quality parameters are suitable.

Observations from multiple years of study have suggested that the evaluated native fish species are fairly tolerant of extreme water quality conditions. The embryo life stage was consistently observed to be the most sensitive; however, the tolerances observed for this life stage may provide a useful baseline for evaluating the suitability of native fish habitat. Larvae and juvenile fishes were observed to display a higher tolerance to extreme water quality conditions throughout the study, suggesting that survival of these life stages may be expected across a wide range of environmental conditions. The results from this multi-year study will help to inform the project-level adaptive management process and will assist in developing guidelines for effective management of created backwater habitat.

FY18 Activities: This work task closed in FY17.

Proposed FY19 Activities: This work task closed in FY17.

Pertinent Reports: A final report will be posted on the LCR MSCP Web site upon completion.

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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$300,000	$399,170.09	$1,100,389.59	$415,000	$ 0	$0	$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 by 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 B4, B6, 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 hypothesis needs to be tested 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 planning 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 deoxyribonucleic acid (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.

Previous Activities: Adult, juvenile, and larval razorback suckers have been genotyped, and multiple iterations of in situ spawning have been completed in the Arizona Juvenile (AJ), Dandy, and Yuma Cove backwaters along Lake Mohave. Collections from FY10 to FY16 were analyzed, identifying considerable variability in individual reproductive success within and especially among different lakeside ponds. The number of adults stocked in the ephemeral ponds (AJ and Dandy) was reduced in FY16 from 100 to 50 of each sex to examine the impacts of density on reproductive success.

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 each stocked with 160 adult bonytail in an approximately even ratio of males to females. 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. Parentage analyses were conducted for the Nevada Egg and North Nine Mile backwaters from FY14 to FY16. Across years and backwaters there was a very high contribution of adults (88–97%) to progeny production, with a single exception (FY16 – North Nine Mile). Individuals of both genders mated with multiple partners, and there was a strong correlation between the number of mates and family size. There was no difference in measures of reproductive success between genders, with males and females making essentially equal contributions within backwaters and years. High variance in reproductive success among individuals did occur, but the main source of variance was the interaction between year and backwater, suggesting a strong effect of environmental factors.

FY17 Accomplishments: Genetic samples were obtained from the AJ (298 larvae, 346 juveniles) and Yuma Cove backwaters (344 larvae, 97 juveniles/recruits). No larvae or juveniles were sampled from the Dandy backwater in 2017. DNA is being extracted from larvae and from fin clips of juveniles/recruits and stocked adults. Initial results from AJ larvae indicate that proportionally fewer individuals may have reproduced than in previous years.

Genomic analyses of razorback suckers have identified more than 40,000 potential markers, and preliminary screening of these has identified thousands of loci

that will be useful for characterizing levels of genetic variation in lower river populations and lineage analyses in backwater ponds (replacing microsatellites). Initial screens also identified three male specific markers, with amplified bands present in 80% of the 64 males surveyed and none of the females. These markers are highly correlated with each other; therefore, they are likely associated with the same locus or region. The sequence of the whole genome (in progress) may identify other important genomic regions to aid in the search for improved identification of individuals by sex.

In 2017, 1,800 native fishes were stocked into six ponds at the Imperial Ponds Conservation Area. Bonytail were stocked in Ponds 2, 5, and 6; razorback suckers were stocked in Ponds 1, 3, and 4; and each pond received 150 male and 150 female adults of the respective species. Genetic data were obtained from all 1,800 adults prior to release. Monitoring was conducted throughout the spawning season to document reproduction and collect larvae or juvenile fish for genetic assessment. No spawning activity or reproduction was observed in razorback sucker ponds. Substantial reproduction occurred in Pond 2, with bonytail larvae and juveniles collected from April to June. In Ponds 5 and 6, larvae were not detected, but sampling in November found a small number of bonytail juveniles in both ponds. Genetic data were obtained from a total of 552 bonytail larvae and juveniles during the sampling year. Parentage analysis conducted for bonytail in Pond 2 showed that reproductive success was high for both genders, with more than 80% of individuals contributing offspring and the majority of males and females mating with more than one individual. Genetic effective size of the population was high, and genetic diversity was preserved between parental and progeny generations, consistent with high reproductive success.

Obligations in FY17 were more than estimated, as efforts initiated under Work Task G3 during FY16 ("Development of SNP Markers for Gender Determination, Parentage Assessment, and Population Genetics of Razorback Sucker") were moved to this work task. Funding associated with this study was not accounted for in the original FY17 estimate, but was provided under this work task, as this new work directly relates to ongoing studies.

FY18 Activities: Work will continue at the AJ and Yuma Cove backwaters but will cease at the Dandy backwater due to the sporadic nature of reproduction there. Points of focus will continue to be the effects of stocking density on reproductive success at the AJ backwater and relative survival of males versus females in all ponds. The latter is critically important, as biases in sex ratio will reduce the effective number of breeders, impacting the amount of genetic variation that can be maintained in these ponds.

In FY18, single nucleotide polymorphic (SNP) markers will be used instead of microsatellites. Because of the large number of SNP loci assayed, it is expected that this approach will provide considerably more power in estimating maternity and paternity in ponds where recruits are now reproducing.

Genetic assessment of native fishes will continue at the Imperial Ponds Conservation Area in FY18. All adults stocked into these ponds have already been genotyped, and parentage analyses will be conducted for a subset of larvae and juvenile fish from all ponds with successful reproduction. Genetic samples will also be collected from Pond 2 young-of-year fish so that these individuals can be included as potential parents in future parentage analyses.

Proposed FY19 Activities: This work task will be closed in FY18. Future genetic monitoring will be conducted under System Monitoring (Section D) or Post-Development Monitoring (Section F).

Pertinent Reports: A comprehensive report covering the 2010–2015 backwater genetics work for razorback suckers and the 2014–2016 reports titled *Genetic and Demographic Studies to Guide Conservation Management of Bonytail in Off-Channel Habitats* will be posted on the LCR MSCP Web site upon completion.

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

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$300,000	$169,883.43	$825,675.70	$0	$0	$0	$0

Contact: Carolyn Ronning, (702) 293-8106, cronning@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 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 gilded flickers, (2) observe how often gilded flickers are using riparian habitat for 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 by 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 gilded flickers are most likely to use riparian habitats within their range to improve the effectiveness of surveys and confirm their habitat characteristics. This study will help (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) define habitat use by gilded flickers 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 honey 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 FY13–16, a study was conducted to document the breeding chronology, seasonal movement and breeding home range size, and year-round habitat use of gilded flickers and to test existing methods to document species movements. Capture and radio telemetry tracking methods were tested, and information on the breeding chronology, behaviors and vocalizations during pair formation, nesting, and family group formations of gilded flickers was collected at an upland ephemeral wash study area that was selected south of Quartzsite, Arizona. Different year-round tracking techniques were employed to compare effectiveness and cost, including backpack and rectrix-mounted radio telemetry and global navigation satellite system (GNSS) locators; the GNSS locator tracking method was least successful. Techniques and equipment were studied for effectiveness on adult males and females as well as juveniles. To document the timing of the different breeding stages, active nest cavities were monitored on a regular basis until nestlings fledged. Juvenile habitat use, average home range size, and behavior while in family group formation were also studied. In FY16, exploratory surveys were conducted at 20 sites throughout the lower Colorado River and western Arizona to identify gilded flickers in riparian habitat.

FY17 Accomplishments: Exploratory surveys to locate gilded flickers continued at eight riparian areas in central and southern Arizona. Point count call-playback surveys were conducted at four of the riparian areas. The point count call-playback survey method detected gilded flickers and northern flickers. Gilded flickers were detected at only two of the eight riparian areas, three additional sites had northern flickers, and two sites had flickers that could not be identified to species. None of the birds were detected within the riparian vegetation; they were observed on the edges or in the adjacent upland Sonoran Desert habitat. Not all gilded and northern flickers responded to call-playback; therefore, more observation time and visits were added to the method to increase the opportunity to detect flicker movements in addition to vocalizations. All cavities observed in FY17 were in saguaros in the upland next to riparian areas. Behaviors observed were similar to those documented at the Quartzite study site.

Detectability and responsiveness of gilded flickers to the survey protocol in riparian vegetation could not be estimated due to the low sample size. Survey methods were refined and the natural history summary updated. It is still unknown if gilded flickers utilize riparian woodlands extensively. Their behavior and large home ranges make them difficult to detect without multiple days of searches in a row at a study area.

This work task was closed at the end of FY17. Monitoring gilded flickers will occur under Work Tasks D6 and F2 in the future.

Obligations were less than expected, as flooding made some sites inaccessible and labor costs were less than anticipated.

FY18 Activities: This work task was closed in FY17.

Proposed FY19 Activities: This work task was closed in FY17.

Pertinent Reports: The final report will be posted on the LCR MSCP Web site upon completion.

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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$100,000	$81,661.52	$637,118.37	$40,000	$0	$0	$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 juvenile flannelmouth sucker habitat selection and use 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 by 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 and < 350 millimeters 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%) 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 have been used for this telemetry work since FY13. Large numbers of telemetered fish (20–42) have been released annually with either sonic or radio tags. From FY13 to FY15, all fish were released in or near Laughlin Lagoon. Fish were detected in a mix of backwater and riverine habitats and remained concealed during daylight hours. In both riverine and backwater habitats, flannelmouth suckers were primarily associated with emergent vegetation. However, the 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.

Efforts in FY16 shifted to 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 the river may serve as nursery habitat for the Reach 3 flannelmouth sucker population. Subadult flannelmouth sucker surrogates were again 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. An initial release of 10 radio- and 18 sonic-tagged fish into the Pulpit Rock backwater took place in early March. A second release into Trampas Wash included 2 radio- and 12 sonic-tagged fish in mid-April. Manual tracking and deployment of submersible ultrasonic receivers was initiated immediately following release of the fish to help determine their locations. Tracking and habitat data collections continued biweekly until late June. Sonic and radio tags were both effective in this lower stretch of the river. Habitat data were collected on four radio- and seven sonic-tagged fish. Active tracking and submersible ultrasonic receivers indicated that the majority of movements in channel and backwater habitats were at night, and fish would return to California or softstem bulrush stands during daylight hours.

FY17 Accomplishments: Manual tracking efforts were redirected to take place at night and into early morning. This change in methodology increased detections with fish that were using open water habitats at night. These fish were subsequently followed during crepuscular periods into their daytime habitats consisting of thick California or softstem bulrush stands adjacent to the river channel. Flannelmouth suckers are difficult to detect with sonic telemetry equipment in these daytime habitats, and nighttime tracking proved to be productive for the collection of habitat data. Movements were observed to be

relatively short and direct once fish chose to move to shoreline California or softstem bulrush habitat from the channel. Often flannelmouth suckers would return to their same daytime location after moving throughout the main channel habitats during the night.

FY18 Activities: Activities will be similar to those in FY17 but will be completed at a reduced level during the final study year. Manual tracking activities will take place from late night into early morning in an attempt to increase detections of flannelmouth suckers in open water habitats and track them to their daytime habitats, where they remain in cover throughout the day. A final report summarizing the entire Reach 3 flannelmouth sucker population will be completed.

Proposed FY19 Activities: This work task will be closed in FY18.

Pertinent Reports: A summary report of FY16–18 activities will be posted on the LCR MSCP Web site upon completion.

Work Task C59: Selenium Monitoring in Created Backwater and Marsh Habitats

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$160,000	$169,998.97	$207,720.00	$160,000	$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: BONY5, MRM2 (BLRA, CLRA, FLSU, and LEBI), MRM5 (BLRA, BONY, CLRA, FLSU, LEBI, and RASU), and RASU6

Location: Big Bend Conservation Area (BBCA), Hart Mine Marsh, Imperial Ponds Conservation Area (IPCA), and McAllister Lake

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 50-year 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 completed over a 1–2 year period. If initial levels of detected selenium are well below thresholds of concern, a long-term selenium monitoring plan may be developed that requires less sampling over time. If there is some concern regarding the initial levels of selenium, 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. A multi-year sampling protocol will be developed to provide 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, the IPCA, and McAllister Lake. Selenium monitoring was conducted in FY15 and FY16 with the collection of water, substrate, plankton, and whole-body fish samples from these sites. Analyses of water samples focused on determining concentrations of dissolved selenium, selenite, and selenate found within the water column. Analyses from the IPCA determined that the current levels of all three analytes are well below threshold water quality standards for fishes and wildlife. Similar results were observed at Hart Mine Marsh and McAllister Lake, with dissolved selenium concentrations below 0.4 microgram per liter (µg/L) and selenite and selenate concentrations below 0.1 µg/L. The BBCA had the highest reported concentration of dissolved selenium (1.2 µg/L), but selenite and selenate concentrations were similar to those found at Hart Mine Marsh (0.1 µg/L). Both of these concentrations are still below threshold water quality standards for fishes and wildlife. Analyses of sediment samples from all three sites reported total selenium concentrations as below detectable levels. Selenium concentrations at McAllister Lake were highest in sediment, plankton, and particularly in fish tissue samples, indicating a potential concern for accumulation. The selenium levels in McAllister Lake will need to be monitored into the future.

In addition to field work conducted in FY16, an Interagency Agreement with the U.S. Fish and Wildlife Service Arizona Ecological Services Field Office was also completed. This agreement will allow for continued selenium monitoring of created backwater and marsh habitat through FY21.

FY17 Accomplishments: Biannual sampling was conducted at all project sites in FY17. Whole body fish, invertebrates, periphyton, sediment, and water were collected at each site and analyzed. Water samples were below the detection limit of 0.00056 parts per million (ppm). This detection limit is well below the Environmental Protection Agency's (EPA) 2016 criterion for safe selenium concentrations for aquatic organisms. Sediment samples from the BBCA and

McAllister Lake were above the 4 ppm dry weight threshold for high-hazard toxicity in sediment. All other sediment samples were below the moderate toxicity threshold. A bluegill whole body sample collected at the BBCA had a selenium concentration of 13.6 ppm dry weight, which is above the 8.5 ppm selenium concentration EPA criterion and above the high-hazard threshold for fishes. Mysid shrimp collected at the BBCA were above the high-hazard threshold for macroinvertebrates. All other invertebrate and fish samples had selenium concentrations lower than the EPA criterion and the moderate threat level threshold.

FY18 Activities: Selenium monitoring will continue with quarterly sampling events at the BBCA, Hart Mine Marsh, the IPCA, and McAllister Lake. Laboratory analyses of the full sample suite will be compared to selenium thresholds suggested by the U.S. Fish and Wildlife Service for aquatic species, and quarterly activity reports will summarize data as they become available. An annual report will be prepared following receipt of all laboratory analyses.

Proposed FY19 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 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, numbers of samples, and expected level of effort.

Pertinent Reports: The annual report titled *Selenium Monitoring in LCR MSCP Created Backwater and Marsh Habitat, 2017* will be posted on the LCR MSCP Web site upon completion.

Work Task C60: Habitat Manipulation

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$175,000	$230,860.93	$239,770.48	$175,000	$175,000	$175,000	$175,000

Contact: Jimmy Knowles, (702) 293-8172, jknowles@usbr.gov

Start Date: FY13

Expected Duration: FY26

Long-Term Goal: Develop cost-effective management techniques and determine the timing and extent of management actions necessary for ensuring that species-specific habitat characteristics are being maintained in all created habitats

Conservation Measures: BEVI1, BLRA1, BONY2, BONY5, CLRA1, CRCR2, ELOW1, FLSU1, GIFL1, GIWO1, LEBI1, MNSW2, MRM2 (BEVI, BLRA, CLRA, CRCR, ELOW, GIFL, GIWO, LEBI, MNSW, SUTA, VEFL, WIFL, WRBA, WYBA, YBCU, YHCR, and YWAR), RASU2, RASU6, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, YHCR2, and YWAR1

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 LCR MSCP habitat creation sites. The intent is to use the results of this research to appropriately manage the 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 (closed), F1, F2, F7, G3, and G4 are used.

Project Description: The LCR MSCP riparian habitat creation sites are planted and managed to reduce invasive species competition with native species and to provide habitat for covered avian species. In natural systems where periodic flooding is a component of the system, 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 vegetation. Over time, some of the LCR MSCP riparian habitat creation sites may grow or advance beyond suitable habitat for some covered species unless management actions are taken.

Without the disturbance events that were once more common in the historic Colorado 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 forest 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 riparian 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 50-year term of the LCR MSCP. The current literature suggests that management of the decadent dry material allows for new habitat to emerge.

The objectives of the riparian 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: A literature review was completed on riparian forest 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 using light detection and ranging (lidar) were investigated to assess structural diversity: (1) field-based methods (terrestrial laser scanning [TLS]) and (2) airborne-based methods (aerial laser scanning [ALS]). Both methods were used to identify vegetation strata and their relative heights at a site within a 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.). It was determined that for riparian forest analysis, ALS provided the necessary detail to evaluate structural diversity of the vegetation and topography. ALS does not provide adequate spatial resolution for evaluation of riparian marsh habitat analysis.

FY17 Accomplishments: Work continued for the riparian forest component of this work task, including collection of additional vegetation structure data (lidar) and soil moisture data. Lidar data were collected under Work Task F1 (Habitat Monitoring at Conservation Areas) at all LCR MSCP conservation areas (with the Fremont cottonwood-Goodding's willow [*Populus fremontii-Salix gooddingii*] [hereafter cottonwood-willow] land cover type) and at all known occupied southwestern willow flycatcher sites along the lower Colorado River. Lidar (F1) and soil moisture data (C60) were also collected at two southwestern willow flycatcher-occupied sites outside of the Lower Colorado River Basin: the Rockhouse Riparian Demonstration Project, located near Roosevelt Lake in Arizona, and three survey sites on the Middle Rio Grande River in New Mexico.

One of the marsh habitat manipulation techniques identified in the literature review was tested at Hart Mine Marsh in cooperation with the U.S. Fish and Wildlife Service. Mechanical disturbance was performed at Hart Mine Marsh, and baseline vegetation data were collected using unmanned aerial systems (UASs) equipped with multispectral and photographic sensors. The data from the sensors were used to create three-dimensional models of the vegetation to describe the structure and species composition. Based on the preliminary results of the study, the following observations were made:

1. Photogrammetric data collected using UASs provide a three-dimensional surface model of riparian marsh vegetation, but do not provide vegetation structure data beneath the canopy. This information is necessary to evaluate the structural diversity of the riparian marsh habitat.

2. The mechanical disturbance technique that was tested at Hart Mine Marsh was deemed inappropriate for the conditions present. The results have not been fully evaluated, but preliminary observations indicate that the technique did not cause sufficient ground disturbance and therefore did not reduce stem density or the amount of senescent vegetation.

Obligations were more than approved because funds were obligated during FY17 for work that will be completed in FY18.

FY18 Activities: The methods developed in FY16 to process and analyze ALS data to describe vegetation structure are being automated to facilitate future processing. Once the automated procedure is complete, ALS data collected at LCR MSCP conservation areas (with the cottonwood-willow land cover type) and southwestern willow flycatcher-occupied sites throughout the Southwestern United States will be processed and analyzed. The data from the southwestern willow flycatcher-occupied sites will be used to develop ranges for each of the vegetation metrics. A similar process will be used for evaluating soil moisture requirements; ranges will be developed using data from the southwestern willow flycatcher-occupied sites. LCR MSCP conservation areas will then be evaluated against these ranges to make recommendations on whether some level of habitat manipulation is warranted or not.

Vegetation structure data using photographic and multispectral sensors will be collected at Hart Mine Marsh to monitor the vegetation response from the mechanical disturbance that was performed in FY17. Additional monitoring techniques (UAS-mounted lidar) are being investigated to evaluate whether these techniques can penetrate the canopy and provide additional data on the vegetative structure of the riparian marsh vegetation. Additional marsh habitat manipulation techniques are being evaluated, and if appropriate, field tests will be planned and designed to evaluate their inclusion in the long-term marsh habitat manipulation toolbox.

Proposed FY19 Activities: ALS data will continue to be acquired in FY19 under Work Task F1 and will be processed and analyzed using the techniques developed in FY18 under this work task. Soil moisture data will also continue to be collected at southwestern willow flycatcher-occupied sites under this work task, while soil moisture data at LCR MSCP conservation areas will be collected under Work Task F1. The long-term monitoring under this research work task will help inform the LCR MSCP about the level of active habitat manipulation that is necessary. If habitat manipulation is deemed necessary, the Habitat Conservation Plan and the literature review conducted under this work task will be consulted to identify appropriate riparian forest habitat manipulation techniques. Initial planning and design will be conducted to implement habitat manipulation tests at select LCR MSCP conservation areas. The goal of these tests will be to evaluate techniques for inclusion in the long-term riparian forest habitat manipulation toolbox.

Vegetation response monitoring will continue at Hart Mine Marsh using data acquired with UASs. This monitoring will continue to inform the LCR MSCP on whether mechanical disturbance should continue to be included in the long-term marsh habitat manipulation toolbox and will also assist in evaluating whether these monitoring techniques are appropriate. Additional marsh habitat manipulation techniques will be evaluated, and if appropriate, field tests will be planned and designed to evaluate their inclusion in the long-term marsh habitat manipulation toolbox.

Pertinent Reports: The report titled *Integrating Terrestrial Laser Scanning* (*TLS*) *and Aerial Laser Scanning* (*ALS*) *to Describe Physiognomic Vegetation Structure in Riparian Forests* and *Options for Managing Emergent Wetlands as Marsh Bird Habitat along the Lower Colorado River* will be posted on the LCR MSCP Web site upon completion.

Work Task C61: Evaluation of Alternative Stocking Methods for Fish Augmentation

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$300,000	$38,271.69	$497,122.01	$300,000	$10,000	$10,000	$10,000

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

Start Date: FY14

Expected Duration: FY21

Long-Term Goal: Maintain the effectiveness of the LCR MSCP Fish Augmentation Program

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

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 that alternative stocking methods have on the 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 (both closed) 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. In FY16, documentation of soft release experiments was moved from Work Task C65 to Work Task C61. Because soft release research is essentially a type of stocking treatment and aims to assess long-term survival through recontact probabilities, it is more appropriately covered under Work Task C61.

Project Description: Extensive monitoring of Colorado River native fishes is a commitment of 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, fishes 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 fishes. To test the effectiveness of these alternate rearing treatments, stockings would be completed in paired groups and may include fishes 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 (closed) 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. A portion of FY14 funding was obligated to upgrade the electrical capabilities at the Lake Mead Fish Hatchery in preparation of future flow-conditioning efforts. This upgrade expanded the ability for controlled flow in ten 30-foot raceways. Monitoring data from flow-conditioned and static-reared cohorts will be analyzed to evaluate differential survival.

A total of 37,723 razorback suckers were repatriated into Lake Mohave during FY13–15 as 18 paired cohorts released in day and night stocking events. All efforts associated with these stocking events were captured under Work Task B2. Approximately 2.3% of FY13, < 1% of FY14, and 1% of FY15 releases had been captured or contacted through monitoring efforts by the end of FY16. While little overall difference in survival has been observed between day and night releases, approximately 62% of contacts from FY14 releases represent fishes stocked at night. Additional capture and contact data for FY13–15 cohorts will be obtained through future-year monitoring efforts and evaluated to determine the effectiveness or benefit of night stockings as compared to traditional day stocking events.

Trials to condition razorback suckers and bonytail to avoid predation at the Valle Vista Golf Course in Kingman, Arizona, that began in FY13 continued for FY14, FY15, and FY16. Funding for these trials included building and lining the experimental ponds at the golf course. Results from FY16 trials showed that survival was higher among bonytail that received three conditioning trials over bonytail that received one or zero conditioning trials.

Soft release treatments for razorback suckers were initiated in three backwaters within Topock Gorge of Reach 3 in FY16. These treatments consisted of fishes being released in paired cohorts of 400 to 600 fish. One cohort was released into a netted off portion of a selected backwater and held for 72 hours, and the other cohort was released directly into the backwater and allowed to disperse without restrictions. Telemetered fishes were released with each group, and remote passive integrated transponder (PIT) tag scanning was conducted to look at immediate dispersal. The relative survival rate will be evaluated after several years of contact data have been collected.

FY16 was the first of three study years in which the survival of razorback suckers stocked into Lake Mohave was compared using cohorts of different quantities. Approximately 7,000 razorback suckers were stocked at 4 locations over a 3-week period, with each location receiving a different-sized cohort of fish (250, 500, or 1,000) each week. The total number of razorback suckers stocked at each location was the same; however, cohort stockings were staggered so that no more than two locations received the same number of fish during any one week. Through the end of FY16, < 1% of these cohorts had been captured or contacted. Capture and contact data will continue to be analyzed as they become available through monitoring efforts.

FY17 Accomplishments: Razorback sucker capture and contact data collected through ongoing monitoring efforts were analyzed during FY17 to evaluate the results from previous year day/night paired releases in Lake Mohave. Through FY17, approximately 2.3% of FY13, < 1% of FY14, and 1% of FY15 releases had been captured or contacted through monitoring efforts. Monitoring data collected through Work Task D8 have demonstrated that stocked fishes are often not contacted for up to 3 years post-release. These cohorts will continue to be tracked through monitoring in future years, as it may require multiple years of data to evaluate this alternative stocking method.

Capture and contact data were also analyzed for fishes released in FY16 that will be used to evaluate the relationship between cohort stocking quantity and survival. Through the end of FY17, approximately 1% of stocked fishes had been captured or contacted, and little difference was observed between contact rates and cohort quantities. These cohorts will continue to be tracked in future years, and capture and contact data will continue to be analyzed as they become available through monitoring efforts. Due to the razorback sucker losses experienced at the Willow Beach National Fish Hatchery as a result of the

parasite Ich outbreak in in early FY17, additional stockings to evaluate comparative survival between cohorts of different quantities in Lake Mohave were postponed. No funding obligations were made toward this work in FY17. These treatments will be evaluated in future years as hatchery stocks are rebuilt and fishes become available.

Predator avoidance trials were ended at the Valle Vista Golf Course due to public tampering with the ponds. Data from these trials could not be used for analyses because of suspected fishing and confirmed stocking of additional largemouth bass into trial ponds. Experimental trials were moved to the Arizona Game and Fish Department Aquatic Research Conservation Center (ARCC) to provide a secure site for research to continue. Experiments to condition bonytail for predator recognition and avoidance began in late FY17. Delays in initiating these experiments resulted in reduced obligations in FY17.

Reach 3 soft release treatments for razorback suckers continued in FY17. Due to a lack of fish in the hatcheries, the cohorts for the paired releases were about one-half the numbers utilized in FY16. It was observed, based on scanner data, that dispersal from both the released and held cohorts was relatively swift at all three backwaters. Future monitoring of these cohorts as they mature and arrive on the spawning grounds will hopefully provide comparisons on survivorship of the individual treatments. Data will be collected through detections derived from PIT scanning recontacts.

Paired stockings of flow-conditioned and static-reared razorback suckers and bonytail were completed in late spring FY17. Approximately 1,200 razorback suckers released in Reach 4 and 50% of the 2,000 bonytail released in Reach 3 were flow conditioned prior to release. Capture and contact data for these cohorts will continue to be collected through ongoing monitoring.

FY18 Activities: The potential benefits of alternative stocking methods will continue to be analyzed using capture and contact data from fishes stocked during previous years. Paired stockings of flow-conditioned and static-reared native fishes will also continue.

Predator avoidance trials will continue at the ARCC. The first experimental trials are expected to be completed by early January 2018. Conditioning retention trials are expected to be completed by April/May 2018 and will be followed by artificial habitat structure selection trials. Results from this research will continue to be reported under this work task through FY21. Funds to support the research through FY21 were obligated in FY18.

Soft release treatments of razorback suckers will continue in order to assess the effect on long-term survival (probability of recontact) of fish that are held for 3 days in a netted off section of a selected backwater compared to fish released without being held. These soft releases should allow the fish time to recover and

acclimate following handling and transport stress associated with a release. This work will be accomplished using paired releases at three locations within Reach 3. Analyses of released fish will continue to be evaluated as these cohorts mature and become available for detection at known spawning sites.

Proposed FY19 Activities: This work task will be extended through FY21 in order to complete planned research at the ARCC. Funding in FY19 will cover administrative costs to manage prior year obligations.

Longer-term evaluation of these various stocking treatments will be conducted using data derived from PIT scanning recontacts. This recontact information will be acquired through the research and monitoring efforts conducted under Work Tasks C64 and D8 after FY18. Comparisons of relative recontact rates of treatment versus controlled fishes in paired releases will suggest the effectiveness of each treatment with respect to its ability to improve post-stocking survival of both razorback suckers and bonytail. Results from the predator avoidance research conducted at the ARCC will continue to be reported under this work task through FY20.

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

Work Task C62: Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$25,000	$12,554.37	$488,287.85	$0	$0	$0	$0

Contact: Barbara Raulston, (702) 293-8396, braulston@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: CRTO1, CRTO2, CRTO3, LLFR1, LLFR2, and LLFR3

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 both species in 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 planning 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 the 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 planning 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 Colorado River toads 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. Lowland leopard frog surveys began in FY15 along the Bill Williams River and the Big Sandy River within the Bill Williams River watershed and historical locations along the Agua Fria and Verde Rivers. Sufficient lowland leopard frog egg masses and breeding habitat data were collected in FY15, so further egg mass searches for this species were not required. Surveys for Colorado River toads were conducted from FY14 to FY16, with egg masses only found in FY14.

FY17 Accomplishments: The final report was completed and the work task closed. No field work was conducted in FY17.

After one season of field study, 62 lowland leopard frog egg mass oviposition sites were found. After three seasons of field study, the number of egg mass oviposition sites detected for Colorado River toads numbered only 14. No additional Colorado River toad egg masses were found in FY16; therefore, final data for both species is described in the 2015 Annual Report.

Lowland leopard frog breeding habitat was most likely to occur in sites with average canopy cover of 15.63%. Egg masses were found at an average distance to vegetation cover of 16.9 inches and were found either on the surface or at an average depth of 2.3 inches. The data suggest that suitable habitat characteristics include shallow water, an exit accessible by crawling (e.g., streambank or downed tree), and moderate canopy cover (i.e., willow trees).

Breeding for Colorado River toads is strongly correlated with summer monsoon rain events; they lay their eggs in areas where water pools. Colorado River toads lay long strings of eggs that can cover a very large area averaging 23 x 19 feet. Sites are very ephemeral; data on water depth or pH do not represent the moment of oviposition. Data analyses suggest that Colorado River toads select shallow water, averaging 0.42 inch, with no canopy cover for oviposition.

FY18 Activities: This work task was closed in FY17.

Proposed FY19 Activities: This work task was closed in FY17.

Pertinent Reports: The *Ecology and Breeding Habitat of Colorado River Toads – 2015 Annual Report* is posted on the LCR MSCP Web site.

Work Task C63: Evaluation of Habitat Features that May Influence Success of Razorback Suckers and Bonytail in Backwater Environments

FY17 Estimate	FY17 Actual Obligations	Cumulative Accomplishment Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$150,000	$141,661.66	$253,566.11	$150,000	$0	$0	$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 (closed) and C58 (closed). 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 fishes. Cover allows fishes to hide and

rest and can be vital to survival by allowing them 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 fishes 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 included 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.

A cavity preference trial was conducted in FY15 to assess if bonytail show a stronger affinity for a particular cavity size. Bonytail (100–150 millimeters [mm] total length [TL]) were exposed to artificial structures offering cavity openings of 50, 75, or 100 mm in diameter. Trial observations suggested a higher frequency in selection of the artificial structure with cavity openings of 50 mm in diameter (the smallest cavity opening offered). The hatchery noted that bonytail took about 30 days to get acclimated to the structure before entering. After acclimating, the hatchery observed the bonytail entering the structure and using it almost exclusively, venturing out rarely to feed.

Artificial habitat selection trials were conducted at Davis Cove to assess the selection of 100-mm drainage pipe by bonytail ranging in size from 241–345 mm TL. The results from 11 weeks of comparing scanning data from pipe habitat and no artificial habitat (control) suggest there was no difference in use. The diameter of the pipe used as artificial habitat may have been too small for the bonytail that were stocked into Davis Cove. Data collection ceased at Davis Cove when dissolved oxygen crashed to lethal levels in parts of the cove in the fall of FY16; therefore, additional data were not available to conduct analyses.

FY16 trials continued on February 10, 2016, when 328 passive integrated transponder (PIT)-tagged bonytail were stocked into Davis Cove. The mean TL and weight of the bonytail were 215 mm and 89 grams, respectively. Artificial habitat composed of polyvinyl chloride (PVC) frames, organic brush bundles, and integrated PIT scanners were paired with PVC frames containing only PIT scanners at four sites within Davis Cove prior to stocking. Scanning intervals lasted between 5 and 7 days and were completed three times between April 7 and May 26, 2016. Over the three scanning intervals, the number of razorback suckers and bonytail contacted was six and eight, respectively. These numbers suggested that the bonytail population had fallen to numbers too low to provide any habitat use data. Restocking Davis Cove at that time with PIT-tagged bonytail was not possible due high temperatures; therefore, habitat testing was moved to the Lake Mead Fish Hatchery.

On July 19, 2016, two bundles of drainage pipe with different pipe diameters, 75 and 100 mm, were placed in a raceway at the Lake Mead Fish Hatchery that contained about 450 bonytail measuring 300–340 mm TL. Each bundle consisted of 10 pipes measuring 1.5 meters long and contained no scanning equipment. The bundles were monitored visually over 2 months after deployment. Bonytail were noted to occupy the space under and around the pipe bundles, but only three were seen inside one of the pipes.

FY17 Accomplishments: Investigations of the selection and use of artificial structures at the Lake Mead Hatchery continued in FY17. Structures consisted of black rubber, 20-gallon garbage cans with 5 x 5-inch openings cut into the lids. On January 11, 2017, two garbage cans were weighted down and submerged in a raceway that held about 450 bonytail (> 305 mm TL). They were removed from the raceway on the day that the bonytail were stocked out of the hatchery (March 13, 2017). Bonytail were noted by hatchery staff to occupy the immediate area near and under the structures over the 2-month time period. Upon retrieving the structures from the raceway, seven bonytail were found inside of one and zero inside of the other. Large amounts of organic waste accumulated on and near the structures while they were deployed. It was decided not to deploy more structures in order to decrease stress on the bonytail within the other raceways.

Experimental trials were initiated at the Aquatic Research and Conservation Center at the Bubbling Ponds Fish Hatchery with the goal of improving

post-stocking survival of razorback suckers and bonytail. Research focused on conditioning fishes to recognize predators by exposing them to one or more conditioning events. Preliminary results suggest that survival of razorback suckers may be improved through multiple conditioning events; however, improved survival of bonytail was not observed.

FY18 Activities: Predator recognition conditioning trials will continue at the Aquatic Research and Conservation Center, and these results will impact how artificial structure selection trials will be performed in the future. Artificial habitat selection trials are expected to begin in summer 2018. Results from these experimental trials may inform future stocking site selection and/or suggest the use of artificial structures at future stocking sites to improve post-stocking survival.

Proposed FY19 Activities: This work task will be closed in FY18.

Pertinent Reports: A summary report will be posted on the MSCP Web site upon completion.

Work Task C64: Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail

FY17 Estimate	FY17 Actual Obligations	Cumulative Accomplishment Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$750,000	$452,557.00	$1,377,928.07	$750,000	$450,000	$450,000	$450,000

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 the 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 (closed), C45 (closed), and C49 (closed). The intent of this combination was to capture the 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 which may also build on information gained in Reach 1 through Work Tasks C13 (closed) and C57 (closed). Information collected under this work task will be added to the database used to complete Work Task D8. Information obtained from C8 (closed) and C61 will be used in this study. Funds from Work Task G3 were provided in FY14 to accomplish preliminary work in Reach 2, which were 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 fishes to identify dispersal and movement of individuals or groups. 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 fishes, 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. These 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.

Reach 2 (Lake Mohave): A sonic telemetry study was initiated in FY15 with the stocking of 19 adult razorback suckers into Lake Mohave. Razorback suckers were tracked monthly, and 25 submersible ultrasonic receivers were deployed, allowing for continuous surveillance throughout the year. Fish movements and habitat use were identified through analyses of active and passive contacts. In FY16, 39 sonic-tagged bonytail were released into Lake Mohave. Active tracking was conducted intensively for 3–6 weeks after release in an effort to maintain contact with these fish. Despite these intensive efforts, recontact rates remained low throughout the year. At the conclusion of the 9-month study period (battery life of the tags), only four fish were still considered active.

Reach 3: Habitat use by razorback suckers was studied in the lower Colorado River from Park Moabi downstream to the Lake Havasu delta. During the 5 years of trammel netting and 3 years of remote passive integrated transponder (PIT) scanning, both trammel nets and PIT scanners predominantly contacted recently released fish (< 3 years). Of the backwaters being monitored, the razorback sucker catch per unit effort for trammel nets and PIT scanners was on average

seven times higher in Park Moabi. Water quality (primarily temperature) and the composition of aquatic vegetation were identified as the greatest distinguishing factors in Park Moabi.

Bonytail survival, distribution, and habitat use have been assessed at three different locations: the Bill Williams River in fall 2014, Park Moabi in spring 2015, and Laughlin Lagoon in winter 2015. Information was obtained through the use of sonic telemetry and remote PIT scanning.

In Laughlin Lagoon, actively tracked bonytail were found associated with California or softstem bulrush habitats 15% of the time. This was the highest association with any habitat type for all actively tracked fish. PIT scanning indicated some level of survival in Laughlin Lagoon based on the detection of 13 bonytail that were stocked 3 months prior to the beginning of this study. Nevertheless, unique PIT tag detections from the first week to the second week dropped 30% at Laughlin Lagoon, compared to a 60% drop observed in Park Moabi and a 90% decline in detections recorded at other release sites based on similar scanning efforts at all locations.

Reaches 4 and 5: In FY16, monthly PIT tag scanning surveys scanned for a total of 9,675.3 hours and resulted in nearly 350 unique razorback sucker contacts and 46 unique bonytail contacts. Native fishes were scanned in nearly every backwater in the area and throughout the main channel. All of the bonytail originated from a single release on September 23, 2015; 29 were detected in October, 12 were detected in November, and then 5 more were detected through January. The majority of razorback suckers recontacted originated from three stocking events from April 2015 through February 2016. There were also 13 fish recontacted that were released prior to 2015, 10 of which were from 2007.

FY17 Accomplishments: Accomplishments for this work task have been summarized by river reach.

Reach 2 (Lake Mohave): Tracking of sonic-tagged razorback suckers released in FY15 continued through monthly monitoring trips. An additional 15 razorback suckers were implanted with 3-year sonic tags and released with 2 cohorts of 250 fish to allow for continued sonic surveillance through FY19. Passive and active tracking allowed for the identification of both large-scale movements and the use of specific spawning locations. 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 and through the spawning season.

An additional 20 sonic-tagged bonytail were released into Lake Mohave in January 2017 with a cohort of 684 PIT-tagged bonytail. Monitoring of these fish followed the same general format as previous stockings, with short-term intensive tracking followed by monthly tracking trips. Low recontact rates were observed

immediately following stockings. Only 3 of 20 fish were contacted via active or passive tracking 1 month after stockings. At the conclusion of this 9-month study period, 4 fish were confirmed as mortalities and 16 had an unknown status.

Reach 3: In January of 2017, 40 sonic-tagged razorback suckers were released into Topock Marsh and throughout the year. Office Cove was surveyed in March 2017, with 43 razorback suckers being contacted.

Reaches 4 and 5: In Reach 4, monthly PIT tag scanning surveys were conducted from October 2016 through September 2017. In Reach 5, PIT tag scanning was conducted in July and August. In total, remote PIT scanners scanned for 22,328.8 hours and resulted in 443 unique razorback sucker contacts and 279 unique bonytail contacts. Native fishes were contacted in nearly every backwater in the area and throughout the main channel. The majority of bonytail contacted (206 of 279) originated from a single release on March 20, 2017. From this release, 191 were detected in March only, 13 were detected through April, and 1 each was detected in May and June. One bonytail was at large for more than 1 year (released in A10 backwater in September 2015 and contacted in the same backwater in March 2017). The majority of razorback suckers contacted (314 of 443) originated from two stocking events, one in April 2015 and one in October 2016. PIT scanners detected 142 razorback suckers more than a year post-release, and all but three were released into the A10 backwater.

Acoustic telemetry was initiated downstream from Palo Verde Dam in December 2016. Subadult razorback suckers and bonytail (10 each species) were implanted with 60-day acoustic tags and released into the A10 upper backwater. Twelve submersible ultrasonic receivers were deployed throughout the reach prior to release of acoustic-tagged fishes and data were downloaded on a monthly basis to track dispersal. In January 2017, an additional 10 subadults of each species were implanted. The releases were split between the A10 lower backwater (five each species) and the A7 upper backwater (five each species). In February 2017, 13 adult razorback suckers were captured in the A10 upper backwater by electrofishing; 10 of these fish were implanted with long-term (36-month) acoustic tags, and all fish were released into the A10 lower backwater. Active tracking of acoustic-tagged fish was focused on tracking adult razorback sucker locations after release in February through the end of the field season in April. Most subadult razorback suckers and bonytail (16 razorback suckers and 17 bonytail) were never contacted alive outside their release backwater. Tracking of adult razorback suckers is ongoing.

The Colorado River downstream from Parker Dam was surveyed by electro-fishing in an effort to find spawning aggregates, but no native fish species were contacted. The Cibola High Levee Pond was surveyed for native fishes in March 2017, with 49 razorback suckers and 51 bonytail being contacted.

Obligations in FY17 were less than estimated for this work task, as additional research efforts scheduled for Reach 3 have been postponed until hatchery stocks at the Willow Beach National Fish Hatchery are rebuilt and additional rearing capacity is developed at other partner facilities. Rearing of additional fishes will allow for implementation of the increased stockings planned for Reaches 3–5. These stockings will double the number of fishes released each year over a 10-year period, and additional research activities will be scheduled concurrently.

FY18 Activities: Activities for this work task have been summarized by river reach.

Reach 2 (Lake Mohave): Sonic-tagged razorback suckers released in FY17 will continue to be tracked as part of this effort. This work can be performed concurrently with bonytail tracking 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.

Twenty bonytail will be obtained from the Lake Mead Fish Hatchery, implanted with 9-month sonic tags, and released into Lake Mohave. These fish will be stocked with a cohort of 500–1,000 fish. Intensive active tracking will be conducted immediately following stocking. Less intensive active tracking and continuous passive tracking will continue throughout FY18.

Reach 3: Regular monitoring of razorback suckers, bonytail, and flannelmouth suckers in Reach 3 will be covered under Work Task D8.

Razorback suckers will continue to be monitored in Topock Marsh. An electrofishing survey will be conducted in the Topock Gorge area to assess the flathead catfish presence. Beal Slough was electrofished in December 2017, with 22 adult razorback suckers being released into the adjacent main stem Colorado River as part of the fish augmentation effort. Beal Slough will be electrofished again in January – February 2018 in an effort to harvest more adult razorback suckers. In March – April 2018, sonic-tagged bonytail will be stocked into Topock Marsh, and their movements will be monitored. Another electrofishing survey targeting flathead catfish will be conducted sometime between March and May 2018.

Reaches 4 and 5: Monthly scanning surveys will continue in Reach 4 in an effort to increase recontact rates with stocked fishes and locate potential riverine spawning aggregates. Sonic telemetry of stocked razorback suckers and bonytail were initiated in early FY18. Scanning locations will be based on the distribution of the telemetered fishes. Additional adult razorback suckers will be captured from the river and implanted with sonic tags in order to aid in the detection of

spawning aggregates in the river. Scanning will be limited in Reach 5 unless the distribution of sonic-tagged fishes suggests that a substantial amount of stocked fishes are dispersing into this reach.

The Moovalya backwater will be surveyed for non-native fishes and stocked with 200–300 PIT-tagged razorback suckers, if suitable. It will be surveyed with remote PIT tag scanners monthly following the release of fishes.

Obligations in FY18 are expected to be less than the approved estimate due to the postponement of additional Reach 3 research activities.

Proposed FY19 Activities: Proposed activities for this work task have been summarized by river reach. Paired experimental releases of non-conditioned native fishes and those conditioned in predator avoidance experiments will be initiated at a location to be determined. Intensive research may also commence along with the increased yearly experimental stocking numbers of razorback suckers and bonytail in these reaches. These research efforts will be contingent upon development of hatchery rearing capacities sufficient to allow for the increased experimental stocking rates to commence. The proposed estimate will provide sufficient funding to support ongoing research as well as additional research associated with planned experimental stocking rates. However, should some research activities not be initiated, a correlating reduction in obligations will be expected.

Reach 2: Sonic-tagged razorback sucker monitoring will continue. Continued releases of sonic-tagged bonytail may also occur.

Reach 3: The monitoring of native fishes in Topock Marsh will continue in FY19.

Reach 4: Surveys and monitoring efforts will continue in FY19. All data will be used to inform managers of potentially favorable release locations and relative survival in Reach 4.

Reach 5: Surveys will be limited unless the distribution of sonic-tagged fishes from Reach 4 suggests that a substantial amount of stocked fishes are dispersing into this reach and forming spawning aggregates.

Pertinent Reports: Annual reports for the various ongoing studies under this work task 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

FY17 Estimate	FY17 Actual Obligations	Cumulative Accomplishment Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$120,000	$135,135.12	$179,187.51	$120,000	$0	$0	$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), C25, C46 (closed), and C61. Preliminary planning, acquisition of materials, and study design development occurred in FY14 with funds from Work Task G3. In FY16, documentation of soft release experiments was moved to Work Task C61. Because soft release research is essentially a type of stocking treatment and aims to assess long-term survival through recontact probabilities, it is more appropriately covered under Work Task C61.

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 they translate 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: The development of a bioenergetics model was initiated in FY14 under Work Task G3. The purpose of the model was to suggest the potential pressure that available piscivorous birds could exert on stocked fishes.

Latent mortality within the first 72 hours following stocking of razorback suckers in Reach 2 was evaluated in FY15. No mortality was observed in the first 72 hours of stocking within the subsample of fish that was held at the stocking location. Latent mortality trials were continued in FY16 with a modification to the original study protocol for simplified data analyses and to be consistent with the current literature's critical stress response period. The latent mortality holding period was reduced to three replicates for one 48-hour time period. Mortality (17%) was observed in one replicate; however, fish condition was noted to be poor at the time of harvest, so these mortalities may not be attributable to transport or stocking stress.

In FY15, efforts to document bird predation on native fishes using remote passive integrated transponder (PIT) tag scanners were initiated. 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 fishes were consumed by cormorants. Additional scanning beneath the known roost sites in the lagoon documented 23 stationary tags that are assumed to be from deceased fishes. These tags were from fishes which had been released throughout the LCR MSCP planning area, and some were from fishes released as early as 2003.

Scanning of known bird roosts immediately following stocking events continued in FY16. Continuous avian scanning for 10 days following a December 2015 release of bonytail resulted in the detection of 24 tags, which was 2.53% of the stocked fishes. Scanning following the May release of bonytail detected seven tags (1%) consumed by avian predators. Bird activity was noticeably different during the May trial, presumably due to local temperatures. Scanning in combination with game cameras from September through May confirmed predation by three species: osprey, cormorants, and great blue herons. This study confirms that bird predation on stocked fishes is occurring. Although the percentage of confirmed initial post-stocking predation appears low, sampling efforts are likely underrepresenting bird predation mortality. The bird roost scanners are limited in number and can only detect tags in birds that recently consumed fishes and who have landed on the roost scanners during that period. Evidence of bird predation on fishes from previous releases (roost-scanned PIT tags) suggests that bird predation may be continuous on stocked fishes. Additional longer-term scanning efforts will be necessary to suggest if continuous bird predation is occurring. These data will also help inform a bioenergetics model that will provide a more quantitative assessment of the potential magnitude and variability of bird predation on stocked fishes. A study plan was completed and includes post-release bird scanning directed at refining the parameters needed for bioenergetics modeling.

FY17 Accomplishments: Efforts in FY17 consisted of avian predation monitoring during the December 2016 and May 2017 bonytail stockings into Laughlin Lagoon. PIT scanners were placed on six roosts, outfitted with motion detection cameras to aid in avian species identification, and were allowed to scan for 10 days post-stocking. Following the December stocking event, 90 unique PIT tags (approximately 5% of stocked fish) were scanned at avian roosts. Motion detection cameras assisted in identification of avian predators, and of the 90 PIT tags scanned, 72 were associated with cormorants, 11 with great blue herons, and seven with an unknown avian predator (no image was captured). In May, temperatures were in excess of 38 degrees Celsius, and it was observed that cormorants were selecting marina docks for roosting as an alternative to roost poles. Therefore, four scanners were deployed on the edges of the existing marina docks, and two additional floating docks were equipped with scanners

and placed nearby. This provided additional monitoring in the event that avian species utilized dock areas when not roosting on pole-mounted scanners. Despite additional scanning efforts, no PIT tags from the 852 bonytail that were stocked in May were recorded on dock- or pole-mounted scanners. Scanners did, however, record five tags from previous stocking events; four of these tags came from bonytail stocked on April 4, 2017.

Avian predation monitoring was also initiated following the stocking of razorback suckers and bonytail at the Imperial Ponds Conservation Area. Pole-mounted scanners were deployed within each pond and allowed to operate for 10 days post-stocking. Avian point counts were also completed three times per day in conjunction with the scanning. No piscivorous birds were observed in or around the ponds during this time, and no tags were detected on the pole-mounted scanners following the 10-day survey.

FY18 Activities: Additional bird predation trials were conducted to refine the bioenergetics model. The December 2017 stocking event consisted of six roost-mounted scanners that were allowed to scan for 10 days post-stocking. It was noted that the recently stocked bonytail were seen in a large school near the release location 1 week post-stocking. It was also observed that the school of bonytail was intermixed with rainbow trout that had been recently stocked in the area. Striped bass and largemouth bass were observed actively predating fish from the school.

This work task will be closed in FY18.

Proposed FY19 Activities: This work task will be closed in FY18.

Pertinent Reports: A final project report for avian predation monitoring will be posted on the LCR MSCP Web site upon completion.

Work Task C66: Marsh Bird Water Depth Analysis

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$100,000	$43,378.83	$127,096.63	$20,000	$0	$0	$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 (BLRA, CLRA, and LEBI)

Location: LCR MSCP project area

Purpose: To identify the range of acceptable water depths in California black rail, western least bittern 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 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 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.

Previous Activities: Yuma clapper rail breeding data from 52 monitoring points and existing daily river gauge data collected from FY06 to FY14 in Topock Gorge and Topock Marsh were compiled and analyzed. Detections of Yuma clapper rails at each monitoring point during the three surveys conducted each year (known occupancy) were compared to the range of water depth fluctuation occurring during that monitoring period to determine whether presence of Yuma clapper rails was influenced by water level fluctuations in each survey period. The data were analyzed using occupancy modeling techniques in Program Presence (Version 9.0). Models were compared using Akaike's information criterion. The results did not support the hypothesis that the per-period levels of water fluctuation as recorded in Topock Gorge affect the presence of Yuma clapper rails, and nesting occurred each year with greater than 12-inch fluctuations in water depth. There is very strong evidence that detectability of Yuma clapper rails varies by year and survey period.

FY17 Accomplishments: A literature search for the California black rail was conducted across its entire range. Published literature was reviewed from the lower Colorado River (United States and Mexico), the San Francisco Bay area, and in Yuba County, California, where the Sierra Nevada foothills meet the Sacramento Valley. In the areas outside the United States portion of the lower Colorado River, there are much larger populations of this species, and the bird's use of water depths has been fairly well documented. In Yuba County, California, a population of California black rails use areas of irrigated, created marsh that can provide relevant, useful data for LCR MSCP creation and management of their habitat. The birds were detected at water depths averaging 0.83 inch. The researchers recommended shallow water, gently sloping landscapes, and variable water levels when managing created marsh for California black rails. The full summary of findings from all sources of information will be included in the FY17 annual report.

The Bureau of Reclamation also initiated a collaboration with ProNatura Noroeste to analyze California black rail data from the Ciénaga de Santa Clara in Mexico. This area has the largest population of the species on the lower Colorado River and will help better define the population parameters of this species in this region. This work will continue in FY 18.

FY18 Activities: The analysis of the data from the California black rail population in Mexico will be completed. 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.

Occupancy modeling for Yuma clapper rails that was completed in FY17 will be updated with data from a HEC-RAS model for Topock Gorge and Topock Marsh. The HEC-RAS model will allow water depths to be estimated at each survey point. This updated data analysis will create a more robust analysis for the Work Task C66 final report. The *Marsh Bird Water Depth Analysis Final Report* will be finalized.

Proposed FY19 Activities: This work task will be closed in FY18.

Pertinent Reports: The *Marsh Bird Water Depth Analysis 2016 Progress Report* is posted on the LCR MSCP Web site.

WORK TASKS – SECTION D

System Monitoring

Work Task D1: Marsh Bird Surveys

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$40,000	$37,432.99	$364,376.83	$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 (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 this work 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 helped to produce 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, using the multi-species protocol, will continue at designated survey points in order 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.

FY17 Accomplishments: Marsh bird surveys were conducted between the I-40 Bridge, near Needles, California, and Lake Havasu during March, April, and May 2017 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. All three covered species were encountered: 55 Yuma clapper rail detections in March, 81 in April, and 76 in May; 21 western least bittern detections in March, 28 in April, and 54 in May; and 1 California black rail detection in March, 0 in April, and 0 in May. Data were compiled and entered into the Avian Knowledge Network Database.

FY18 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 FY19 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 – 2015–2017* will be posted on the LCR MSCP Web site upon completion.

Work Task D2: Southwestern Willow Flycatcher Presence/Absence Surveys

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$750,000	$812,409.57	$9,367,975.99	$650,000	$200,000	$200,000	$200,000

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 (FY16–17) and system monitoring of southwestern willow flycatchers (FY18–55)

Conservation Measures: MRM1, MRM2, and MRM4 (WIFL)

Location: Reaches 1–7 along the lower Colorado River (LCR), southern Nevada, 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 on the Havasu National Wildlife Refuge, 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. Monitoring of southwestern willow flycatchers will be split into separate work tasks beginning in FY18, with system-wide monitoring continuing under this work task and post-development monitoring conducted under Work Task F9.

Project Description: Presence surveys are conducted along the LCR from the Southerly International Boundary with Mexico to southern Nevada, including the Virgin River between the Virgin River Gorge and Lake Mead, the Bill Williams River, and the 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.

FY17 Accomplishments: Presence surveys for southwestern willow flycatchers were conducted at 70 sites along the LCR and its tributaries in FY17, and life history studies were conducted at 38 sites. All LCR MSCP conservation areas with potential habitat were surveyed: the Beal Lake Conservation Area, the Cibola National Wildlife Refuge Unit #1 Conservation Area, the Cibola Valley Conservation Area, Hunters Hole, the Laguna Division Conservation Area, Planet Ranch, the Palo Verde Ecological Reserve, and Yuma East Wetlands (26 sites total). System-wide surveys were conducted at Alamo Lake, the Bill Williams River (Bill Williams River National Wildlife Refuge and Planet Ranch), Meadow Valley Wash, Muddy River, the Pahranagat NWR, the Warm Springs Natural Area, and Topock Marsh (44 sites total). Surveys were not conducted on the Virgin River due to safety concerns, so efforts were redirected for a fourth year to Alamo Lake, Arizona, to increase the amount of demographic data collected. Life history study activities included banding, nest monitoring, habitat threat analyses, and microclimate analyses.

A total of 161 southwestern willow flycatchers were detected at 18 of the 70 sites during presence surveys, and 98 territories were documented (table 1). Surveyors confirmed that southwestern willow flycatchers were resident or breeding at 18 of the sites (within 7 study areas): Alamo Lake, the Bill Williams River National Wildlife Refuge, Meadow Valley Wash, the Muddy River, the Pahranagat NWR, Topock Marsh, and the Warm Springs Natural Area (table 2).

Table 1.—Southwestern Willow Flycatcher Detections

Detection	Number
Total resident adults detected	**161**
New captures banded	19
Banded in previous year and recaptured in FY17	9
Banded in previous year and redetected, and identity confirmed but not recaptured	37
Bird band confirmed – bird identity unknown	6
Bird identity unknown but confirmed resident	90
Total territories	**98**
Number of confirmed breeding territories	80
Pair with no nest found	2
Unpaired individuals	16
Total nestlings banded	**44**

Table 2.—Study Areas Where Resident Adult Southwestern Willow Flycatchers were Observed

Study Area	Number of Residents
Alamo Lake	112
Bill Williams River National Wildlife Refuge	10
Meadow Valley Wash	9
Muddy River	3
Pahranagat National Wildlife Refuge	18
Topock Marsh	4
Warm Springs Natural Area	5
Total	**161**

Nest success was calculated for 92 southwestern willow flycatcher nests that contained flycatcher eggs (table 3). Depredation was the major cause of nest failure (44%). Brown-headed cowbird brood parasitism was observed in 6 (7%) of the 84 nests with known parasitism status.

Table 3.—Southwestern Willow Flycatcher Nest Success

Detection	Number of Nests
Nest successful and fledged young	51 (55%)
Nest failed	35 (38%)
Nest found empty (no indication of whether the young survived)	6 (7%)

Capture and redetections were compared between FY16 and FY17 at sites monitored in both years (table 4). The distance between yearly sightings for these southwestern willow flycatchers (adults and juveniles) ranged between 0.5 and 39.3 miles, with a median of 18.7 miles for adults and 5.8 miles for juveniles.

Table 4.—Southwestern Willow Flycatcher Captures and Redetections in FY17 of Birds from FY16 and Previous Years

Age	FY16	Detected Again in FY17	Detected in Different Study Area than Previous Year
Resident adults	65	29 (45%)	5 (8%)
Juveniles	48	11 (23%)	7 (47%)

In FY17, the LCR MSCP designed the monitoring plan for FY18–22.

FY18 Activities: Presence surveys for southwestern willow flycatchers will be conducted at all conservation areas with appropriate habitat: Topock Marsh, the Bill Williams River, and Alamo Lake. Nest monitoring will be conducted at Topock Marsh. The triennial surveys for southwestern willow flycatchers will be conducted at the sites below the Cibola National Wildlife Refuge to the Northern International Boundary with Mexico.

Proposed FY19 Activities: Presence surveys for southwestern willow flycatchers will be conducted at Topock Marsh, the Bill Williams River, and Alamo Lake. Nest monitoring will be conducted at Topock Marsh. Presence surveys at all conservation areas with appropriate habitat will be conducted under Work Task F9 beginning in FY19. Color banding of southwestern willow flycatchers will only occur at conservation areas where resident birds are confirmed to be present and will be conducted under Work Task F9 beginning in FY19.

Pertinent Reports: The 2017 annual report and the 5-year summary report will be posted on the LCR MSCP Web site upon completion.

Work Task D5: Monitoring Avian Productivity and Survivorship

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$250,000	$233,591.60	$3,319,923.22	$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 (BEVI, ELOW, GIFL, GIWO, SUTA, VEFL, WIFL, YBCU, and YWAR)

Location: Reach 3, Beal Lake Conservation Area (BLCA), Havasu National Wildlife Refuge, Arizona; and Reach 4, Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1).

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 National Wildlife Refuge, at the New South Dike, in mixed Fremont cottonwood-saltcedar habitats. These sites provided data from different reaches of the LCR 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 along the LCR has been conducted during different seasons since 2000 to provide information on habitat use by birds during the breeding and non-breeding seasons. Color banding target species such as Bell's vireos, 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.

FY17 Accomplishments: Banding was conducted at the BLCA and Cibola NWR Unit #1 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 151 captures at the BLCA and 146 captures at Cibola NWR Unit #1.

Three LCR MSCP species were captured and banded during the MAPS season. At the BLCA, one Bell's vireo was captured and color banded and one Gila woodpecker (*Melanerpes uropygialis*) was captured and banded with only a Federal band, as it was too large for the color bands available. There were two Gila woodpeckers and one yellow warbler captured and color banded at Cibola NWR Unit #1.

Two yellow warblers were recaptured at the BLCA; their initial captures were in 2015 and 2016. There were three summer tanagers recaptured at the BLCA – a pair from 2016 and one male from 2011. A Bell's vireo originally banded in 2014 was resighted at the BLCA.

At Cibola NWR Unit #1, a male blue grosbeak banded in 2010 and an Abert's towhee banded in 2009 were recaptured. The recapture of the Abert's towhee was submitted to the U.S. Geological Survey Bird Banding Laboratory, and it was determined it was the oldest Abert's towhee on record.

FY18 Activities: MAPS banding stations will continue to operate at the BLCA and Cibola NWR Unit #1 during the FY18 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. An evaluation will be conducted 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 FY19 Activities: Breeding season monitoring will continue in FY19 based on the recommendations from the project evaluation.

Pertinent Reports: The *2017 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

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$480,000	$21,818.80	$2,635,887.80	$480,000	$500,000	$500,000	$500,000

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 (BEVI, ELOW, GIWO, SUTA, VEFL, GIFL, and YWAR)

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 improve the survey methods for monitoring elf owl and gilded flicker breeding populations within the LCR MSCP planning 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 vireos, elf owls, Gila woodpeckers, gilded flickers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers. 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. Gilded flickers will be monitored separately during the height of their breeding activity using a similar protocol as the other species and incorporating call-playback. 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: 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 from FY05 to FY06 and a double sampling rapid/intensive area search protocol from FY07 to FY15. Surveys were conducted in the riparian habitat of the lower Colorado and Bill Williams Rivers. The surveys from FY07 to FY15 estimated that Arizona Bell's vireos and Sonoran yellow warblers were the LCR MSCP covered bird species with the largest population sizes within the study area, summer tanagers and Gila woodpeckers were present within the study area in lesser numbers, and vermilion flycatchers and gilded flickers were rarely detected. Gilded flickers were only detected breeding along the Bill Williams River east of Planet Ranch. An evaluation of the survey protocol for gilded flickers was initiated under Work Task C52 to improve the survey method for this species.

Elf owls were monitored separately during the breeding season from FY08 to FY10. Only one elf owl was detected near Blankenship Bend during that 3-year period.

Monitoring methods have been regularly reviewed and improved since FY06 to increase detection of Arizona Bell's vireos, elf owls, Gila woodpeckers, gilded flickers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers:

- Two weeks were added to the beginning of the field season to more accurately estimate the population of early-nesting species.

- The number of intensive area searches was analyzed to ensure the method was achieving a sufficient census of breeding territories.

- Life history information was gathered for many of the riparian species in the project area, including more accurate arrival and departure times for migrants, unique calls and songs not previously documented, information about second clutches and renesting attempts, and information about territory sizes.

- The statistical analysis was improved.
- Field crew training was improved.
- Some processes, such as data entry and analyses, were automated.
- An evaluation of the survey protocol for gilded flickers was initiated under Work Task C52 to improve the survey method for this species.
- An evaluation of the protocol was initiated under Work Tasks C24 and C36 (closed) to improve the survey methods for this species.
- An evaluation of the monitoring protocol was initiated in FY16 to update the monitoring questions, update the vegetation layer used to define survey plots, and ensure that the size and number of plots is sufficient to address the monitoring questions.

FY17 Accomplishments: Data and record management activities continued, and the 2011–2015 summary report was finalized. The monitoring protocol evaluation tasks were defined and work began on updating the vegetation map used to define survey plots, as vegetation has changed. A method for entering data in the field using a new mobile electronic field form platform was implemented. Completion of the evaluation was delayed, as extensive changes to the vegetation layer won't be completed until FY18, and plot analysis can't begin until the vegetation layer is available.

No system-wide surveys were conducted in FY17, which resulted in substantially less obligations than estimated in the FY17 work plan.

FY18 Activities: Data and record management activities will continue. System-wide surveys for gilded flickers will be conducted using the point count call-playback method developed under Work Task C52. The monitoring protocol evaluation will continue, including verifying goals and objectives, updating the vegetation map and the associated survey plots, and analyzing existing data to verify the number of plots to survey annually in order to detect presence of territorial nesting riparian birds and measure their population trends. Once complete, a 10-year monitoring plan will be prepared as well as updated survey protocols and training materials. Refinement of the mobile electronic field form platform will continue. System-wide surveys for elf owls, summer tanagers, Gila woodpeckers, Sonoran yellow warblers, Arizona Bell's vireos, and vermilion flycatchers will not be conducted in FY18.

Proposed FY19 Activities: System-wide monitoring will resume in FY19 for summer tanagers, Gila woodpeckers, Sonoran yellow warblers, vermilion flycatchers, and Arizona Bell's vireos using the double sampling rapid/intensive

area search protocol. System-wide surveys for the gilded flickers will be conducted using the point count call-playback method developed under Work Task C52.

Pertinent Reports: The *Lower Colorado River Riparian Bird Surveys, 2015 Annual Report* is posted on the LCR MSCP Web site. The *Lower Colorado River Riparian Bird Surveys, Summary Report, 2011–2015* will be posted upon completion.

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

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	F209 Proposed Estimate	FY21 Proposed Estimate
$650,000	$621,507.82	$6,777,978.78	$50,000	$50,000	$50,000	$50,000

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 (FY06–17) and system-wide monitoring for yellow-billed cuckoos (FY18–55)

Conservation Measures: MRM1 and MRM2 (YBCU)

Location: Protocol-level surveys are conducted in suitable habitat within the LCR MSCP planning area

Purpose: To conduct system-wide surveys to monitor yellow-billed cuckoo populations along the lower Colorado River from the Grand Canyon to the Southerly International Boundary with Mexico.

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. Monitoring of yellow-billed cuckoos will be split into separate work tasks beginning in FY18, with system-wide monitoring continuing under Work Task D7 and post-development monitoring conducted under Work Task F10.

Project Description: Yellow-billed cuckoos use Fremont cottonwood-Goodding's willow (hereafter 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 system-wide sites (not conservation areas) consisting of cottonwood-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 by 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 lower Colorado River. 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 this species. Confirmed breeding of yellow-billed cuckoos has been documented at the Palo Verde Ecological Reserve every year beginning in 2009, with nesting activity documented late into September. Nesting has also been confirmed at the Cibola Valley Conservation Area (2008–14 and 2016), the Cibola National Wildlife Refuge Unit #1 Conservation Area (2010–12 and 2014–17), and at the Beal Lake Conservation Area (2010, 2011, 2013, and 2015). In FY16, the level of effort and scope of the project were reduced. Intensive nest monitoring and capture and banding of birds to document activities of specific individuals was not 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.

FY17 Accomplishments: Surveys were conducted at all LCR MSCP conservation areas with cottonwood-willow habitat. Birds banded in previous years were re-sighted incidentally to these activities. One bird previously fitted with tracking equipment was captured at PVER and the equipment was removed. Followup visits to determine breeding status were conducted at conservation areas where breeding has yet to be documented. The monitoring objectives were reviewed in light of the results from FY07 to FY16, and changes were made to focus the monitoring on informing habitat creation and management and on monitoring yellow-billed cuckoo occupancy at conservation areas. Therefore, system-wide areas were not monitored in FY17, as nesting continued to occur primarily on LCR MSCP conservation areas.

A total of 27 confirmed breeding territories, 21 nests and an additional 16 probable and 22 possible breeding territories were detected in FY17. There were 25 confirmed breeding territories and 19 nests at the Palo Verde Ecological Reserve (Phases 3–7) and 2 confirmed territories and 2 nests at the Cibola National Wildlife Refuge Unit #1 Conservation Area (Crane Roost and Hippy Fire).

In FY17, one of seven yellow-billed cuckoos captured and fitted with a global navigation satellite system (GNSS) locator in FY15 was recaptured. Additionally, three new adults and two other previously banded adults were captured during mist netting. The data from the single bird fitted with a GNSS locator in FY15 that was recaptured indicated only one fall stopover location, in Jalisco, Mexico, due to failure of the GNSS locator. These data, combined with data from three other birds tracked previously, support a fall migration route for this population

following the west coasts of Mexico and Central America. The data lend support for wintering grounds for this population in the Gran Chaco region of northern Argentina and southern Bolivia.

FY18 Activities: System-wide surveys will be conducted on the Bill Williams River. Surveys at conservation areas will be conducted under Work Task F10. A 10-year monitoring plan will be developed to document yellow-billed cuckoo presence along the lower Colorado River to provide activity and nesting location data that can be used in association with habitat monitoring (F1). System-wide monitoring detections will be used with data from Work Task F1 to identify and refine the characteristics of suitable habitat, which will inform the adaptive management program. A sampled design or rotating schedule will be considered to reduce annual costs.

Proposed FY19 Activities: System-wide surveys are not scheduled in FY19, as nesting continues to occur primarily on LCR MSCP conservation areas (F10). Habitat conditions within the Bill Williams River National Wildlife Refuge and Topock Marsh will be assessed. Surveys to address needs identified in the 10-year monitoring plan could resume if habitat conditions improve.

Pertinent Reports: The *Yellow-billed Cuckoo Surveys on the Lower Colorado River, 2016 Annual Report* is posted on the LCR MSCP Web site. The annual report for 2017 will be posted upon completion.

Work Task D8: Razorback Sucker and Bonytail Stock Assessment

FY17 Estimate	F17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$925,000	$940,176.70	$7,463,124.61	$925,000	$1,125,000	$1,125,000	$1,125,000

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: BONY5 and RASU6

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 acquired from work accomplished under Work Tasks C8 (closed), C12 (closed), C13 (closed), 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. The Bureau of 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.

FY17 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 the Boulder Basin, Virgin Basin, Temple Basin, Gregg Basin, and the Overton Arm. The LCR MSCP captured 209 fish representing 11 different species from the Virgin and Temple Basins. One flannelmouth sucker was captured during this effort.

Wild-born razorback sucker larvae collection 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 402 larvae were captured, with 120 larvae from Las Vegas Bay, 275 larvae from Echo Bay, and 7 larvae from the Muddy River/Virgin River inflow area. An additional 6 larvae were also collected in the Colorado River inflow area during subsequent sampling. The majority of larvae 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 FY17 field season. A small subset of larvae was taken to the Lake Mead Fish Hatchery for grow-out and future genetic analyses. These fish will be returned to the lake in future years.

Monitoring of the Lake Mead adult razorback sucker population also continued in FY17. Fourteen sonic-tagged fish were contacted and monitored throughout the year using active (manual tracking) and passive (stationary submersible ultrasonic receivers) telemetry. Sonic-tagged fish provided the general location of razorback sucker populations and 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 53 razorback suckers: 12 from Las Vegas Bay, 14 from Echo Bay, 15 from the Muddy River/Virgin River inflow, and 12 from the Colorado River inflow area. Of the 53 razorback suckers captured, 27 were recaptured fish. The remaining razorback suckers captured were untagged, presumed to be wild-spawned, and included six juvenile fish. Based on capture data, the razorback sucker population in Lake Mead was estimated at 421 individuals (95% confidence interval [CI] from 305 to 615) in FY17. Aging information was also obtained from 34 razorback suckers during the 2017 study year, bringing the total number of razorback suckers aged lake-wide to 588. The ages of wild razorback suckers captured from long-term monitoring areas in 2017 ranged from 2 to 14 years old.

Reach 2 (Lake Mohave): A total of 1,385 razorback suckers were successfully repatriated into Lake Mohave in FY17. A total of 684 bonytail were also released in Lake Mohave, 20 of which were sonic tagged as part of ongoing research being carried out under Work Task C64.

Annual razorback sucker roundups were conducted in December and March. During these efforts, 100 razorback suckers were captured using trammel nets. Ten additional razorback suckers were captured during April gill net surveys. Electrofishing surveys were conducted in the river section of Lake Mohave above the Willow Beach National Fish Hatchery in June, July, August, and September, resulting in the capture of 33 razorback suckers. The use of remote sensing, which was expanded in 2011 to include the lotic portion of Lake Mohave upstream of the Willow Beach National Fish Hatchery, 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 FY17, 71,434 remote-sensing PIT tag contacts were recorded throughout the lake. In the river section of Lake Mohave above the Willow Beach National Fish Hatchery, 10,393 hours of scan time resulted in 29,939 total contacts representing 2,182 unique PIT tags. In the basin section of Lake Mohave, an effort of 30,958 hours of scan time resulted in 41,056 contacts representing 1,770 unique PIT tags. Supplemental scanning was also conducted in other areas of the lake, with 13,499 hours of scan time resulting in 439 total contacts representing 111 unique PIT tags. After duplicate PIT tags contacted in multiple lake sections were removed from analyses, 3,707 unique fish were contacted in 54,850 hours of scan time during FY17. This is slightly higher than the 3,128 PIT tags contacted in 36,944 hours of scan time in 2016 and a 17.5% increase in unique contacts compared to those made in 2015 (3,059 PIT tags contacted in 23,008 hours of scan time).

The razorback sucker population in Lake Mohave was estimated from two data sources in FY17: (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 FY17 field season, the repatriate population estimate for the basin section of Lake Mohave was 1,291 (95% CI from 531 to 3,436). Based on 2016–17 remote PIT scanning, the lake-wide Lake Mohave repatriate population was estimated at 3,815 individuals (95% CI from 3,573 to 4,073). Subpopulation estimates using zone-specific scanning were also calculated and estimated the basin (River Miles 13–29) population at 2,008 (95% CI from 1,848 to 2,181) and the river (River Mile 43–63) population at 2,213 (95% CI from 1,976 to 2,479).

Reach 3 (Lake Havasu): A total of 8,497 razorback suckers and 5,011 bonytail were released into Reach 3 during FY17; all fishes were released with a PIT tag.

Capture/contact data were acquired through Work Tasks C53, C65, 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.

All survey methods conducted in Reach 3 in FY17 resulted in 3,306 unique razorback suckers, 728 bonytail, and 12 flannelmouth sucker contacts. Reach 3 had a razorback sucker population estimate of 5,337 (95% CI from 5,043 to 5,633). This population continues to show growth, as it has increased by more than 500 fish over the last 3 years. Bonytail contacts are still rare in this reach and typically only occur for the first several months post-release; the increase in contacts this year was a result of the ongoing avian predation work being conducted in Laughlin Lagoon.

Reaches 4 and 5 (Parker Dam to Imperial Dam): A total of 6,519 razorback suckers and 6,687 bonytail were stocked into Reaches 4 and 5 during FY17; all fishes were released with a PIT tag.

Capture/contact data for Reaches 4 and 5 is obtained primarily through work being conducted under Work Task C64. Supplemental scanning and electrofishing is conducted in an effort to increase contacts and locate potential spawning aggregates.

In FY17, a total of 443 unique razorback suckers and 279 unique bonytail were captured/contacted. Electrofishing was conducted from Palo Verde Dam downstream to the C-10 backwater; however, no native fish aggregations were observed.

FY18 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 fishes, and active and passive tracking of sonic-tagged fishes.

Proposed FY19 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 50-year term of the LCR MSCP. An evaluation of the razorback sucker and bonytail sampling design will be initiated after receiving the results of the genetic review (Work Task G4). The continuation of genetic monitoring of native fish species will be accomplished under Work Task D8 following the closure of Work Task C31 and C40 in FY18. Additional funding is proposed for FY19–21 to support this continuing work.

Pertinent Reports: The *Razorback Sucker Studies on Lake Mead, Nevada and Arizona 2016–2017 Final Annual Report* and the *Demographics and Monitoring of Repatriated Razorback Sucker in Lake Mohave 2017–Annual Report* will be posted on the LCR MSCP Web site following review.

Work Task D9: System Monitoring of Covered Bat Species

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$140,000	$125,396.79	$2,337,352.30	$140,000	$100,000	$100,000	$100,000

Contact: Carrie Ronning, (702) 293-8106, cronning@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 in order to monitor distribution and evaluate habitat implementation success (FY04–17), and system-wide monitoring and species research will be conducted for LCR MSCP bat species in order to monitor their distribution (FY18–55).

Conservation Measures: MRM1 (CLNB, PTBB, WRBA, and WYBA), WRBA1, and WYBA1

Location: System-wide along the lower Colorado River (LCR) below Hoover Dam

Purpose: To conduct system-wide monitoring of covered bat species to document their habitat use

Connections with Other Work Tasks (Past and Future): System-wide monitoring data will be used in conjunction with post-development monitoring (F4) in order to document habitat use of covered bat species.

Project Description: Covered and evaluation bat species will be monitored along the LCR to document their presence and habitat use. 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 pale 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.

Presence was monitored using acoustic monitoring stations along the river from FY02 to FY16. Individual bats were captured from FY07 to FY16 using techniques such as mist netting to obtain reference calls for bat identification and to verify species' presence, reproductive status, and demographics along the LCR.

Surveys were conducted from FY02 to FY16 to identify pale Townsend's big-eared bat and California leaf-nosed bat roost sites along the LCR MSCP planning area (to fulfill conservation measures CLBN1 and PTBB1) and to learn more about the species' distribution and habitat. An inventory of all bats banded at mines and foraging habitat along the LCR from 1958 to 2016 was compiled.

A foraging distance study was conducted to further clarify the if habitat created within 5 miles of California leaf-nosed bat roosts (CLNB1) and within 10 miles of pale Townsend's big-eared bat roosts (PTBB1) could be used for foraging. Tracking showed that California leaf-nosed bat males fly at least 10.3 miles between roost and foraging areas, while females fly at least 8.7 miles. The maximum straight line distance that a pale Townsend's big-eared bat was tracked was 9.5 miles. Although distances were reported as straight lines, the total travel distance was often much longer, including one California leaf-nosed bat with a minimum travel distance of 50 miles in 4.5 hours and a pale Townsend's big-eared bat that was tracked for 10.8 miles.

FY17 Accomplishments: The five permanent acoustic monitoring stations were operated from June to August in order to detect bat presence. The stations were located at Havasu National Wildlife Refuge-Pintail Slough, the Bill Williams River National Wildlife Refuge, Cibola National Wildlife Refuge-Island Unit, the Picacho State Recreation Area, and the Mittry Lake Wildlife Area. Western red bats and California leaf-nosed bats were detected at all five acoustic monitoring stations. Western yellow bats were detected at four stations but not detected at the Bill Williams River National Wildlife Refuge. No pale Townsend's big-eared bat calls were recorded during FY17.

The analysis of acoustic monitoring data from FY16 was completed. Western red bats were detected at all five acoustic monitoring stations. Western yellow bats were detected at four stations but not detected at the Mittry Lake Wildlife Area. California leaf-nosed bats were detected at four stations but not detected at Havasu National Wildlife Refuge-Pintail Slough. No pale Townsend's big-eared bat calls were recorded during FY16.

Capture surveys were conducted at the ‘Ahakhav Tribal Preserve once a month from June to August. A total of 116 bats of 10 species were captured, including 1 Pale Townsend’s big-eared bat and 8 California leaf-nosed bats.

The final report was completed for the foraging distance study of pale Townsend’s big-eared and California leaf-nosed bats along the LCR. From these results, it is clear that California leaf-nosed bats are capable of flying more than 5 miles (CLNB1) between roost sites and foraging habitat provided by conservation areas (actually they can travel up to 10 miles) and that created habitat within 10 miles of pale Townsend’s big-eared bat roosts (PTBB1) can be used for foraging. Roost locations surveyed from FY02 to FY16 are within foraging distance of a number of conservation areas. Not all roosts are known. The acoustic and capture detections reported under Work Task F4 verify that the Beal Lake Conservation Area, the Cibola National Wildlife Refuge Unit #1 Conservation Area, the Cibola Valley Conservation Area, the Palo Verde Ecological Reserve, and Planet Ranch in Reaches 3–5, as well as Hunters Hole and Yuma East Wetlands in Reaches 6–7, support foraging California leaf-nosed bats and that the Beal Lake Conservation Area, the Cibola National Wildlife Refuge Unit #1 Conservation Area, the Cibola Valley Conservation Area, Planet Ranch, and the Palo Verde Ecological Reserve (Reaches 3–5) support foraging pale Townsend’s big-eared bats.

System-wide monitoring objectives were defined and a monitoring plan developed for FY18–28. Costs in FY17 decreased, as data collection for the California leaf-nosed bat and pale Townsend’s big-eared bat roost colony population estimates and foraging distance study ended. Data collection efforts shifted to monitoring additional conservation area acreage under post-development monitoring (F4).

FY18 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. Bat captures will be conducted to validate the presence of covered and evaluation species.

Standardization and consolidation of data and development of mobile electronic field forms for bat monitoring activities will continue.

Proposed FY19 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. Bat captures may be conducted to validate the presence of covered and evaluation species.

Pertinent Reports: The report titled *2016 System-Wide Acoustic Monitoring of LCR MSCP Bat Species* is posted on the LCR MSCP Web site. The 2017 reports will be posted upon completion.

Work Task D10: System Monitoring of Rodent Populations

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$40,000	$32,248.98	$288,928.41	$40,000	$40,000	$40,000	$40,000

Contact: Jeff Hill, (702) 293-8163, jhill@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: MRM1 (DPMO), MRM2 (DPMO, CRCR, and YHCR), CRCR1, and YHCR1

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 – closed) 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 along 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 planning area from FY11 to FY16 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.

FY17 Accomplishments: Rodent live trapping surveys were conducted within previously occupied locations to document the presence of Colorado River and Yuma hispid cotton rats. The areas surveyed included the Havasu National Wildlife Refuge outside of the Beal Lake Conservation Area, the Imperial National Wildlife Refuge outside the Imperial Ponds Conservation Area, and the Picacho State Recreation Area approximately 24 miles north of Yuma, Arizona. No cotton rats were captured at any system-wide monitoring sites. Four desert pocket mice were captured at the Havasu National Wildlife Refuge, but the subspecies was not determined.

System-wide monitoring objectives for FY17–27 were defined to determine the sampling design and level of effort.

FY18 Activities: System-wide surveys will be conducted to detect the presence of Colorado River and Yuma hispid cotton rats within selected areas that have potential habitat along the LCR outside LCR MSCP conservation areas. If potential habitat patches are discovered in areas that can inform LCR MSCP habitat creation, monitoring may be conducted to document Colorado River and Yuma hispid cotton rat presence.

Proposed FY19 Activities: Rodent presence surveys will be conducted to meet system-wide monitoring objectives throughout the LCR system.

Pertinent Reports: The report titled *Post-Development and System Monitoring of Rodent Populations*: *2015* is posted on the LCR MSCP Web site. The FY16 and FY17 reports will be posted upon completion.

Work Task D12: Lowland Leopard Frog and Colorado River Toad Surveys

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$35,000	$17,835.26	$486,256.04	$0	$0	$0	$0

Contact: Barbara Raulston, (702) 293-8396, braulston@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: CRTO1 and LLFR1

Location: Within Reaches 3–7 of the LCR MSCP planning area 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 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. No lowland leopard frogs were found at Planet Ranch, but six Colorado River toads 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 different survey methods: visual encounter surveys (VESs), VESs with an audio broadcast call/response component (VES C/Rs), funnel trap arrays, environmental deoxyribonucleic acid (eDNA) sampling, and digital automated recorder (DAR) recordings. Analyses to compare the detection rates of each survey method are ongoing. A cost-corrected detection probability was developed to account for both the amount of effort required to survey and the probability of detecting an animal. Based on those two criteria, the detection probability suggested that the VES C/R method was the most cost-effective method for detecting lowland leopard frogs. This method was also the most cost effective for detecting Colorado River toads, but other concerns, such as labor needs and equipment costs, will determine which method is the best for a given application.

FY17 Accomplishments: For lowland leopard frogs, the most cost-effective method for detecting presence was the VES method. Its low overall cost and high probability of detection make it an effective method for determining the presence of this species. In the trial implementation of this method, efficiency was increased by conducting VESs for shorter periods (30 minutes versus 2 hours) and adding a call/response component to the method. The final report was completed.

Results of this study indicate that for Colorado River toads, VES C/Rs and DAR recordings were the most cost-efficient methods of detection. A VES is still the preferred method when rain is not predicted and surveys must be conducted regardless of the weather. VES C/Rs and DAR recordings are only suitable for detecting Colorado River toads after a monsoon event (i.e., when toads are calling).

FY18 Activities: This work task was closed in FY17.

Proposed FY19 Activities: This work task was closed in FY17.

Pertinent Reports: The report titled *Development and Implementation of a Repeatable Monitoring Plan for Lowland Leopard Frogs and Colorado River Toads on the Lower Colorado River* is posted on the LCR MSCP Web site.

Work Task D14: System-Wide Monitoring of MacNeill's Sootywing Skippers

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$0	$0	$0	$0	$20,000	$20,000	$20,000

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

Start Date: FY19

Expected Duration: FY55

Long-Term Goal: System-wide monitoring for MacNeill's sootywing skippers (sootywings)

Conservation Measures: MNSW1 and MRM2 (MNSW)

Location: Existing habitat in Reaches 1–7, including conservation areas created in Reaches 5–7, which are not creditable under conservation measure MNSW2.

Purpose: To monitor vegetation, plant quality, and populations of sootywings in existing habitat along the lower Colorado River to document presence within the LCR MSCP planning area

Connections with Other Work Tasks (Past and Future): Habitat requirements were studied under Work Task C7 (closed) and Work Task F6. Sootywing presence at conservation areas and system-wide habitats were monitored under Work Task F6.

Project Description: Under this work task, the LCR MSCP will monitor for presence and habitat use of sootywings in existing habitat along the lower Colorado River

Previous Activities: This is a new start in FY19.

FY17 Accomplishments: This is a new start in FY19.

FY18 Activities: This is a new start in FY19.

Proposed FY19 Activities: Riparian areas with a quailbush component will be surveyed for the presence of sootywings. Presence surveys for sootywings will be conducted in potential habitat during March, April, May, and July. If sootywings are detected before the July survey, surveys in the remaining months will not be conducted.

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

WORK TASKS – SECTION E

Conservation Area Development and Management

Work Task E1: Beal Lake Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$250,000	$205,584.41	$4,359,323.11	$250,000	$900,000	$900,000	$750,000

Contact: Keith Hannon, (702) 293-8166, khannon@usbr.gov

Start Date: FY04

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, BONY2, CRCR2, ELOW1, GIFL1, GIWO1, MNSW2, NMGS1, RASU2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, and YWAR1

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 Section F work tasks. 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 the 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 by 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 119 acres of the Fremont cottonwood-Goodding's willow (hereafter cottonwood-willow) cover type. 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. This area includes both the 225-acre backwater and 119 acres of cottonwood-willow habitat, including a mosaic of cottonwood-willow, honey mesquite, and marsh.

In FY18, the U.S. Fish and Wildlife Service and LCR MSCP agreed to the expansion of the BLCA. The habitat creation concept includes expanding the existing conservation area by establishing approximately 300–400 acres of additional cottonwood-willow, honey mesquite, and marsh land cover types to be managed for LCR MSCP covered species.

Annual Maintenance and Management:

Riparian: Irrigation is provided to the riparian fields from March through mid-September using a diesel-powered pump and a series of alfalfa valves, which deliver water to individual cells. The system requires onsite personnel to fuel, start, and maintain the pump as well as to 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-powered 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 occur 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 have been installed to allow connection to or isolation of Beal Lake from Topock Marsh, require 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-powered pump.

Previous Activities:

Riparian: The riparian area has been irrigated and managed since 2001.

Beal Lake: Previous native fish stockings had maintained a population of approximately 100 razorback suckers. However, a fishkill was observed in February 2013 after a golden algae outbreak. There were no detections of any fishes while 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 (µS/cm) in FY14. Conductivity decreased to nearly 6,000 µS/cm after the lake was reconnected to Topock Marsh in FY15, and it has been maintained at approximately 2,200 µS/cm since FY16. 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.

FY17 Accomplishments:

Maintenance/Restoration/Management:

Cottonwood-Willow: In FY17, 1,101 acre-feet of water was delivered to the BLCA (119 acres). In February 2017, the 12-acre willow marsh was flood irrigated to manage salinity.

Beal Lake: A drawdown of Beal Lake was conducted in February 2017 using the existing pump stand, which eliminated the need to bring in a large portable pump, reducing obligations. During the drawdown, the four upstream wedge wire screens on the Beal Lake rock structure were removed, pressure washed, and reinstalled. The downstream cages, which were placed to exclude small mammals from the culverts in the rock structure, were also checked and cleaned. Removing the downstream screens and implementing the new maintenance strategy has resulted in a 1-foot increase in water surface elevation at Beal Lake.

Routine interior and levee road maintenance was conducted in June 2017.

Monitoring:

Cottonwood-Willow: Monitoring was conducted for vegetation, birds, bats, and rodents.

Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques.

Marsh bird surveys were conducted on three occasions at the wetland portions of the BLCA. Western least bitterns and Yuma clapper rails were detected and are presumed to be breeding at the site.

Riparian bird surveys were conducted mid-April 15 to mid-June 15 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 protocol was conducted from early May to early August. One Arizona Bell's vireo was captured and color banded. In addition, previously banded Arizona Bell's vireos, Sonoran yellow warblers, and summer tanagers were resighted and recaptured. 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. Yellow-billed cuckoos were detected, and breeding was possible.

Mist netting for bats occurred once per month in June and July. California leaf-nosed bats were captured. A long-term acoustic bat station was also used to detect the presence of LCR MSCP bat species from June to August. Western red bats, western yellow bats, and California leaf-nosed bats were detected at the BLCA.

Rodent trapping was conducted in fall and spring. No Colorado River cotton rats were captured, but desert pocket mice were captured (possibly the *sobrinus* subspecies based on range).

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 was maintained at appropriate levels through routine maintenance of the wedge wire screens. Results from zooplankton and phytoplankton sampling continue to show relatively low levels of plankton biomass. Golden algae were not detected in FY17 and have been absent from samples since May 2013. No fisheries activities were conducted at Beal Lake, as no native fishes have been stocked since the 2013 golden algae outbreak.

FY18 Activities:

Maintenance/Restoration/Management:

Cottonwood-Willow: Riparian fields will be irrigated from March through September. A Land Use Agreement for the expansion of the existing 434-acre BLCA to approximately 1,000 acres has been signed with the U.S. Fish and Wildlife Service. The habitat creation concept includes expanding the existing BLCA by establishing approximately 300–400 acres of additional cottonwood-willow, honey mesquite, and marsh land cover types to be managed for LCR MSCP covered species. This would include areas that can be flood irrigated as well as areas that would take advantage of the relatively high water table. Honey mesquite, in addition to cottonwood-willow areas planted in low densities, would typically only be irrigated until their roots can reach the water table. Cottonwood-willow areas planted in high density would typically be flood irrigated to create moist soil conditions for nesting birds.

Beal Lake: The annual removal, cleaning, and replacement of the wedge wire screens along the rock structure were conducted in Beal Lake's unlined ditch in January 2018. Permitting and environmental compliance for the proposed dredging of Beal Lake has begun. The dredging will help provide deeper areas within the lake for native fishes to seek thermal refuge and escape from predation. Approximately 400,000 cubic yards of material are to be dredged, and the location of the spoil piles is being coordinated with the Havasu National Wildlife Refuge.

Monitoring:

Cottonwood-Willow: Vegetation data will be collected using lidar remote sensing techniques. The salinity and soil moisture monitoring network will be expanded to this conservation area to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. Marsh bird surveys will be conducted in March, April, and May. General bird surveys will be conducted from April to June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Avian mist netting will be conducted from May to August. Bat acoustic monitoring will be conducted during summer. Rodent monitoring will be conducted in fall and spring.

Beal Lake: Monitoring activities at Beal Lake will be focused on water quality. Golden algae sampling will not be conducted in FY18, as no golden algae were detected during the previous 4 years of sampling (FY14–17). Sampling may resume following future native fish stockings. All native fish work at Beal Lake has been postponed until dredging is completed.

Proposed FY19 Activities:

Maintenance/Restoration/Management:

Cottonwood-Willow: Riparian fields will be irrigated from March through September. Permitting, design, and compliance to restore the expansion area is expected to be completed. Control of saltcedar in the recently burned portions of the expansion area may be conducted to reduce sprouting.

Beal Lake: Maintenance, cleaning, and rotation of the wedge wire screens within the unlined ditch are anticipated. Dredging is anticipated to take place in FY19 and FY20, moving 400,000 cubic yards out of Beal Lake. When completed, the dredging will deepen approximately 50 acres of the lake by 6 feet, with a goal of obtaining a depth of 12 feet. The dredge material will be placed on the identified pre-existing dredge spoil piles adjacent to Beal Lake.

Cottonwood-Willow: Vegetation data will be collected using lidar remote sensing techniques. The data collected from the expanded salinity and soil moisture monitoring network will be used to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. Marsh bird surveys will be conducted in March, April, and May. General bird surveys will be conducted from April to June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons. Avian mist netting will be conducted

from May to August. Bat capture surveys and acoustic monitoring will be conducted during summer. Rodent monitoring will be conducted in fall and spring.

Beal Lake: Water quality monitoring will continue. Native fish stockings may resume following the completion of dredging activities. Fisheries research projects will be identified and initiated as stockings resume.

Pertinent Reports: The *2017 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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$600,000	$488,325.18	$10,230,059.70	$600,000	$500,000	$500,000	$500,000

Contact: Andrea Finnegan, (702) 293-8203, afinnegan@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, CRCR2, ELOW1, GIFL1, GIWO1, MNSW2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, and YWAR1

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 and species monitoring are being addressed under Section C and Section F work tasks.

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 the 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 Fremont cottonwood-Goodding's willow (hereafter cottonwood-willow) and 78 acres of honey mesquite, which are both managed for LCR MSCP covered species.

Annual Maintenance and Management: A local farmer 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 and is done in conjunction with maintenance of the irrigation canals, gates, and roads.

The annual costs associated with operating the PVER 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.

Cottonwood-Willow: Water is ordered through and provided by the PVID. At the PVER, two pump platforms deliver water to individual phases through J and K Canals. 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 50-year term of the LCR MSCP.

Honey Mesquite: For honey mesquite, water is typically only used for establishment. Irrigation is reduced or concluded when the roots have reached the groundwater table.

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. The replacement of an existing pump with two 30-cubic-foot-per-second electric irrigation pumps, installation of delivery pipes and a pump stand, and an electrical upgrade were completed in January 2015.

FY17 Accomplishments:

Maintenance/Restoration/Management: The PVER is fully developed and has transitioned into maintenance and monitoring. Annual management and maintenance was conducted through the year as described above.

The methods used to report irrigation quantities at the PVER did not provide an accurate representation of water usage. The PVID will be providing water order data monthly to the LCR MSCP; using these data will increase the accuracy of water usage at each phase of the site.

Irrigation at the PVER was discontinued from November 2016 through January 2017 because the trees were dormant and irrigation was not needed for salinity management. This change brings the PVER in line with other conservation areas, as the PVER was the only conservation area that received irrigation during winter months. In addition to this winter outage, all checks planted with honey mesquite will no longer receive irrigation, as their roots have reached groundwater, unless future conditions dictate watering should be resumed. The exception is the honey mesquite habitat in Phase 8 where volunteer cottonwoods have become established. An irrigation management study plan will be developed to determine how cottonwood health and productivity will be affected by a gradual cessation of applied water.

Monitoring: Monitoring was conducted at the PVER for vegetation, birds, bats, and small mammals.

Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques.

Riparian bird surveys were conducted at the PVER from April 15 to June 15, 2017, using the LCR MSCP double sampling protocol. Sonoran yellow warblers, summer tanagers, and Arizona Bell's vireos were detected breeding at the site. There were no southwestern willow flycatchers detected during protocol level surveys. Yellow-billed cuckoo surveys were conducted between late June and early August. Yellow-billed cuckoos were detected in Phases 2–8, and nesting was confirmed in Phases 3–7.

Mist netting for bats occurred once per month in June, July, and August. Western red bats, western yellow bats, and California leaf-nosed bats were captured. Two long-term acoustic bat stations were also used to detect the presence of LCR MSCP bat species from June to August. Western red bats and western yellow bats were detected at both acoustic bat stations, and California leaf-nosed bats were only detected at the PVER 1 station.

Small mammal trapping was conducted in fall. Colorado River cotton rats were captured as well as one desert pocket mouse (subspecies not determined).

FY18 Activities:

Maintenance/Restoration/Management: Annual management and maintenance of the created habitat is ongoing. Irrigation and management of the PVER will continue on the same schedule until data become available that indicate adjustments are needed.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The salinity and soil moisture monitoring network will be expanded to this conservation area to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. 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. Surveys will also be conducted for MacNeill's sootywing skippers.

Proposed FY19 Activities:

Maintenance/Restoration/Management: Irrigation and management of the PVER will continue on the same schedule until data become available that indicate adjustments are needed.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The data collected from the expanded salinity and soil moisture monitoring network will be used to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. 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 monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Pertinent Reports: The *2017 Palo Verde Ecological Reserve Annual Report* will be posted on the LCR MSCP Web site upon completion.

Work Task E5: Cibola Valley Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$800,000	$436,085.32	$12,457,921.39	$850,000	$850,000	$600,000	$350,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, CRCR2, ELOW1, GIFL1, GIWO1, MNSW2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, and YWAR1

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 (CVIDD) were secured by 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 the CVCA's fee title and water entitlements. The acreage for LCR MSCP covered species is managed by 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). 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: Water is ordered through and provided by the CVIDD. A local farmer 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 CVCA. 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 CVIDD 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 and is done in conjunction with maintenance of the irrigation canals, gates, and roads.

The annual costs associated with operating the CVCA 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.

Fremont Cottonwood-Goodding's Willow (hereafter cottonwood-willow): 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 typically occurs from February through October and is expected throughout the 50-year term of the LCR MSCP.

Honey Mesquite: For honey mesquite, water is typically only used for establishment. Irrigation during establishment is done by creating deep furrows and planting only within the furrows. Typically, irrigation is concluded within 2 to 3 years, when the roots have reached the groundwater table.

Previous Activities: Through FY16, 853 acres of cottonwood-willow and honey mesquite have been established in Phases 1–8 and are being managed for LCR MSCP covered species.

FY17 Accomplishments: In the spring of FY17, Phase 9, consisting of 76 acres, was planted with a mix of cottonwood, willow, honey mesquite, and other riparian shrub and grass species. The trees for the FY18 planting of Phase 11 (193 acres) were purchased in FY17. Approximately 2,000 linear feet of irrigation canal was anticipated to be repaired in FY17, but these repairs were delayed, which resulted in lower than anticipated obligations.

Maintenance/Restoration/Management: Management, maintenance, irrigation, and monitoring of the established habitat continued. Established phases developed as cottonwood-willow (Phase 1, 2, and 3) continued to be irrigated. Irrigation on Phase 7 was discontinued in 2017. Phases 8 and 9 were irrigated using furrows in the honey mesquite planting and flood irrigation in the cottonwood-willow checks.

Minor repairs were completed on the irrigation canals within the CVCA; however, an inventory was completed, and a large portion of the canal that delivers water to Phase 3 was identified for replacement.

Monitoring: In 2017, monitoring was conducted at the CVCA for birds, bats, and small mammals.

Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques.

Riparian bird surveys were conducted at the CVCA from April 15 to June 15, 2017, using the LCR MSCP double sampling protocol. Three territories of Arizona Bell's vireos were recorded. 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. There were 17 detections, 1 probable breeding territory, and no confirmed nesting at the CVCA in 2017.

The CVCA was mist netted for bats once per month in June, July, and August. Western yellow bats, western red bats, and California leaf-nosed bats were captured. Two long-term acoustic bat stations were also used to detect the presence of LCR MSCP bat species from June to August. Western red bats and western yellow bats were detected at both acoustic bat stations, and California leaf-nosed bats and pale Townsend's big-eared bats were only detected at the CVCA 2 station.

Small mammal trapping was conducted in fall. Three Colorado River cotton rats and one desert pocket mouse (subspecies not determined) were captured.

FY18 Activities: Phase 11 will be planted with honey mesquite in late March or early April 2018. The Restoration Development and Monitoring Plan for the planting of Phases 10 and 11 was completed. The plants for Phase 10 (123 acres) will be ordered in FY18 to allow time for propagation, and the planting will take place in FY19. Replacement of 2,000 linear feet of the concrete-lined canal that delivers water to Phase 3 has been completed.

Maintenance/Restoration/Management: Regular management, maintenance, irrigation, and monitoring will continue. The cottonwood-willow land cover type within Phases 1, 2, 3, 8, and 9 will be irrigated; however, the areas planted with honey mesquite trees within Phase 8 will no longer receive water starting in 2018. Phase 11 will be watered regularly after planting is complete.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The salinity and soil moisture monitoring network will be expanded to this conservation area to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether

soil moisture and salinity conditions are adequate for sustained vegetation health. 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. Surveys will also be conducted for MacNeill's sootywing skippers.

Proposed FY19 Activities:

Maintenance/Restoration/Management: Regular management, maintenance, irrigation, and monitoring will continue. Irrigation will be provided to Phases 1, 2, 3, 8, and 9. Phase 10 (123 acres) planting will take place in FY19. Phase 10 is the final phase planned for planting at the CVCA.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The data collected from the expanded salinity and soil moisture monitoring network will be used to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. 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 monitoring will be conducted during summer. Small mammal monitoring will be conducted in fall and spring.

Pertinent Reports: The *2017 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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$250,000	$131,649.13	$7,312,979.80	$250,000	$250,000	$200,000	$200,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BLRA1, CLRA1, CRCR2, and LEBI1

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 marsh vegetation. The approach was to remove a substantial amount of existing saltcedar 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 management guidelines for integrating emergent vegetation and open water at varying depths into a mosaic of marsh habitats.

Annual Maintenance and Management of the Marsh: 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, Colorado River water can also be pumped and delivered either into 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 saltcedar, 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.

FY17 Accomplishments:

Maintenance/Restoration/Management: The majority of the activities that occurred in FY17 were for management, maintenance, and monitoring of the established marsh. No construction repairs or replacements were completed in FY17. This resulted in lower than estimated obligations.

Pump Stand Replacement: The pump stand is in a shallow section of the river, which has resulted in pump damage (sedimentation) and decreased pump efficiency (low suction head). To mitigate the negative impacts of shallow river conditions, a sediment transport and entrainment modeling study was completed to refine the new pump stand design.

A conceptual design for the pump stand replacement was completed; however, the replacement is not scheduled until FY19. Funding for replacement of the pump stand was provided by the U.S. Fish and Wildlife Service.

Monitoring: Monitoring was conducted at Hart Mine Marsh for vegetation and marsh birds.

Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques.

Vegetation treatments for control of cattails and other encroaching marsh vegetation species were tested using a Marsh Master in partnership with the U.S. Fish and Wildlife Service.

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.

FY18 Activities:

Maintenance/Restoration/Management: Management and monitoring of Hart Mine Marsh will continue. Vegetation maintenance will be reduced to an as-needed basis and will likely result in slightly lower obligations this year.

Pump Stand Replacement: The preliminary design, including addressing sediment intake at this site, will be completed. Materials necessary for the pump replacement will be acquired, allowing for installation of the pumps and construction of the pump stand to be completed in FY19 during winter when the river stage is low.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. Marsh bird surveys will be conducted March and April.

Proposed FY19 Activities:

Maintenance/Restoration/Management: Management and monitoring of Hart Mine Marsh will continue. No construction, restoration, or changes to marsh management are anticipated.

Pump Stand Replacement: Construction of the pump stand and installation of the pumps is expected to be complete. If funds provided by the U.S. Fish and Wildlife Service have been exhausted, the LCR MSCP will obligate funding to complete the project, which may result in higher obligations.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. Marsh bird surveys will be conducted in March and April.

Pertinent Reports: The *2017 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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$50,000	$24,709.69	$152,046.51	$400,000	$400,000	$50,000	$50,000

Contact: John Swatzell, (702) 293-8165, jswatzell@usbr.gov

Start Date: FY05 (closed in FY07; reopened in FY17)

Expected Duration: FY55

Long-Term Goal: Habitat management

Conservation Measures: BONY2 and RASU2

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

Purpose: To maintain a disconnected backwater for native fishes established under the 1997 Biological and Conference Opinion on Lower Colorado River Operations and Maintenance Activities

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 (BO). Continued maintenance and management obligations of McAllister Lake, as well as research and development of the backwater as native fish habitat, were subsumed by 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, including the design and construction of a pumping system to exchange water within the lake to manage salinity and other water quality parameters at levels suitable for supporting native fishes.

A pumping station would be placed on a constructed berm between McAllister Lake proper and the western lobe of the lake. The creation of this earthen berm 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 earthen berm would be localized deepening in these pump-out areas. These deeper areas may, in turn, provide a 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 reduce accumulation rates of selenium within the lake. It is anticipated that operating a pumping system at this remote location will likely require installation of either a solar- or diesel-powered pumping system. If the proposed pumping system is installed, the backwater would continue to be managed for native fishes.

If the proposed development is not implemented and the pumping system is not installed due to incompatibilities with Imperial NWR missions, the work task would be closed consistent with the March 16, 2016, letter titled "Closure of the 1997 Biological and Conference Opinion (BO) on the lower Colorado River Operations and Maintenance (as amended on April 30, 2002) Reasonable and Prudent Alternative Number 3 (RPA 3)," and all commitments under the 1997 BO will have been satisfied.

Previous Activities: The Bureau of Reclamation initiated a series of experimental pump tests during FY03 and FY04, which included dewatering 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 pumping and the consistency of the groundwater supply through the river aquifer. 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 in order 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 (μS/cm).

The 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. The suspension of activity allowed time for developing 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, 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 U.S. Fish and Wildlife Service's (USFWS) Environmental Contaminants Office. The levels of selenium were elevated in mosquitofish 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 Arizona 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 step-wise fashion in order to adequately consider the potential challenges of this site.

FY17 Accomplishments: The LCR MSCP met with the USFWS (Imperial NWR and Refuge Complex Managers as well as the USFWS Arizona Ecological Services Field Office) for approval of the conceptual design and selection of a pumping station. The above-mentioned parties agreed on the conceptual design but requested additional information prior to making a decision on a pumping station.

The LCR MSCP conceptually evaluated both solar- and diesel-powered pumping systems. The solar-powered pumping system would remove water at a lower rate over a longer period of time, whereas seasonal pumping with a diesel-powered pump would occur at a higher rate for a shorter period of time. Both systems would target a water exchange of about 62 acre-feet annually. During the FY03 and FY04 study, using a diesel-powered pump, this level of water exchange took about 49 hours. The solar-powered system would require 22 to 47 days to remove the same volume of water. There was concern that the longer pumping schedule may not yield similar results as the FY03 and FY04 high flow studies. The USFWS requested testing a low-rate system prior to making a decision.

In January, the conductivity was 16,000 µS/cm. A diesel-powered pumping system removed 64 acre-feet of water over 80 hours. Following the first dewatering, the lake recharged through groundwater percolation for 20 days. The second drawdown took about 60 hours to complete. The pumping reduced the

conductivity by about 10,000 µS/cm. Assistance from onsite staff from the Imperial National Wildlife Refuge resulted in obligations being less than anticipated.

FY18 Activities: Completion of an engineering design and shop drawings for the separation of the western lobe from the main body of McAllister Lake and installation of the pumping system is expected. Environmental compliance and permitting will be initiated once the design is complete.

A low-rate pumping system will be tested in FY18. A pump will operate at a pumping volume of about 1,200 gallons per minute between 6 to 8 hours per day for about 40 days to simulate pumping with a solar-powered system. Results will determine if a low- or high-exchange-rate pumping system or a combination of both is the best option at this site.

As a result of the second year of pumping, construction will be delayed; therefore, obligations will be less than approved. However, the overall cost to construct the pumping system has not changed.

Proposed FY19 Activities: Construction activities will begin upon completion of the dewatering study, environmental compliance, and permitting.

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

Work Task E14: Imperial Ponds Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$1,450,000	$496,526.61	$10,512,052.06	$1,450,000	$350,000	$350,000	$350,000

Contact: John Swatzell, (702) 293-8165, jswatzell@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, BLRA1, BONY2, CLRA1, ELOW1, GIFL1, GIWO1, LEBI1, RASU2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, and YWAR1

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 is being conducted under Work Task C25.

Project Description: The Imperial Ponds Conservation Area is an integrated mosaic of native land cover types, including disconnected backwaters, Fremont cottonwood-Goodding's willow (hereafter cottonwood-willow), and marsh. It is situated within the Martinez Lake Management Unit (previously identified as an Intensive Management Area) of the Imperial National Wildlife Refuge, an area of focused management for sensitive wildlife species, including native fishes, marsh birds, neotropical migratory birds, and migratory waterfowl. The marsh created within Field 18 and the cottonwood-willow to be created are mitigation for dredging of the Laguna Reservoir, which is an action covered under the LCR MSCP.

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 summer 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 disconnected backwaters: Two groundwater wells supply water to all six ponds. Each pond receives approximately 8.50 acre-feet per month, except during July through September, when the water volume increases to 17 acre-feet of water per month, for a total of 773 acre-feet for the year. Annual costs included those for electricity for the well, maintenance of the pumps and valves to direct water delivery, and boat ramp maintenance.

Cottonwood-Willow: Field leveling and irrigation system installation for the area were completed in FY08. Soil salinity 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 National Wildlife Refuge. This field was cleared in winter 2007–08 and was converted into a common and Olney's three-square 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 Yuma clapper rails and California black rails. 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 is received from a pump platform, which is located in the Martinez Lake inlet

channel. 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.

FY17 Accomplishments:

Maintenance/Restoration/Management: A hydraulic model for the existing irrigation system was created and presented to the Imperial NWR. Imperial NWR staff agreed to the recommended changes to the canal system, including replacement of almost 4,000 linear feet of concrete-lined canal. Obligations were less than approved this fiscal year to allow adequate time for the development of the model and discussions with the U.S. Fish and Wildlife Service.

A chain link fence was installed along the fire break to minimize access from the river to the conservation area. Buried electrical power was run to each pond. The power will allow for future automation of valves, installation of electronic flow meters, improved water quality monitoring, and automated passive integrated transponder tag scanning.

Disconnected Backwaters: All ponds were stocked with native fishes in FY17. Ponds 1, 3, and 4 were stocked with razorback suckers in December 2016, and Ponds 2, 5, and 6 were stocked with bonytail in March 2017.

Approximately 755 acre-feet of water was delivered to the ponds in FY17.

Cottonwood-Willow: 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.

Marsh: The 12-acre marsh created in Field 18 continued to be managed for marsh covered species.

Monitoring:

Disconnected Backwaters: Each pond was stocked with 300 adult, native fishes in an even ratio of males to females, and a tissue sample was collected from each fish to aid in genetic monitoring. Fisheries activities during FY17 included pond population monitoring via remote passive integrated transponder scanners, annual winter surveys using a variety of capture gear, and larval and young-of-year fish monitoring through spring and summer.

Water quality was monitored continuously throughout the year. Multi-parameter water quality probes were deployed to record temperature, pH, dissolved oxygen, and specific conductivity at 12-hour intervals. All water quality parameters remained within the ranges of acceptability for native fishes.

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 both surveys in April on Field 18, and California black rails were detected on Field 18 during the first survey in April. No covered marsh birds were detected at the ponds.

Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques.

FY18 Activities:

Maintenance/Restoration/Management: Onsite maintenance, utility payments, and water management for the site will continue. A request for proposal is anticipated to go out for bid and awarded for the replacement of the concrete-lined canal for delivery of water into the fields. The cost of replacement would be obligated using FY18 funds, but the replacement would not occur until FY19.

Disconnected Backwaters: Water will be supplied to the ponds following the water management schedule. Post-development monitoring is being completed under Work Task F5.

Cottonwood-Willow: The fields will be irrigated to manage salinity in the soils. Currently, 34 acres are scheduled for riparian restoration by the LCR MSCP. Discussions with the USFWS have indicated a desire to evaluate planting an additional 69 acres of riparian restoration on adjacent lands. Riparian restoration has been put on hold until options for the management these fields are evaluated. Management options include (1) complete conversion with cottonwood-willow by the LCR MSCP, (2) conversion to fields managed by the U.S. Fish and Wildlife Service for waterfowl and upland bird species, (3) creation of additional ponds by the LCR MSCP managed for native fishes, or (4) some combination of these options.

Marsh: The 12-acre marsh created in Field 18 will continue to be managed for marsh covered species.

Monitoring: Monitoring will continue in FY18 similar to previous efforts for fishes and marsh birds. Vegetation data will be collected using lidar remote sensing techniques.

Proposed FY19 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 is anticipated.

Disconnected Backwaters: Boat ramps and riprap shorelines will be maintained. The automated watering schedule for all six ponds will continue to be used.

Cottonwood-Willow: An evaluation of drainage options, crop production, and management of salt will be initiated for the fields available for riparian restoration.

Marsh: The 12-acre marsh created in Field 18 will continue to be managed for marsh covered species.

Monitoring: Monitoring will continue in FY19 similar to previous efforts for fishes and marsh birds. Vegetation data will be collected using lidar remote sensing techniques.

Pertinent Reports: The *2017 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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$700,000	$2,966,489.85	$5,403,846.89	$700,000	$200,000	$150,000	$100,000

Contact: Terry Murphy, (702) 293-8140, tmurphy@usbr.gov

Start Date: FY05

Expected Duration: FY21

Long-Term Goal: Habitat creation

Conservation Measures: BEVI1, BLRA1, BONY2, CLNB2, CLRA1, CRCR2, ELOW1, FLSU1, GIFL1, GIWO1, LEBI1, MNSW2, PTBB2, RASU2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, YHCR2, and YWAR1

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 inform the selection of future conservation area sites to be developed under Conservation Area Development and Management (Section E) work tasks. 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 for integration of multiple land cover types on a conservation area in which the primary purpose is the creation of a backwater.

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 into a long-term commitment for the 50-year 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 Office of Valuation Services. The cost of appraisal services is captured under the budget of this work task.

After new sites are evaluated and prioritized, Reclamation will get concurrence from the Steering Committee to go forward with the new conservation areas either through the site selection process or, if acquisition is required, through a land and water resolution. This approval allows Reclamation to move forward with the new site and prepare specific Restoration Development and Monitoring Plans that inform implementation of the conservation area.

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 FY16, 14 conservation areas have been established.

FY17 Accomplishments: Coordination with resource agencies and attendance at planning meetings was a similar effort to that of previous years. Obligations exceeded the approved estimate. The increase in obligations, as discussed and concurred with by the Steering Committee, was needed to acquire a dredge to complete the backwater creation requirement in a timely fashion.

Hydraulic Dredge: A 14-inch hydraulic cutter section dredge and support tender were acquired for $2.2 million. The dredge, with its 44-inch cutter head, is capable of digging as shallow as 5 feet and as deep as 20 feet, which is sufficient for creation of backwaters on the lower Colorado River. Delivery is scheduled for FY18, and the dredge will be put into service at the Mohave Valley Conservation Area.

Cadastral Surveys: A multi-year agreement with the Bureau of Land Management (BLM) cadastral survey team was signed to conduct record searches, complete administrative surveys, and complete official cadastral surveys as necessary to determine landownership for multiple parcels necessary to complete the backwater and marsh creation components of the program. FY17 funding was used to evaluate a location for a new backwater in Reach 3, which appeared to be on Reclamation withdrawn land. The area evaluated was within Township 8N, Range 23E, Section 26, San Bernardino Meridian within the State of California. At the conclusion of each investigation, the BLM provides a written summary to support the basis of the findings and a land status map demonstrating landowners within the subject area. The report and map are scheduled for delivery in FY18.

Yuma Meadows Conservation Area: A 433-acre parcel of land within the Laguna Division on Reclamation withdrawn lands in the State of California has been identified as an ideal candidate for the creation of backwaters. The property also contains an office and warehouse complex known as the Laguna Field Office. The site has a shallow water table, is currently closed to the public, and is managed by Reclamation. Preliminary investigations and the *Yuma Meadows Conservation Area Restoration Development and Monitoring Plan* were completed.

Proposed Conservation Areas:

Dennis Underwood Conservation Area: An agreement in principle has been reached with the landowner, the Metropolitan Water District of Southern California, to utilize up to 635 acres for development of Fremont cottonwood-Goodding's willow (hereafter cottonwood-willow) and honey mesquite). This conservation area is located south of Blythe, California, within the Palo Verde Irrigation District. Initial investigations included an evaluation of available soils data and a conceptual layout for restoration. The Federal appraisal began through the U.S. Department of the Interior's designated Office of Valuation Services. Simultaneously, an environmental assessment/negative declaration was drafted to satisfy both National Environmental Policy Act and California Environmental Quality Act requirements.

New Conservation Areas:

Palo Verde Ecological Reserve-South (*PVER-South*): PVER-South became a conservation area in FY17 and will be tracked under Work Task E37.

Three Fingers Lake: Three Fingers Lake became a conservation area in FY17 and will be tracked under Work Task E38.

Potential Conservation Areas:

Backwaters and Marsh Within Reach 4: Reach 4 has the highest potential for establishment of marshes and backwaters in California based on the needs of the LCR MSCP. An agreement was signed with the BLM cadastral team to determine the land status in Reach 4.

FY18 Activities: Coordination with resource agencies will continue.

Reach 3 Cadastral Surveys: The report and maps provided by the cadastral team indicate the area within Township 8N, Range 23E, Section 26, San Bernardino Meridian within the State of California is on Reclamation withdrawn land, and the surrounding land is managed by the BLM. The parcels appear to be large enough to create a 21-acre backwater, which would be located within the State of California. Based on these findings, additional investigation, such as obtaining topographic data, soil sampling, and installation of groundwater wells, will be initiated.

Reach 4 Cadastral Surveys: The BLM has initiated record searches for an area within Reach 4 that may be suitable for either a backwater or marsh complex. The task is to identify land status within Township 95, Range 22F, Sections 5, 7, and 8, San Bernardino Meridian within the State of California. The final report and map are scheduled for delivery in FY19.

Screening and Evaluation of Potential Conservation Areas, Step 1; Trip Reports. The LCR MSCP managers met with the U.S. Fish and Wildlife Service (USFWS) managers from the four national wildlife refuges located along the lower Colorado River and with staff from the USFWS Phoenix Ecological Services Field Office. Areas with the potential for restoration as a conservation area were discussed, and site visits were planned to evaluate their inclusion into the LCR MSCP as conservation areas. The site visits and trip reports, completed in December 2017, recommended expansion of two existing conservation areas and additional investigations at other conservation areas on the refuges.

Beal Lake Conservation Area Expansion: The habitat creation concept includes expanding the existing Beal Lake Conservation Area by establishing approximately 300–400 acres of additional cottonwood-willow, honey mesquite, and marsh land cover types to be managed for LCR MSCP covered species. This would include areas that can be flood irrigated as well as areas that would take advantage of the relatively high water table. Honey mesquite, in addition to cottonwood-willow areas planted in low densities, would typically only be irrigated until their roots can reach the water table. Cottonwood-willow areas planted in high density would typically be flood irrigated to create moist soil conditions for nesting birds.

Cibola National Wildlife Refuge Unit #1 Conservation Area Expansion: The habitat creation concept includes expanding the existing conservation area by establishing approximately 1,200 acres of additional cottonwood-willow, honey mesquite, and marsh land cover types on lands immediately south of the area. The restored acreage would include areas that can be flooded and areas that would utilize the water table after establishment. Honey mesquite, in addition to cottonwood-willow areas planted in low densities, would typically only be irrigated until their roots reach the water table. Cottonwood-willow areas planted in high density would typically be flood irrigated to create moist soil conditions for nesting birds.

Imperial Ponds Riparian Expansion: Currently, 34 acres are scheduled for riparian restoration by the LCR MSCP. Discussions with the USFWS have indicated a desire to evaluate planting an additional 69 acres of riparian restoration on adjacent lands. Riparian restoration has been put on hold until options for the management of the available 103 acres are evaluated. Management options include (1) complete conversion with cottonwood-willow

by the LCR MSCP; (2) conversion to fields managed by the USFWS for waterfowl and upland bird species, (3) creation of additional ponds by the LCR MSCP managed for native fishes, or (4) some combination of these options.

Proposed Conservation Areas:

Yuma Meadows Conservation Area: The Yuma Meadows Conservation Area is within the Laguna Division on Reclamation withdrawn lands. The property also contains an office and warehouse complex, known as the Laguna Field Office. The *Yuma Meadows Conservation Area Restoration Development and Monitoring Plan* was sent to the California Department of Fish and Wildlife for approval. Implementation of the conservation area will serve as partial fulfillment of the LCR MSCP's 360-acre backwater acreage goal. The project will create a series of disconnected backwaters, totaling of 123 acres, to be managed for native fishes, specifically bonytail and razorback suckers. Development of this site will satisfy partial fulfillment of both the LCR MSCP Habitat Conservation Plan habitat requirements and California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06. The conservation area will consist of three to four large disconnected backwaters (referred to as refugia ponds) ranging in size from 20 to 50 acres, totaling 111 acres, and smaller disconnected backwaters (referred to as grow-out ponds) ranging in size from 1–4 acres, totaling 12 acres. Both types of ponds are considered disconnected backwaters and, when completed, are expected to provide 123 acres of the backwater land cover type to the program. A Memorandum of Understanding was signed with Reclamation's Yuma Area Office to secure the property for LCR MSCP use.

FY19 Proposed Activities: Coordination efforts with resource agencies will be reduced as lands become available to the program for restoration. It is anticipated that all cadastral surveys will be completed and enough land will have been identified that this work task will likely close at the end of FY21.

Reach 4 Cadastral Surveys: The reports and maps on land status for areas identified as potential backwaters or marsh in Reach 4 are expected to be completed. Additional investigations may occur based on the findings of the report and needs of the program. The data collection for new marsh and backwater complexes normally includes the drilling and instrumentation of ground water wells, collection of digital elevation data, and soil sampling.

Refuge Trip Reports: As a result of the trip reports conducted in FY18, additional investigations, funded under Work Task E16, will occur at the Cibola and Imperial National Wildlife Refuges. The investigations are as follows:

Hart Mine Marsh Expansion: The habitat creation concept discussed includes establishing cottonwood-willow on abandoned agricultural fields at the southern end of Farm Unit #2, which abuts Hart Mine Marsh. The 175-acre complex would be cleared and contoured to allow for managed flooding from the existing

irrigation canal infrastructure. Although the addition of riparian habitat in the area would be beneficial, additional data collection and evaluation would be required before a final decision can be made. The water table in the immediate area is high, and soils are saline. An evaluation of drainage options, crop production, and management of salt will be initiated.

Imperial Ponds Expansion: An evaluation of drainage options, crop production, and management of salt will be initiated for the 103 acres available for riparian restoration.

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

Work Task E17: Topock Marsh Pumping

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$1,000	$0	$475,824.63	$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 Fire Break 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 had met its construction obligations under Avoidance and Minimization Measure 2 (AMM2).

At the 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 was required by the LCR MSCP to meet the commitments stated in AMM2 was received on July 2, 2012. Additional funding from the Habitat Maintenance Fund (HMF) will be required to complete the infrastructure improvements.

The USFWS concurred with the use of HMF and AMM2 funds for this purpose, and an agreement to move forward was formalized. Key components of the agreement included (1) all commitments under AMM2 will remain fulfilled, (2) all AMM2 funds will be expended prior to utilization of the HMF, and (3) prior to construction activities, the USFWS and the LCR MSCP will enter into an agreement to use the HMF that will detail the long-term roles and responsibilities of both agencies and marsh management objectives.

FY17 Accomplishments: An engineering and hydrological analysis was performed at Topock Marsh. The marsh can be filled by three methods depending on river stage. The primary water input is through Fire Break Canal, a concrete-lined canal that diverts water from the Colorado River at approximately River Mile (RM) 241. A small amount of water can also be diverted into the marsh through the Farm Ditch, an earthen canal located at approximately RM 238. Occasionally, water is delivered through the South Dike water control structure at RM 234. The capacity of all three delivery features was determined for various marsh water surface elevations. In addition, a Hydrologic Engineering Center's River Analysis System (HEC-RAS 5.0.1) model was created.

To reach the target water surface elevation within Topock Marsh by the start of marsh bird nesting season (March 15), the entire water diversion would have to be pumped from the river. Unfortunately, the river stage does not rise early enough in the year to support the use of gravity diversion to fill the marsh. This presents two challenges. First, pumping surface water to fill the marsh when the river stage is low is difficult, and sediment entrainment and damage to the pumps is a concern. Second, the high cost of filling a 3,000-acre marsh would become an annual cost (approximately $80,000), and there is no source of funding for the electrical expense after completion of the LCR MSCP. The analysis determined that the refuge does have a large enough water entitlement to fill the marsh by March 15 through pumping and then maintaining water elevations through gravity diversion.

FY18 Activities: Reclamation's Yuma Area Office built the original inlets and outlets to Topock Marsh and have some responsibilities for the continued operation in coordination with the USFWS. The Yuma Area Office presented the findings of the engineering and hydrological analysis to the USFWS at the Refuge, Complex, and Regional levels. The presentation summarized the results

of the analysis discussed above. There is no simple solution to this issue, and additional discussions and development of multiple engineering options are anticipated as a result of the meeting. The development of alternatives would be initiated but not completed until FY19. The engineering options would include changing the target maximum water surface elevation of the marsh, delaying the date past March 15, when the maximum water elevation is reached, and possibly alternate options to deliver water to the marsh. The USFWS and LCR MSCP have concurred that operational costs of the pump system could be funded through the HMF.

Proposed FY19 Activities: Engineering alternatives will be presented to the USFWS at the Refuge, Complex, and Regional levels. Given the technical issue of diverting a large volume of water during low river stage and the $80,000 annual operating cost, the USFWS will have to make a decision on the preferred system from the multiple scenarios developed.

Engineering design, permitting, and environmental compliance will be delayed until the final alternative is selected by the USFWS and concurrence is obtained by Reclamation's Yuma Area Office.

Pertinent Reports: N/A

Work Task E18: Law Enforcement and Fire Suppression

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$250,000	$212,393.13	$1,876,740.78	$200,000	$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 by 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 lower Colorado 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 inspection 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. These recommendations help identify high-risk areas, areas in need of fuel reduction, damage to infrastructure, and management of visitor use areas.

FY17 Accomplishments: Work with local fire and law agencies in support of the law and fire management activities continued in FY17. Activities included patrols, monitoring, planning, site visits, coordination meetings, and attendance at agency staff meetings.

In FY17, law enforcement activities included more than 200 patrols of LCR MSCP conservation areas.

Fire suppression efforts related to LCR MSCP conservation areas included responding to a fire near the Beal Lake Conservation Area. The fire occurred on July 9, 2017, and approximately 135 acres were burned; however, only a small portion of the fire encroached on the conservation area. The fire mainly burned adjacent saltcedar stands and caused to no damage to the conservation area. No replanting or additional restoration is required.

FY18 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.

The LCR MSCP is entering into a 5-year Interagency Agreement with the National Park Service's Exotic Plant Management Team to provide invasive plant species support and fuel load reduction at LCR MSCP conservation areas. The crews will respond as needed and have the flexibility to be able to work on any and all of the conservation areas. If large fuel reduction projects are identified, they will be funded under the appropriate conservation area work task.

Proposed FY19 Activities: BLM law and fire personnel will continue with proactive patrols similar to those in prior years. Work to renew the 5-year law and fire interagency agreements will begin in FY19. The National Park Service's Exotic Plant Management Team will begin providing invasive plant species removal and fuels reduction support. The obligations have been increased to account for the additional expense.

Pertinent Reports: N/A

Work Task E21: Planet Ranch

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$2,000,000	$689,679.10	$11,026,508.63	$3,000,000	$4,000,000	$4,000,000	$3,000,000

Contact: Jeremy Brooks, (702) 293-8257, jjbrooks@usbr.gov

Start Date: FY05 (closed in FY05; reopened in FY09)

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, BONY2, CLRA1, CRCR2, ELOW1, GIFL1, GIWO1, LEB1, MNSW2, RASU2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, YBCU2, and YWAR1

Location: Reach 3, Bill Williams River, 11 miles east of River Mile 190, Arizona

Purpose: To create and manage disconnected backwaters within 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.

Project Description: Planet Ranch, located on the Bill Williams River, was acquired 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 (Fremont cottonwood-Goodding's willow [hereafter cottonwood-willow], honey mesquite, marsh, and backwater) within the property boundary where feasible, (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 site will be called the Middle Bill Williams River NWR). The current restoration concept for active restoration includes disconnected backwaters for native fishes. These areas will be integrated into a mosaic with cottonwood-willow and honey mesquite. An additional 396 acres of cottonwood-willows downstream at the Middle Bill Williams River NWR will also be afforded protection by securing the Planet Ranch property and are also creditable to the LCR MSCP.

The conservation area includes the entire 3,418 acres of land. However, the ranch west of the main north/south access road (approximately 660 acres) and some acreage east of the main north/south access road, defined as reserved under the lease amendment, would be managed for LCR MSCP covered species.

The ranch east of the main north/south access road (approximately 2,758 acres) would not be managed for LCR MSCP covered species. These lands would be managed by the Arizona Game and Fish Department, with the exception of any lands shown as reserved for LCR MSCP purposes in the lease amendment.

A tentative schedule of activities 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) infrastructure improvements, pond construction, ground stabilization on farmed areas, and restoration of cottonwood-willow between FY18 and FY21. A Land Use Agreement will be developed to further define roles and responsibilities, including public access.

Previous Activities: Planet Ranch encompassed approximately 8,400 acres, of which approximately 2,400 acres had previously been farmed for alfalfa. In 2008, the 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 from the Freeport Minerals Corporation (FMC). Legislation directing the Secretary of the Interior to enter in an agreement for the acquisition of Planet Ranch was signed in December 2014. Program Decision Document 15-002, which allowed Reclamation to enter into a lease for the land and water, was approved by the Steering Committee on April 22, 2015. The sum of $8,300,000 to secure this land and water was determined through the Federal appraisal process. FMC retained ownership of lands on Planet Ranch that were not acquired by the Arizona Game and Fish Commission.

The Arizona Game and Fish Commission received title for the land and water rights through a donation from the FMC in December 2015. The lease between Reclamation and the FMC was transferred as part of the donation agreement.

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.

FY17 Accomplishments: To ensure the viability of water rights associated with the property, approximately 1,000 acres of alfalfa was grown as pasture from December 16, 2016, through December 15, 2017. Water use was tracked through

totalizing flow meters and, when combined with acreage being farmed, documents the beneficial use of water on the property. Water use and crop acreage were updated every 2 weeks. A contract farmer provided irrigation and site maintenance as well as an onsite presence. On December 15, 2017, the pumps were turned off after diverting 5,549 acre-feet of water onto the alfalfa.

Repairs to the irrigation system continued due to the age of the irrigation infrastructure and its limited use in the past decades. However, these repairs were less than expected, which decreased obligations. A backhoe and a skidsteer loader with auger attachments were purchased to support ranch operations.

To support restoration design decisions, detailed hydraulic and hydrologic reports were prepared. These reports included aerial photo analyses and geomorphic mapping, evaluation of historical groundwater data, development of a steady-state groundwater model, characterization of the Bill Williams River and tributaries to Planet Ranch, hydrologic modeling, development of a digital elevation model, scour analyses, recommendations for bank stabilization, slope stability analyses, and recommendations for pond liner materials.

Environmental compliance for the construction of the ponds and other restoration-related components was initiated, and a draft environmental assessment was drafted for internal review. Compliance activities included a Class III Pedestrian Survey of the areas to be restored. Until compliance is completed, construction activities will be limited and will result in obligations less than were approved.

The entrance gates along the main north-south access road through Planet Ranch were reopened to the public after 32 years of closure in January 2017; they provide a travel corridor between La Paz and Mohave Counties.

Monitoring:

Planet Ranch: Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques. No southwestern willow flycatchers were detected during five surveys conducted at one site on Planet Ranch in 2017. Surveys for yellow-billed cuckoos were not conducted. Both species were present prior to the purchase of Planet Ranch by the FMC. During pre-development surveys in 2017, breeding territories for Gila woodpeckers, vermilion flycatchers, Arizona Bell's vireos, and Sonoran yellow warblers were recorded. Summer tanagers were present, but breeding status was not determined. No other surveys for covered species were conducted.

Middle Bill Williams River NWR: Vegetation data were collected using lidar remote sensing techniques. There were no southwestern willow flycatchers or yellow-billed cuckoos detected during the surveys. General bird surveys resulted

in the detection of 22 species breeding within surveyed plots, including Arizona Bell's vireos, Gila woodpeckers, Sonoran yellow-warblers, and vermilion flycatchers.

FY18 Activities: Irrigation of the alfalfa ceased on December 15, 2017. The irrigation system will be dismantled. The groundwater wells used for irrigation of the alfalfa have received "lock-out/tag-out" protection, and the Arizona Game and Fish Department has been asked if they wish to excess or use the system on another property.

Existing Bill Williams River hydrologic models have been updated with new topographic and hydrologic information to provide the LCR MSCP with a tool to inform future management decisions for Planet Ranch. Releases from Alamo Dam are the responsibility of the U.S. Army Corps of Engineers. The topographic and hydrologic information was provided to the U.S. Army Corps of Engineers and the Bill Williams River Corridor Steering Committee. The model will allow for the assessment of both the current conditions as well as conditions after release and the benefits or drawbacks of those releases.

A Land Use Agreement between Reclamation and the Arizona Game and Fish Department has been drafted. A Restoration Development and Monitoring Plan, which would guide development of the conservation area, has been drafted.

A value planning study was completed on the draft restoration design concept. A value engineering study is also anticipated but is not expected until late FY18 or FY19. Compliance, including coverage for the northern Mexican gartersnake, was not completed until FY18; therefore, construction activities will be limited and will result in obligations less than were approved.

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 as long as releases are coordinated with activities associated with the construction of Planet Ranch. Coordination with both the USFWS and U.S. Army Corps of Engineers will continue.

Monitoring:

Planet Ranch: Vegetation data will be collected using lidar remote sensing techniques. Construction compliance monitoring will be conducted as needed to minimize impacts to listed and covered species. Post-development monitoring for southwestern willow flycatchers, yellow-billed cuckoos, and other riparian birds

will be conducted in potential habitat outside the construction area. Post-development surveys for other covered species will begin after construction is completed and appropriate habitat is present.

Middle Bill Williams River NWR: Vegetation data will be collected using lidar remote sensing techniques. Surveys for southwestern willow flycatchers, yellow-billed cuckoos, and other riparian breeding birds will be conducted.

Proposed FY19 Activities: Erosion control structures will provide protection of the property from releases from Alamo Dam or from storm events on adjacent dry washes and are the first priority for construction crews. Construction is expected to begin in late FY18 or the start of FY19. In conjunction, excavation of the first set of ponds is anticipated. Both efforts will be guided by the *Planet Ranch Restoration Development and Monitoring Plan*. Due to the size and complexity of Planet Ranch, several years of construction will be required for full development, with completion scheduled for late 2020 or 2021.

Monitoring:

Planet Ranch: Vegetation data will be collected using lidar remote sensing techniques. Construction compliance monitoring will be conducted as needed to minimize impacts to listed and covered species. Post-development monitoring for southwestern willow flycatchers, yellow-billed cuckoos, and other riparian birds will be conducted in potential habitat outside the construction area. Post-development surveys for other covered species will begin after construction is completed and appropriate habitat is present.

Middle Bill Williams River NWR: Vegetation data will be collected using lidar remote sensing techniques. Surveys for southwestern willow flycatchers, yellow-billed cuckoos, and other riparian breeding birds will be conducted.

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

Work Task E24: Cibola National Wildlife Refuge Unit #1 Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$750,000	$900,063.09	$5,918,390.62	$750,000	$900,000	$900,000	$1,400,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@usbr.gov

Start Date: FY07

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, CRCR2, ELOW1, GIFL1, GIWO1, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, and YWAR1

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 was established with the U.S. Fish and Wildlife Service to restore new areas and maintain created land covers on Cibola NWR Unit #1.

This work task 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 Fremont cottonwood-Goodding's willow (hereafter 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 (192 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 339 acres that were cleared as a result of the Hippy Fire and has been developed as cottonwood-willow land cover.

- 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, and it is scheduled for cottonwood-willow land cover.

- Area #5 (Crane Roost) includes 154 acres that have been planted with cottonwood, willow, and honey mesquite.

In FY18, the U.S. Fish and Wildlife Service and LCR MSCP agreed to the expansion of Cibola NWR Unit #1. The habitat creation concept includes expanding the existing conservation area by establishing approximately 1,200 acres of additional cottonwood-willow, honey mesquite, and marsh land cover types on lands immediately south of the existing conservation area.

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 National Wildlife Refuge and 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 and is done in conjunction with maintenance of the irrigation canals, gates, and roads.

The annual costs associated with operating 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 only a portion of a field. These checks 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 50-year term of the LCR MSCP.

Previous Activities: Through FY16, 506 acres of cottonwood-willow have been established within the 950-acre site. Native trees have been irrigated and managed since 2007. Monitoring for birds, MacNeill's sootywing skippers, bats, and rodents were conducted. In FY15, planning and design started for a pump stand upgrade, which will include abandoning the existing pump stand and constructing a new one.

FY17 Accomplishments:

Maintenance/Restoration/Management: Management, maintenance, flood irrigation, and monitoring of the established habitat created continued. Approximately 122 acres were planted with a mix of cottonwood, willow, honey mesquite, and other riparian shrub and grass species in accordance with the Restoration Development and Monitoring Plan for the middle Hippy Fire area. Plants were ordered for the North 160 area (158 acres). Obligations in FY17 were higher than approved, but necessary, due to the large acreage being managed and the size of the plant orders. Future budget estimates have been increased to reflect actual costs.

Pump Stand Replacement: Replacement pump construction started in FY 17 and is anticipated to be completed in the spring of FY18.

Monitoring: Monitoring was conducted at Cibola NWR Unit #1 for vegetation, birds, bats, and rodents.

Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques.

The site was surveyed for riparian birds using the LCR MSCP double sampling protocol. Summer tanagers were detected breeding. Avian mist netting following the Monitoring Avian Productivity and Survivorship (MAPS) protocol was conducted from early May to early August. Yellow warblers and Gila woodpeckers were captured and color banded. Southwestern willow flycatcher surveys were conducted, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted, and breeding was confirmed.

Mist netting for bats occurred once per month at the site from June to August. California leaf-nosed bats were captured. A long-term acoustic bat station was also used to detect the presence of LCR MSCP bat species from June to August. Western red bats, western yellow bats, and California leaf-nosed bats were detected.

Rodent trapping was conducted in fall and spring. Colorado River cotton rats continue to be detected at the site.

FY18 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 FY18 on the North 160 area. Approximately 158 acres will be planted with a mix of cottonwood, willow, honey mesquite, and other riparian shrub and grass species. Plants will be ordered for Eastside (37 acres) and replanting of 20 acres where the seed feasibility study was conducted in 2008 in order to allow time for propagation before planting in the spring of FY19.

Expansion of Cibola NWR Unit #1: A Land Use Agreement for the expansion of the existing 950-acre Cibola NWR Unit #1 area to approximately 2,150 acres has been signed with the U.S. Fish and Wildlife Service. The habitat creation concept includes expanding the existing conservation area by establishing approximately 1,200 acres of cottonwood-willow, honey mesquite and marsh land cover types on lands immediately south of the existing conservation area. The restored acreage would include areas that can be flooded and areas that would utilize the water table after establishment. Honey mesquite and low-density cottonwood-willow habitat may only be irrigated until their roots reach the water table. Cottonwood-willow areas planted in high density will be flood irrigated to create moist soil conditions for nesting birds.

Pump Stand Replacement: Construction of the replacement pump stand will occur in 2018.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The salinity and soil moisture monitoring network will be expanded to this conservation area to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. General bird surveys will be conducted from mid-April to mid-June. A MAPS station will be operated from May until the end of July. 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. Rodent monitoring will be conducted in fall and/or spring. Surveys will also be conducted for MacNeill's sootywing skippers.

Proposed FY19 Activities:

Maintenance/Restoration/Management: Management, maintenance, flood irrigation, and monitoring of the established habitat created will continue. Planting of Eastside (37 acres) and replanting of 20 acres where the seed feasibility study was conducted in 2008 is anticipated. The Restoration Development and Monitoring Plan, permitting, design, and compliance to restore the expansion area are expected to be completed. Control of saltcedar in portions of the expansion area may be conducted.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The data collected from the expanded salinity and soil moisture monitoring network will be used to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. General bird surveys will be conducted from mid-April to mid-June. A MAPS station will be operated from May until the end of July. 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. Rodent monitoring will be conducted in fall and/or spring.

Pertinent Reports: The *Cibola National Wildlife Refuge Unit #1 Conservation Area, Fiscal Year 2017 Annual Report* will be posted on the LCR MSCP Web site upon completion.

Work Task E25: Big Bend Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$30,000	$29,993.90	$1,231,363.15	$20,000	$20,000	$20,000	$320,000

Contact: Laken Anderson, (702) 293-8153, landerson@usbr.gov

Start Date: FY09

Expected Duration: FY55

Long-Term Goal: Habitat protection and management

Conservation Measures: BONY2, RASU2, and FLSU1

Location: Reach 3, Nevada, River Mile 266.5

Purpose: To protect and manage an existing connected backwater for native fishes

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 under 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). This 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.

FY17 Accomplishments:

Maintenance/Restoration/Management: Minimal maintenance activities were conducted in 2017.

The annual light detection and ranging (lidar) survey was conducted to provide elevation data used to monitor sediment deposition over the following years, which will help identify if sediment removal is needed at the BBCA.

SNWA's security fence surrounding the upland portion of the BBCA remains damaged, and the culverts remain filled with sediment. Clark County is responsible for clearing the culverts, and the SNWA is responsible for repairing the BBCA fence.

Monitoring: Fisheries monitoring activities were conducted monthly throughout the year. Netting activities were completed in the winter and spring months, and remote PIT scanning was conducted continuously via the permanent scanner that was installed in FY16. A total of seven bonytail and two razorback suckers were captured through netting efforts, and six bonytail and one razorback sucker were contacted through remote PIT scanning. All bonytail captures and contacts were from an April 2017 release in Laughlin Lagoon. Larval razorback and

flannelmouth suckers were also captured in the BBCA throughout the spawning season. Larval capture rates were higher than FY16 but similar to the years prior to FY15. Water quality parameters remained within thresholds for all native fishes.

Vegetation and bathymetric data were collected using lidar remote sensing techniques.

Marsh bird surveys were conducted on three occasions at the wetland portions of the BBCA. No covered species were detected.

Rodent trapping was conducted in fall and spring. Colorado River cotton rats and desert pocket mice (most likely the *sobrinus* subspecies based on range) were captured.

Surveys were conducted for MacNeill's sootywing skippers. No individuals or eggs were detected. Quailbush habitat is very limited.

FY18 Activities:

Maintenance/Restoration/Management: Routine maintenance activities will be conducted.

One bathymetric lidar remote sensing survey is scheduled to be conducted in 2018 to continue BBCA backwater management monitoring. The purpose of these annual surveys is to provide elevation data, which will be used to monitor sediment deposition.

Monitoring: The BBCA will be monitored at a level similar to that in FY17. Continuous remote PIT scanning will be conducted via the existing permanent scanner, and additional mobile scanners will be deployed during monitoring trips in an effort to increase scanning contacts for all fish species. Vegetation data will be collected using lidar remote sensing techniques. Marsh bird surveys will be conducted during March, April, and May at the four established survey points. Rodent trapping will be conducted in fall and/or spring.

Proposed FY19 Activities:

Maintenance/Restoration/Management: Annual bathymetric lidar surveys will continue at the BBCA. Based on the results of the survey, dredging BBCA's 15 acres of backwater will be analyzed and environmental compliance for dredging is likely to begin. Routine maintenance activities will be conducted.

Monitoring: Fisheries monitoring will be conducted at a level and interval similar to that in previous years. Monitoring trips will include larval light trapping, remote PIT scanning, and trammel netting. Water quality will be

recorded during each monitoring event and quarterly outside of the monitoring period. Vegetation data will be collected using lidar remote sensing techniques. Marsh bird surveys will be conducted during March, April, and May at the four established survey points. Rodent trapping will be conducted in fall and/or spring.

Pertinent Reports: The *Big Bend Conservation Area, Fiscal Year 2017 Annual Report* will be posted on the LCR MSCP Web site upon completion.

Work Task E27: Laguna Division Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$200,000	$179,098.65	$27,515,124.80	$150,000	$120,000	$100,000	$100,000

Contact: Arien Chavez, (702) 293-8027, amchavez@usbr.gov

Start Date: FY10

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, ELOW1, GIFL1, GIWO1, SUTA1, VEFL1, WIFL1, YBCU1, YHCR2, and YWAR1

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 consisted 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

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 from the Gila Gravity Main 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 for flooding and to 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.

The LCR MSCP controls water levels at the LCDA based on habitat requirements. The conservation area has been used to store excess flows through a coordinated effort with the Bureau of Reclamation's Water Operations Group. When excess flows are anticipated, the water control structures at the LDCA can be adjusted to accommodate a portion of the excess flow.

Annual Maintenance and Management: The LDCA was designed and constructed in such a way as to reduce annual operation and maintenance costs. The water delivery system does not require onsite personnel, and there are no pumps at the LDCA to maintain. Water is diverted from the desilting forebay of the Gila Gravity Main Canal (LDCA Headworks) and delivered to the conservation area via gravity. Inspection and maintenance of the LDCA Headworks occurs annually and includes visual inspection of the cathodic protection system and pressure washing inside the structure. Every 3 years, to coincide with a planned outage on the Gila Gravity Main Canal, a more rigorous inspection of the LDCA headworks and cathodic protection is performed. Routine maintenance on the water control gates within the conservation area occurs annually. The annual cost for operation and maintenance of the LDCA includes road grading.

Previous Activities:

Maintenance/Restoration/Management: Inlet modifications to the point of diversion at the Gila Gravity Main Canal sluicing gates were made to allow for up to a 100-cubic-foot-per-second 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 fall 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 were used to create contour mapping.

Clearing and contouring activities in Reach 2 began in summer 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 3,200,000 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. Fremont cottonwood-Goodding's willow and honey 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 spring 2014.

FY17 Accomplishments:

Maintenance/Restoration/Management: Access, law enforcement, and fire suppression at the LDCA were regulated by the Bureau of Land Management. No invasive plant species management activities took place. The water control infrastructure was maintained via regular inspections and by performing preventive maintenance. General site maintenance, which included placement of straw bales, placement for soil stabilization, and grading of the roads, was also conducted.

Inspection of the cathodic protection system for the LDCA Headworks took place on May 15, 2017, and included general maintenance of the intake structure. The cathodic protection system inspection is typically conducted every 3 years and includes general maintenance on the water control gates and pressure washing of the interior of the headworks structure.

Monitoring: Monitoring was conducted at the LDCA for vegetation, rodents, and birds.

Vegetation data were collected using lidar remote sensing techniques.

Marsh bird surveys were conducted on three occasions at portions of the LCDA that currently contain marsh vegetation. Western least bitterns and Yuma clapper rails were detected and are presumed to be breeding at the LCDA.

Riparian bird surveys were conducted at the LDCA from April 15 to June 15, 2017, using the LCR MSCP's double sampling protocol. No LCR MSCP covered species were detected as breeding at the site. Southwestern willow flycatcher surveys were also conducted, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted between late June and early August in the northern reach of the LCDA, and there were nine detections and two possible breeders at the conservation area.

Small mammal trapping was conducted in fall and spring. No Yuma hispid cotton rats were captured.

FY18 Activities:

Maintenance/Restoration/Management: Access, law enforcement, and fire suppression at the LDCA are regulated by the Bureau of Land Management. No invasive plant species management activities will take place. The water control infrastructure is being maintained via regular inspections and preventive maintenance. General site maintenance will include straw bale placement for soil stabilization and grading of the roads.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. Monitoring for marsh birds will continue in suitable habitat. General bird surveys will be conducted from mid-April to June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons where appropriate habitat is available. Surveys for rodents will be conducted in appropriate habitat.

Proposed FY19 Activities:

Maintenance/Restoration/Management: Access, law enforcement, and fire suppression at the LDCA will be regulated by the Bureau of Land Management. Control of invasive plant species is not anticipated. The water control infrastructure will be maintained throughout the year via regular inspections and preventive maintenance.

An inspection of the Gila Gravity Main Canal is scheduled for November 2018, so the next inspection of the LDCA Headworks structure and cathodic protection inspection will occur a year early to take advantage of the dewatered canal.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. Monitoring for marsh birds will continue in suitable habitat. General bird surveys will be conducted from mid-April to June. Single species surveys for southwestern willow flycatchers and yellow-billed cuckoos will be conducted during their respective breeding seasons where appropriate habitat is available.

Pertinent Reports: The 2017 *Laguna Division Conservation Area Annual Report* will be posted on the LCR MSCP Web site upon completion.

Work Task E28: Yuma East Wetlands

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$450,000	$269,402.54	$2,372,563.15	$300,000	$275,000	$275,000	$275,000

Contact: Jeremy Brooks, (702) 293-8157, jjbrooks@usbr.gov

Start Date: FY10

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, BLRA1, CLRA1, ELOW1, GIFL1, GIWO1, LEBI1, NMGS1, SUTA1, VEFL1, WIFL1, YBCU1, YHCR2, and YWAR1

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 Fremont cottonwood-Goodding's willow (hereafter 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 by the LCR MSCP to support the long-term operation and maintenance of created habitats and adaptive management actions that benefit species covered under the LCR MSCP Habitat Conservation Plan. Infrequent but substantial capital improvements may also occur and will be in addition to annual operating costs.

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, 103 acres of honey mesquite, and 94 acres of marsh.

Annual Maintenance and Management: The work associated with the operation and maintenance of YEW is described in the Yuma East Wetlands Annual Management Plan. The plan is developed collaboratively among, and concurred to by, all stakeholders prior to obligation of funding. The document describes the scope of work, budget, and responsibilities of all parties and is limited to recurring operation and maintenance activities. Funding for 70% of the annual operation and maintenance budget is provided by the LCR MSCP, while the remaining 30% is provided by the site stakeholders.

Annual operation and maintenance activities anticipated throughout the 50-year term of the LCR MSCP 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, the 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. Monitoring began in FY13.

FY17 Accomplishments:

Maintenance/Restoration/Management: YEW was operated and maintained in accordance with the work identified in the FY17 Yuma East Wetlands Annual Management Plan. LCR MSCP-supported activities included 22 flood irrigation cycles as well as other related site maintenance and management activities. In the spring of FY17, the FY18 Yuma East Wetlands Annual Management Plan was developed and approved.

To resolve repeated failure of the vertical turbine pump at the North Channel, a trailer-mounted centrifugal pump was installed on a temporary basis to test and evaluate the pump's performance. The pump offered numerous advantages over the existing pump, including being able to be moved during high flood events as well as being able to handle high sediment loads. The trailer-mounted pump performed satisfactorily, and a proposal was submitted at the end of FY17 to procure and install a new trailer pump. This proposal is expected to be funded in FY18, which resulted in lower than anticipated costs in FY17.

Monitoring: Monitoring was conducted at YEW for vegetation, birds, small mammals, and bats.

Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques.

Marsh bird surveys were conducted on three occasions at the wetland portions of YEW. 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. Arizona Bell's vireos and Gila woodpeckers were detected breeding at the site. Southwestern willow flycatcher surveys were also conducted, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted, and there were four detections, one possible breeder, and one probable breeder at the site.

An established long-term acoustic bat station was used to detect LCR MSCP covered and evaluation bat species from June to August. Western red bats, western yellow bats, and California leaf-nosed 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 species of small mammals captured.

FY18 Activities:

Maintenance/Restoration/Management: YEW will be operated and maintained in accordance with the work identified in the FY18 Yuma East Wetlands Annual Management Plan. The FY19 annual management plan will be developed with the site stakeholders in spring 2018.

It is anticipated that two agreements will be awarded in FY18. The first will be the issuance of a new 5-year agreement for operation and maintenance of the conservation area. This agreement will begin in FY19 and will run through FY23. The second will be for the purchase and installation of a new centrifugal trailer-mounted pump to replace the North Channel pump. The pump was not budgeted; therefore, obligations may be more than anticipated.

Flow meters for the North Channel and AHA pumps, as well as gauges for the South Channel and North Channel marsh complexes, are planned for installation in FY18.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The salinity and soil moisture monitoring network will be expanded to this conservation area to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. 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. Surveys for rodents will be conducted in appropriate habitat.

Proposed FY19 Activities: YEW is expected to be operated and maintained in accordance with the work identified in the FY19 Yuma East Wetlands Annual Management Plan. The FY20 annual management plan will be developed with the site stakeholders in spring 2019.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The data collected from the expanded salinity and soil moisture monitoring network will be used to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. 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: The 2017 annual site report will be posted on the LCR MSCP Web site upon completion.

Work Task E31: Hunters Hole

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$60,000	$41,975.85	$497,692.18	$30,000	$30,000	$30,000	$30,000

Contact: Arien Chavez, (702) 293-8027, amchavez@usbr.gov

Start Date: FY11

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, GIFL1, GIWO1, SUTA1, VEFL1, WIFL1, YBCU1, YHCR2, and YWAR1

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 Southerly International Boundary with Mexico. Hunters Hole once consisted of a series of interconnected ponds with adjacent marsh and a few stands of Fremont cottonwood-Goodding's willow (hereafter 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. Officials from State, local, Tribal, and Federal agencies joined together in an effort to restore the area while increasing public safety and border security. The LCR MSCP assumed management of Hunters Hole as a conservation area with 44 acres of cottonwood-willow land cover. The LCR MSCP coordinates with the U.S. Border Patrol concerning access to the conservation area.

Annual Maintenance and Management: Irrigation is provided by a groundwater well through a series of automated valves and delivered to five cells within the conservation area. The entire irrigation system is managed remotely, including operation of the well. Irrigation cycles are run every 3 weeks

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, and periodic inspections.

Previous Activities: This conservation area has been managed by the LCR MSCP since 2012. Monitoring began in 2013.

FY17 Accomplishments:

Maintenance/Restoration/Management: Hunters Hole was irrigated and managed throughout the year for LCR MSCP covered species. Fifteen irrigation cycles were performed. Irrigation cycles, water use, and costs were monitored in a continuing effort to run the conservation area as efficiently as possible. The groundwater pump servicing the site experienced a 2-week outage for maintenance and repair, and a small road washout was repaired. No other significant management actions were taken.

Monitoring: Monitoring was conducted at Hunters Hole for vegetation, birds, bats, and small mammals.

Vegetation data were collected in using light detection and ranging (lidar) remote sensing techniques.

Riparian bird surveys were conducted at Hunters Hole from April 15 to June 15, 2017, using the LCR MSCP double sampling protocol. No LCR MSCP species were detected, but 10 other riparian bird species were found.

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 California leaf-nosed bats were detected.

Small mammal trapping was conducted in fall and spring. Yuma hispid cotton rats were captured at the site on both occasions.

FY18 Activities:

Maintenance/Restoration/Management: Hunters Hole is operated on an automated irrigation system. It will be irrigated and managed throughout the year for LCR MSCP covered species. No construction, restoration, or changes to management activities are planned.

On February 6, 2018, a small fire (approximately 3 acres) started within Cell 2 at Hunters Hole. The City of San Luis Fire Department responded, and with the assistance of the Bureau of Land Management, the fire was quickly extinguished. The fire was declared out on February 9, and it is believed the fire was arson.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. The salinity and soil moisture monitoring network will be expanded to this conservation area to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. 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 FY19 Activities:

Maintenance/Restoration/Management: Hunters Hole is operated on an automated irrigation system. It 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: Vegetation data will be collected using lidar remote sensing techniques. The data collected from the expanded salinity and soil moisture monitoring network will be used to assess whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. 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 *2017 Hunters Hole Conservation Area Annual Report* will be posted on the LCR MSCP Web site upon completion.

Work Task E33: Pretty Water Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$150,000	$173,882.03	$1,724,886.24	$40,000	$30,000	$20,000	$20,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@usbr.gov

Start Date: FY13

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, ELOW1, VEFL1, WRBA2, and WYBA3

Location: Reach 4, Cibola National Wildlife Refuge, 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 National Wildlife Refuge, located in California between River Miles 95 and 97. On July 17, 2006, lightning ignited a fire on the refuge that burned approximately 4,600 acres of saltcedar intermixed with mesquite in both California and Arizona.

The PWCA contains 566 acres of honey mesquite, which will be managed for LCR MSCP covered species throughout the 50-year term of the program.

Annual Maintenance and Management: The PWCA was fully developed in FY15 and provides the honey mesquite land cover type while minimizing long-term operational and maintenance costs. Invasive plant species control may be periodically implemented. Other annual management activities will be limited to coordination with the U.S. Fish and Wildlife Service.

Previous Activities: The Restoration Development and Monitoring Plan was approved by the California Department of Fish and Wildlife in 2012. A Land Use Agreement Exhibit between the LCR MSCP and the U.S. Fish and Wildlife Service was signed in 2013. In FY14, compliance and pre-construction activities were completed, and honey mesquite were ordered. The site was cleared, and 22,500 honey mesquite were planted in FY15. After planting and watering was completed, public access was re-established along the main access roads; in addition, the parking area and primitive boat ramp were regraded to previous conditions.

FY17 Accomplishments: The PWCA is fully developed, and measures to aggressively control invasive plant species were implemented. Non-native species control was implemented after planting to allow native vegetation to mature without competition. Invasive plant species control efforts were more than anticipated, and, therefore, obligations were slightly higher.

Monitoring: Monitoring was conducted for vegetation, birds, and MacNeill's sootywing skippers.

Vegetation data were collected using light detection and ranging (lidar) remote sensing techniques.

Riparian bird surveys were conducted mid-April 15 to mid-June 15 using the LCR MSCP's double sampling protocol. No LCR MSCP species were detected.

Surveys were conducted for MacNeill's sootywing skippers, and they were determined to be present.

FY18 Activities: The PWCA is fully developed and is being managed for LCR MSCP covered species. Inspections will be conducted to ensure that the honey mesquite have successfully established. Invasive plant species control efforts will continue on an as-needed basis, and as a result, annual operating costs have been reduced.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. General bird surveys will be conducted from April to June. The site will be evaluated for suitable habitat for the LCR MSCP covered rodent species. If the site is determined suitable for these species, rodent monitoring will be conducted in fall and/or spring.

Proposed FY19 Activities: The PWCA is fully developed and will continue to be managed for LCR MSCP covered species. Inspections will be conducted to ensure that the honey mesquite have successfully established.

Monitoring: Vegetation data will be collected using lidar remote sensing techniques. General bird surveys will be conducted from April to June. Surveys will be conducted for MacNeill's sootywing skippers. The site will be evaluated for suitable habitat for the LCR MSCP covered rodent species. If the site is determined suitable for these species, rodent monitoring will be conducted in fall and/or spring.

Pertinent Reports: The 2017 annual report will be posted on the LCR MSCP Web site upon completion.

Work Task E35: Mohave Valley Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$5,500,000	$4,765,001.75	$3,532,302.58	$3,500,000	$1,750,000	$160,000	$80,000

Contact: Laken Anderson, (702) 293-8153, landerson@usbr.gov

Start Date: FY15

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BONY2, FLSU1, and RASU2

Location: Reach 3, River Miles 237–238, Park Moabi Regional Park, California

Purpose: To create and manage a mosaic of land cover types to provide habitat for LCR MSCP covered species

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: 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 the Mohave Valley Conservation Area (MVCA) s 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 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. 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 Commission (landowner) and the county (lessee) were approached about the project in 2012 and agreed to allow the creation of the conservation area. The Restoration Development and Monitoring Plan was approved by the California Department of Fish and Wildlife in November 2015.

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. These data, in conjunction with 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. A geotechnical survey was conducted in June 2014.

Riparian bird surveys were conducted in existing habitat in April and May 2015; no LCR MSCP species were detected.

FY17 Accomplishments: The Commission approved the project, and a modification to the lease agreement was approved during the October 2016 Commission meeting. The Storm Water Pollution Protection Plan was submitted in December 2016. Construction activities began in January 2017, with land-based equipment clearing and excavating below groundwater to a minimum depth of 4 feet. By the end of the fiscal year, approximately 860,000 cubic yards of material had been excavated. Obligations in FY17 accounted for the labor, land-based equipment, materials costs, and installation of the passive integrated transponder antennas, which are built into the bridge structures. Obligations were less than what was approved due to the construction start date being delayed from October 2016 to January 2017. Marsh plants were ordered in FY17 and are to be planted in February 2018, when the river stage is low.

Monitoring: Compliance monitoring was conducted as needed during construction. Post-development monitoring will begin after restoration is complete.

FY18 Activities: Construction activities will continue in FY18. The northern inlet and southern outlet bridges were placed in winter. The marsh plants, mesquites, and cottonwood and willows will be planted in April 2018 once the coffer dams have been removed and the backwater has been connected to the river. Land-based excavation will finish by April, and dredging operations are expected to begin in April 2018.

Monitoring: Compliance monitoring will be conducted as needed during construction. Post-development monitoring will begin after restoration is complete.

Proposed FY19 Activities: Dredging activities are anticipated to be completed by March 2019. Replanting, if necessary, will be conducted in the spring of FY19, and construction of the MVCA is anticipated to be completed by April 2019.

Monitoring: Compliance monitoring will be conducted as needed during construction. Post-development monitoring will begin after restoration is complete.

Pertinent Reports: The Restoration Development and Monitoring Plan is posted on the LCR MSCP Web site.

Work Task E36: Parker Dam Camp

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$100,000	$16,424.69	$16,424.69	$50,000	$40,000	$20,000	$20,000

Contact: John Swatzell (702) 293-8165, jswatzell@usbr.gov

Start Date: FY17

Expected Duration: FY55

Long-Term Goal: Habitat protection and management

Conservation Measures: BEVI1, CRCR2, ELOW1, VEFL1, WRBA2, and WYBA3

Location: Reach 4, Bureau of 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, the Bureau of 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 the Bureau of 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 number of preliminary technical and cost-benefit assessments were conducted; the site is not recommended for creation of disconnected backwaters at this time. It is targeted to be managed for the honey mesquite land cover type.

FY17 Accomplishments: An agreement was signed by the LCR MSCP and Lower Colorado Dams Office that outlined the responsibilities of each party and identified Parker Dam Camp as a LCR MSCP conservation area.

A youth crew was brought in to clean up the site and remove non-native plants. Youth crews enable the LCR MSCP to leverage funds with non-program funding and also allow for an educational opportunity for youths. A decision was made to reduce the effort this fiscal year and to spread the cleanup over multiple years to take advantage of the cost share; this resulted in a reduction of obligations in FY17.

Monitoring: Monitoring was conducted at Parker Dam Camp for birds and MacNeill's sootywing skippers.

Riparian bird surveys were conducted from April 15 to June 15, 2017, using the LCR MSCP double sampling protocol. Gila woodpeckers were documented breeding.

Parker Dam Camp was surveyed for the presence of quailbush to determine if potential habitat was present for MacNeill's sootywing skippers. Nectar sources are abundant, but there is no quailbush. No surveys for MacNeill's sootywing skippers were conducted.

FY18 Activities: Along with minor site maintenance and general cleanup, a plan for exotic plant removal and replacement with native vegetation on a small stream located on the northern portion of Parker Dam Camp will be developed. The plan may be implemented over a series of years in combination with general maintenance and employment of youth crews.

Monitoring: General bird surveys will be conducted from May to early August. The conservation area will be surveyed for the presence of quailbush to determine if potential habitat is present for MacNeill's sootywing skippers. If suitable habitat is present, surveys will be conducted.

Proposed FY19 Activities: Minor site maintenance and general cleanup will continue at the reduced annual rate. Implementation of exotic plant removal and replacement on a portion of the small stream is planned, which increases the budget slightly.

Monitoring: General bird surveys will be conducted from May to early August. Parker Dam Camp will be surveyed for the presence of quailbush to determine if potential habitat is present for MacNeill's sootywing skippers. If suitable habitat is present, surveys will be conducted.

Pertinent Reports: The 2017 annual report will be posted on the LCR MSCP Web site upon completion.

Work Task E37: Palo Verde Ecological Reserve-South

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$200,000	$10,027.29	$10,027.29	$500,000	$100,000	$150,000	$1,000,000

Contact: Andrea Finnegan, (702) 293-8203, afinnegan@usbr.gov

Start Date: FY17

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, ELOW1, GIFL1, GIWO1, MNSW2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, and YWAR1

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 Task F1, and wildlife monitoring is conducted under Work Tasks F2–F4, and F7.

Project Description: Palo Verde Ecological Reserve-South (PVER-South), located within the Palo Verde Irrigation District, is approximately 350 acres 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 requirements 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, and 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 of this project 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 inform 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 completed under Work Task E16.

FY17 Accomplishments: Restoration of PVER-South was postponed while other priority sites were being developed. Restoration plans will be adapted to meet program needs at that time.

Maintenance/Restoration/Management: Obligations were less than approved due to the postponement of restoration planning.

Monitoring: Pre-development surveys were conducted for riparian birds. There were no probable or confirmed breeding territories detected for any covered species.

FY18 Activities: Restoration of PVER-South is on hold while other priority sites are being developed. Restoration plans will be adapted to meet program needs at that time.

Maintenance/Restoration/Management: While restoration of PVER-South is on hold, obligations will be minimal.

Monitoring: Pre-development monitoring will be conducted in FY18 if additional data are needed for compliance documentation and funded under post-development work tasks (Section F).

Proposed FY19 Activities:

Maintenance/Restoration/Management: The Restoration Development and Monitoring Plan is expected to be drafted in coordination with the California Department of Fish and Wildlife. Based on the requirements of the plan, design, permitting, and compliance will be initiated. The development schedule will be integrated with construction activities of other conservation areas. Remaining permitting and compliance activities will be completed. The LCR MSCP may maintain a cover crop on the site until restoration activities are ready to begin. The Palo Verde Irrigation District will provide water to PVER-South and a record of diversionary amounts.

Monitoring: Pre-development monitoring will be conducted in FY19 if additional data are needed for compliance documentation.

Pertinent Reports: N/A

Work Task E38: Three Fingers Lake

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$200,000	$115,742.63	$115,742.63	$200,000	$100,000	$100,000	$100,000

Contact: John Swatzell, (702) 293-8165, jswatzell@usbr.gov

Start Date: FY17

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BLRA1, CLRA1, CRCR2, and LEBI1

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 is conducted under Work Tasks F2–F4 and F7, and fisheries monitoring is conducted under Work Task F5.

Project Description: Three Fingers Lake, located within the Cibola National Wildlife Refuge, is a 680-acre conservation area being restored to create a 241-acre marsh complex within the State of California. Honey mesquite and Fremont cottonwood-Goodding's willow will be included on the fringe to add to the mosaic and for soil stabilization. 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, which established 24 acres of open water with a small fringe of cattails. The surrounding landscape is dominated with invasive saltcedar. 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 the U.S. Fish and Wildlife Service (USFWS) have resulted in a restoration concept that would create a large marsh complex similar in size to

Hart Mine Marsh (E9). A decision was made to construct a marsh complex, as it is more cost effective to construct and more manageable than a backwater/marsh mosaic design. The restoration concept includes reshaping and contouring of the ground surrounding the dredged channel to allow for managed flooding. Using a combination of river stage and pumped surface water, water levels would be maintained in the marsh throughout the year and could be held static during the marsh bird breeding season.

The existing earthen and sheet pile structures will be modified to ensure their long-term viability and reduce the permeability of the sheet pile structure. The existing pump stand and pumps will remain and be used to divert water into the dredged channels to increase circulation. Culverts or weirs could also be constructed to ensure the maximum marsh elevations would not be exceeded.

Shaping and contouring of the ground adjacent to the dredged channels would target a depth of 0–2 feet and would be sloped from the edge of the channels out to the perimeter of the marsh. Smaller, deeper channels may also be excavated to increase depth diversity and facilitate circulation of water. Approximately 1,000,000 cubic yards of dirt are anticipated to be moved.

Previous Activities: Identification of Three Fingers Lake and evaluation for inclusion into the LCR MSCP were conducted under Work Task E16.

FY17 Accomplishments: A design concept to create a marsh complex has been developed with the USFWS. River gauge information will be used in conjunction with water surface elevation data from data loggers installed within Three Fingers Lake to complete the design. Final land cover type acres will be determined after the design has been finalized. Creditable acres will be based on an as-built survey conducted after the construction is completed.

Monitoring: Pre-development monitoring for riparian birds was conducted in FY17 from mid-April through June and funded under post-development work tasks (Section F). No probable or confirmed breeding territories for covered species were recorded during general bird surveys. One yellow warbler was recorded, but no breeding status was determined. The Cibola National Wildlife Refuge conducted marsh bird surveys, and the LCR MSCP will coordinate with the refuge to ensure these surveys continue up to and after construction. The USFWS monitored water quality. No other surveys were conducted in 2017.

Proposed FY18 Activities: Site-specific compliance activities to allow for development of Three Fingers Lake are being initiated. A Land Use Agreement for restoration activities was signed by the USFWS.

Maintenance/Restoration/Management: Restoration design, quantity and cost estimates, compliance, and permitting are expected to be completed for a 30% design. The development schedule will be integrated with construction activities already scheduled at other conservation areas.

Monitoring: Three groundwater monitoring wells were installed to track groundwater elevations. Water surface levels are also being monitored.

Pre-development monitoring will be conducted in FY18 if additional data are needed for compliance documentation.

Proposed FY19 Activities

Maintenance/Restoration/Management: Restoration design, quantity and cost estimates, National Environmental Policy Act compliance, and permitting will be completed. A value engineering study is anticipated at the 30% design stage. The revised design will form the basis of the Rivers and Harbors Act, Section 404 permit application. Final construction drawings are expected to be completed.

Monitoring: Pre-development monitoring will be conducted in FY19 if additional data are needed for compliance documentation.

Pertinent Reports: N/A

Work Task E39: Dennis Underwood Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$0	$0	$0	$6,000,000	$500,000	$500,000	$200,000

Contact: Andrea Finnegan, (702) 293-8203, afinnegan@usbr.gov

Start Date: FY18

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, ELOW1, GIFL1, GIWO1, MNSW2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, and YWAR1

Location: Reach 4, River Miles 96–99, 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 Task F1, and wildlife monitoring is conducted under Work Tasks F2–F4 and F7.

Project Description: The Dennis Underwood Conservation Area is located adjacent to the north border of the Pretty Water Conservation Area. The property is located within the Palo Verde Irrigation District and owned by the Metropolitan Water District of Southern California. The district has identified 635 acres of active agricultural ground for inclusion in the LCR MSCP. The development of this project will 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. Restoration of the site includes planting both the honey mesquite and Fremont cottonwood-Goodding's willow (hereafter cottonwood willow) land cover types.

Previous Activities: This is a new start FY18.

FY17 Accomplishments: This is a new start FY18.

FY18 Activities: Pending approval of the Steering Committee and passage of a land and water resolution, the LCR MSCP will secure an easement to establish the conservation area. Compensation for the use of the land and water will be made to the district based on an appraisal and the resolution. The LCR MSCP will establish a farming contract to continue farming a cover crop to prepare the ground for restoration. A Restoration Development and Monitoring Plan will be prepared for the cottonwood-willow and honey mesquite establishment and submitted to the California Department of Fish and Wildlife for approval.

Construction activities to prepare land for cottonwood-willow and honey mesquite habitat will begin.

Monitoring: Compliance monitoring will be conducted as needed during construction and funded under post-development work tasks (Section F). Post-development monitoring will begin after restoration is complete and trees are mature enough to provide habitat.

Proposed FY19 Activities: Honey mesquite habitat will be planted on 400 acres. Maintenance and irrigation will be provided to the created habitat.

Monitoring: Compliance monitoring will be conducted as needed during construction. Post-development monitoring will begin after restoration is complete and trees are mature enough to provide habitat.

Pertinent Reports: N/A

Work Task E40: Yuma Meadows Conservation Area

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$0	$0	$0	$0	$4,000,000	$3,000,000	$300,000

Contact: Arien Chavez, (702) 293-8027, amchavez@usbr.gov

Start Date: FY19

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BONY2, BONY4, RASU2, and RASU4

Location: Reach 6, Federal lands, River Miles 45–47, California

Purpose: To create and manage disconnected backwaters for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): This is a new conservation area for the LCR MSCP in FY19. Vegetation monitoring is conducted under Work Task F1, and wildlife monitoring is conducted under Work Tasks F2, F3, F7, F9, and F10.

Project Description: The Yuma Meadows Conservation Area is within the Laguna Division on Bureau of Reclamation withdrawn lands. The property also contains an office and warehouse complex, known as the Laguna Field Office, which the LCR MSCP will occupy. Implementation of the conservation area will serve as partial fulfillment of the LCR MSCP's 360-acre backwater acreage goal. The project will create 123 acres of disconnected backwaters that will be managed for native fishes, specifically bonytail and razorback suckers. Development of this area will satisfy partial fulfillment of LCR MSCP Habitat Conservation Plan requirements and California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06. The conservation area will consist of three to four large disconnected backwaters (referred to as refugia ponds) ranging in size from 20 to 50 acres, totaling 111 acres, and smaller disconnected backwaters (referred to as grow-out ponds) ranging in size from 1–4 acres, totaling 12 acres. Both types of ponds are considered disconnected backwaters and, when completed, are expected to provide 123 acres of the backwater land cover type to the LCR MSCP.

Previous Activities: This is a new start FY19.

FY17 Accomplishments: This is a new start FY19.

FY18 Activities: This is a new start FY19.

Maintenance/Restoration/Management: Preliminary site suitability investigations, environmental compliance, and permitting activities for development of the area are underway using funding from Work Task E16 until FY19. A Memorandum of Understanding with Reclamation's Yuma Area Office was signed to allow the property to be developed as a conservation area.

Proposed FY19 Activities:

Maintenance/Restoration/Management: Development of the conservation area will commence once environmental compliance is complete. Initial development will include construction of 12 acres of grow-out ponds. Construction of the grow-out ponds is not anticipated to start until mid-way through the fiscal year and would be completed in FY20. Construction of the larger refugia ponds requires the use of a dredge and will be sequenced into the construction schedule.

Monitoring: Compliance monitoring will be conducted as needed prior to and during construction and funded under post-development work tasks (Section F). Post-development monitoring will begin after restoration is complete.

Pertinent Reports: N/A

WORK TASKS – SECTION F

Post-Development Monitoring

Work Task F1: Habitat Monitoring at Conservation Areas

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$950,000	$839,620.04	$5,330,401.31	$850,000	$700,000	$700,000	$700,000

Contact: Jimmy Knowles, (702) 293-8172, jknowles@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Pre- and post-development monitoring

Conservation Measures: BEVI1, BLRA1, CLRA1, CRCR2, ELOW1, GIFL1, GIWO1, LEBI1, MNSW2, MRM2 (BEVI, BLRA, CLRA, CRCR, ELOW, GIFL, GIWO, LEBI, MNSW, SUTA, VEFL, WIFL, WRBA, WYBA, YBCU, YHCR, and YWAR), SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, YHCR2, YWAR1

Location: All LCR MSCP conservation areas

Purpose: The purpose of this work task is to provide post-development monitoring to assess the effectiveness of each conservation area. Monitoring will include biotic and abiotic components and will inform management decisions throughout the 50-year term 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 (closed) was used for analyses performed under this work task. All salinity and soil moisture monitoring previously performed under Work Task E34 (closed) is now performed under this work task (since FY17). Data collected under this work task are also used under Work Task C60.

Project Description: Species habitat characteristics will be evaluated. Monitoring data will be used to document progress toward achieving LCR MSCP goals and to provide habitat data for covered species to inform management decisions.

Previous Activities: Four conservation areas were monitored in FY10 using a variety of monitoring protocols designed to provide information about vegetation composition and health from ground cover to the upper canopy. In FY11, new protocols were developed and tested in a pilot-year study in addition to those used in FY10. 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 the known variability on the conservation areas was not detectable at various spatial scales. 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 Palo Verde Ecological Reserve, and Yuma East Wetlands were monitored, collecting data on density, vegetation structure, canopy closure, and canopy height.

In FY14, long-term vegetation monitoring started being transitioned to using remote sensing techniques. This decision was based on the improvements in light detection and ranging (lidar) technology. Lidar has been 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.

FY17 Accomplishments: Lidar data for all conservation areas were collected in FY17. These data will be processed and analyzed using techniques developed under Work Task C60 to provide metrics describing the vegetation structure related to species' habitat requirements. The lidar data will also be used for analyses that will allow for vegetation at multiple scales and from multiple years to be monitored for the growth and seral succession of existing habitat.

In addition to the lidar data being collected for vegetation monitoring, bathymetric data were collected using lidar technology for the Big Bend Conservation Area (E25) to monitor the changes in sediment deposition over time. Based on the results of the survey, dredging will be analyzed as a future maintenance activity.

A tool was developed in FY16 to automate vegetation classification using lidar data according to the Anderson and Ohmart classification system. Refinements and improvements were made to this tool in FY17. The tool was used to assign the Anderson-Ohmart structure type to Fremont cottonwood-willow and honey mesquite vegetation at all conservation areas. The results from this tool are used to determine habitat creation accomplishment in accordance with the established process. The tool will be expanded to automate additional steps of the habitat creation accomplishment tracking/accounting process. Results from ground-based vegetation surveys will be used to validate the accuracy of the remote sensing-based vegetation classification.

Soil moisture data were collected under this work task and Work Task C60 during FY17 and will be used with lidar vegetation monitoring data to evaluate the habitat conditions at sites with and without observed southwestern willow flycatcher breeding. Soil moisture data were collected at the Rockhouse Riparian Demonstration Project (near Roosevelt Lake, Arizona), three study areas on the Middle Rio Grande in New Mexico, and the Palo Verde Ecological Reserve.

Salinity and soil moisture monitoring began to be managed under this work task in FY17, and data will be used to (1) further identify the range of habitat characteristics (vegetation and soil moisture) present at areas occupied by breeding southwestern willow flycatchers, (2) assess whether adequate soil moisture is being maintained during the nesting season at conservation areas being managed for southwestern willow flycatchers, and (3) assess whether soil moisture and salinity conditions are adequate for sustained vegetation health. A scope of work was developed to expand the monitoring network using the protocols developed under Work Task E34 (closed).

FY18 Activities: Long-term habitat monitoring is continuing in FY18. Lidar data will be acquired to assess vegetation characteristics and will be analyzed using the tools developed under Work Task C60. Lidar data collected in FY17 were used to perform the habitat creation accomplishment analysis.

In cooperation with other Bureau of Reclamation offices and the U.S. Geological Survey, the LCR MSCP will acquire lidar data for the entire LCR planning area during FY18. Lidar data and multispectral satellite data will be used to perform a vegetation classification across this area of interest. This vegetation classification will be used for several purposes: (1) identify areas for system-wide monitoring of suitable habitat for several covered species, (2) create a stratified random sampling design for the system-wide riparian bird monitoring project, and (3) identify areas for future conservation areas. The vegetation classification will

utilize a procedure used previously by the Bureau of Reclamation for classifying riparian vegetation. Ground-based vegetation surveys will be conducted and used to validate the accuracy of the remote sensing-based vegetation classification.

Vegetation monitoring techniques being analyzed under Work Task C60 may be used under this work task. This involves the use of unmanned aerial systems (UASs) to collect marsh vegetation data at Hart Mine Marsh using multispectral and photographic sensors. Depending on the results of the work being performed under Work Task C60, UAS-based monitoring may be incorporated into the long-term marsh vegetation monitoring performed under this work task.

The salinity and soil moisture monitoring network was expanded to include monitoring at six conservation areas: the Beal Lake Conservation Area, the Palo Verde Ecological Reserve, the Cibola Valley Conservation Area, the Cibola National Wildlife Refuge Unit #1 Conservation Area, Yuma East Wetlands, and Hunters Hole. Instrumentation includes shallow groundwater monitoring stations to monitor groundwater levels and groundwater salinity and soil monitoring stations that will monitor soil moisture and soil salinity.

Proposed FY19 Activities: Long-term habitat monitoring will continue in FY19 using the previously developed techniques. Using the lidar data collected from FY14 to FY17, a data collection schedule will be developed based on the needs for each conservation area. It is likely that lidar data will be collected at a higher frequency for new conservation areas, while more mature conservation areas will require less frequent data collection. Based on the results of the marsh vegetation monitoring using UAS techniques (C60), UAS-based data collection will be evaluated as a tool for habitat monitoring under this work task. If it is concluded that UAS techniques provide valuable marsh vegetation monitoring data, marsh vegetation monitoring will transition to UAS-based techniques. Due to the rapid deployment time possible using UASs, it is likely that this technique could also be used when data are required soon after a disturbance occurs (e.g., fire or flash flood).

The salinity and soil moisture monitoring network will continue to operate at the six conservation areas and will be expanded as needed to include all conservation areas where these parameters are of concern for evaluating species' habitat requirements and maintaining vegetation health.

Additional remote sensing techniques and products will be evaluated based on vegetation mapping needs at LCR MSCP conservation areas. The techniques and products evaluated may also be used for system-wide monitoring purposes.

Pertinent Reports: During the development of remote sensing vegetation monitoring techniques, an annual report for FY17 will not be prepared. Once remote sensing monitoring techniques are finalized, the reports will then be prepared annually and posted on the LCR MSCP Web site upon completion.

Work Task F2: Avian Monitoring at Conservation Areas

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$350,000	$487,309.71	$2,252,652.83	$350,000	$450,000	$450,000	$450,000

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 conservation areas

Conservation Measures: MRM1 and MRM2 (BEVI, ELOW, GIFL, GIWO, SUTA, VEFL, and YWAR)

Location: Beal Lake Conservation Area (BLCA), Havasu National Wildlife Refuge, Arizona; Middle Bill Williams River National Wildlife Refuge, Bill Williams National Wildlife Refuge, Arizona; Planet Ranch, Arizona; Cibola Valley Conservation Area (CVCA), Arizona; the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1) and Hart Mine Marsh, Cibola National Wildlife Refuge, Arizona; Imperial Ponds Conservation Area, Arizona; Laguna Division Conservation Area (LDCA), Arizona; Yuma East Wetlands, Arizona; Hunters Hole, Arizona; Mohave Valley Conservation Area, California; Parker Dam Camp, California; Palo Verde Ecological Reserve (PVER), California; Palo Verde Ecological Reserve-South (PVER-South), California; Pretty Water Conservation Area (PWCA) California; and Three Fingers Lake, California.

Purpose: To monitor Arizona Bell's vireo, elf owl, Gila woodpecker, gilded flicker, Sonoran yellow warbler, summer tanager, and vermillion flycatcher use of conservation areas

Connections with Other Work Tasks (Past and Future): Pre- and post-development avian monitoring will be conducted at 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). Work Tasks C24, C36 (closed), and C52 provided information for developing a protocol to monitor elf owls and gilded flickers on the conservation areas.

Project Description: The creation of riparian habitat will benefit LCR MSCP covered avian species (Arizona Bell's vireos, elf owls, Gila woodpeckers, gilded flickers, Sonoran yellow warblers, summer tanagers, and vermillion flycatchers). Conservation areas will be monitored for bird activity using the double sampling area search method, which involves intensive and rapid area search surveys. 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 conservation areas.

Previous Activities: Pre- and post-development monitoring for avian covered species has been conducted at 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 PWCA, the Mohave Valley 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, the LDCA, Yuma East Wetlands, and Hunters Hole. 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 area search plots were surveyed using intensive area search surveys due to the small acreage of habitat in the conservation areas. In FY11 and FY12, all area search plots were surveyed with rapid area search protocols, and a subset of those area search plots was surveyed using intensive area search protocols. In FY13, three additional area search plots were established at Yuma East Wetlands and were surveyed with intensive area search surveys. Beginning in FY14, area search plots were selected with a stratified random approach because existing habitat at the conservation areas exceeded the amount of habitat that could be covered within 80-area search plots. Each year, avian use was evaluated at each conservation area and compared among conservation areas. Arizona Bell's vireos, Sonoran yellow warblers, and summer tanagers were the covered species that had the largest populations breeding at the conservation areas. An evaluation of the monitoring plan for conservation area monitoring (F2) and system-wide monitoring (D6) was initiated to clarify the monitoring questions the data will inform and to improve the accuracy of monitoring methods.

FY17 Accomplishments: Avian post-development monitoring was conducted at existing conservation areas. The following conservation areas were surveyed: the BLCA, the Middle Bill Williams River National Wildlife Refuge, Parker Dam Camp, the PVER, the CVCA, Cibola NWR Unit #1, the PWCA, the LDCA, Yuma East Wetlands, and Hunters Hole. Eighty area search plots on the conservation areas were surveyed using the double sampling protocol. Rapid area search surveys were conducted on all area search plots, and intensive

area search surveys were conducted on a stratified random subsample of eight of those area search plots. Data collection in the field utilized a new mobile electronic field form platform instead of paper data sheets and maps.

LCR MSCP covered bird species and other territorial breeding birds were documented at each conservation area:

- BLCA – Two area search plots were surveyed at this conservation area. There were 47 pairs of territorial breeding birds comprising 12 species detected. These included five pairs of Arizona Bell's vireos, four pairs of Sonoran yellow warblers, and one pair of summer tanagers.

- Middle Bill Williams River National Wildlife Refuge – Fifteen area search plots were surveyed at this conservation area. There were 514 pairs of birds comprising 24 species detected. These included 11 pairs of Arizona Bell's vireos, 11 pairs of Gila woodpeckers, 34 pairs of Sonoran yellow warblers, and 6 pairs of summer tanagers.

- Parker Dam Camp – Two area search plots were surveyed at this conservation area. There were 44 pairs of birds comprising 15 species detected. These included two pairs of Gila woodpeckers.

- PVER – Fifteen area search plots were surveyed at this conservation area. There were 125 pairs of territorial breeding birds comprising 19 species detected. These included two pairs of Arizona Bell's vireos, two pairs of Sonoran yellow warblers, and two pairs of summer tanagers.

- CVCA – Twelve area search plots were surveyed at this conservation area. There were 116 pairs of territorial breeding birds comprising 18 species detected. These included three pairs of Arizona Bell's vireos.

- Cibola NWR Unit #1 – Seven area search plots were surveyed at this conservation area. There were 76 pairs of territorial breeding birds comprising 13 species detected. This included one pair of summer tanagers.

- PWCA – Ten area search plots were surveyed at this conservation area. There 64 pairs of territorial birds comprising 13 species detected. No LCR MSCP covered species were detected.

- LDCA – Thirteen area search plots were surveyed at this conservation area. There were 195 pairs of territorial birds comprising 12 species detected. No LCR MSCP covered species were detected.

- Yuma East Wetlands – Four area search plots were surveyed at this conservation area. There were 109 pairs of territorial breeding birds comprising 16 species detected. These included two pairs of Arizona Bell's vireos and one pair of Gila woodpeckers.

- Hunters Hole – One area search plot was surveyed at this conservation area. There were 15 pairs of territorial breeding birds comprising 10 species detected. No LCR MSCP covered species were detected.

All conservation areas had numerous pairs of non-territorial breeders as well. Many species of migrants and non-breeders were detected at all conservation areas.

Avian pre-development monitoring was conducted at proposed conservation areas that have not yet been developed. The following proposed conservation areas were surveyed: Planet Ranch, the PVER-South, and Three Fingers Lake. Twenty area search plots on these proposed conservation areas were surveyed using rapid area search surveys.

LCR MSCP covered bird species and other territorial breeding birds were documented at each proposed conservation area:

- Planet Ranch – Nine area search plots were surveyed at this proposed conservation area. There were 109 pairs of territorial breeding birds comprising 22 species detected. These included 15 pairs of Arizona Bell's vireos, 3 pairs of Gila woodpeckers, 2 pairs of Sonoran yellow warblers, and 3 pairs of vermilion flycatchers.

- PVER-South – Two area search plots were surveyed at this proposed conservation area. There were 29 pairs of territorial breeding birds comprising 9 species detected. No LCR MSCP covered species were detected.

- Three Fingers Lake – Nine area search plots were surveyed at this proposed conservation area. There were 165 pairs of territorial breeding birds comprising 12 species detected. No LCR MSCP covered species were detected.

All proposed conservation areas had numerous pairs of non-territorial breeders as well. Many species of migrants and non-breeders were detected at all conservation areas.

Pre-construction and compliance activities related to the Migratory Bird Treaty Act were conducted at the Mohave Valley Conservation Area.

Data and record management activities continued, and the 2011–15 summary report was finalized. The FY17 pre-development annual report was also finalized. The monitoring protocol evaluation tasks were defined, and work began on updating the vegetation map used to define survey plots, as vegetation has changed. This evaluation of the monitoring protocol for Work Tasks D6 and F2 will ensure that monitoring methods and statistical analyses are meeting the LCR MSCP objectives and budgetary targets for the next 10 years.

Obligations exceeded the proposed budget, as the costs for conducting surveys were greater than anticipated, and project oversight had to increase in order to successfully roll out a new mobile electronic field form platform.

FY18 Activities: Avian post-development monitoring will be conducted at existing conservation areas, including the BLCA, the Middle Bill Williams River National Wildlife Refuge, Parker Dam Camp, the PVER, the CVCA, Cibola NWR Unit #1, the PWCA, the LDCA, Yuma East Wetlands, and Hunters Hole. Surveys will be conducted using the double sampling method. Eighty area search plots will be selected from all possible plots within the conservation areas using a stratified random approach. All plots will be surveyed with rapid surveys, and a subset of eight area search plots will be selected to be surveyed with intensive surveys using a stratified random approach. Avian pre-development surveys will occur as needed.

Pre-construction and compliance activities related to the Migratory Bird Treaty Act will be conducted as needed on existing and proposed conservation areas.

Data and record management activities will continue. The FY17 post-development annual report will be finalized. The monitoring protocol evaluation will continue, including verifying goals and objectives, updating the vegetation map and the associated survey plots, and analyzing existing data to verify the number of plots to survey annually in order to detect presence of territorial nesting riparian birds and measure their population trends. Once complete, a 10-year monitoring plan will be prepared as well as updated survey protocols and training materials. Refinement of the mobile electronic field form platform will continue.

Proposed FY19 Activities: Avian post-development monitoring for LCR MSCP covered species will be conducted at conservation areas supporting riparian vegetation, including the BLCA, the Middle Bill Williams River National Wildlife Refuge, Parker Dam Camp, the PVER, the CVCA, Cibola NWR Unit #1, the PWCA, the LDCA, Yuma East Wetlands, and Hunters Hole. Avian pre-development surveys will occur as needed.

Pre-construction and compliance activities related to the Migratory Bird Treaty Act will be conducted as needed on existing and proposed conservation areas.

Data and record management activities will continue. The FY18 post-development annual report will be finalized. The 10-year monitoring plan for conservation area monitoring (F2) and system-wide monitoring (D6) will be completed with updated protocols.

Pertinent Reports: The report titled *Riparian Bird Surveys at Pre-Development Conservation Areas in the Lower Colorado River Region, 2017* is posted on the LCR MSCP Web site.

Work Task F3: Rodent Monitoring at Conservation Areas

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$65,000	$42,126.44	$531,391.11	$65,000	$65,000	$65,000	$65,000

Contact: Jeff Hill, (702) 293-8163, jhill@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Conduct pre- and post-development monitoring for small mammal species

Conservation Measures: CRCR1, DPMO1, MRM1 (CRCR, DPMO, and YHCR), MRM2 (DPMOR), and YHCR1

Location: Reaches 3–7

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 was used under Work Task C27 (closed) to document habitat characteristics and improve small mammal monitoring methods. Protocol improvements developed under Work Task C27 (closed) 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 to FY16. Trapping occurred for 1–3 nights at the sites sampled each year and was conducted in vegetation anticipated to provide the best habitat to obtain detections of Colorado River and Yuma hispid cotton rats. As of FY16, cotton rats (genus *Sigmodon*) were captured within or adjacent to all developed conservation areas except Hart Mine Marsh, the Imperial Ponds Conservation Area, and the Laguna Division Conservation Area. Colorado River cotton rats were captured at the Big Bend Conservation Area (BBCA), the

Beal Lake Conservation Area, (BLCA) the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1), the Cibola Valley Conservation Area (CVCA), and the Palo Verde Ecological Reserve (PVER). Yuma hispid cotton rats were captured at Hunters Hole and YEW and on the Imperial National Wildlife Refuge next to the Imperial Ponds Conservation Area. Desert pocket mice were detected at many conservation areas, but the subspecies could not be determined.

FY17 Accomplishments: Presence live trapping surveys were conducted at the BBCA, the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, YEW, the LDCA, and Hunters Hole. Colorado River cotton rats were captured at the BBCA, the PVER, the CVCA, Cibola NWR Unit #1; none were captured at the BLCA. Yuma hispid cotton rats were captured at YEW and Hunters Hole; none were captured at the LDCA.

Obligations were less than anticipated, as trapping was not conducted in spring if Colorado River and Yuma hispid cotton rats were detected in fall.

FY18 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, the CVCA, YEW, and the LDCA to detect the presence of cotton rats.

Proposed FY19 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, the CVCA, Hunters Hole, the LDCA, the PVER, and YEW.

Pertinent Reports: The FY17 annual report will be posted on the LCR MSCP Web site upon completion.

Work Task F4: Bat Species Monitoring at Conservation Areas

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$150,000	$123,507.75	$1,152,713.33	$80,000	$140,000	$140,000	$140,000

Contact: Jeff Hill, (702) 293-8163, jhill@usbr.gov

Start Date: FY07

Expected Duration: FY55

Long-Term Goal: Pre- and post-development monitoring of covered bat species

Conservation Measures: MRM1, MRM2 (CLNB, PTBB, WRBA, and WYBA), 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 the use of conservation areas by the two LCR MSCP covered bat species (western red bat and western yellow bat) and the two evaluation species (pale Townsend's big-eared bat and California leaf-nosed bat).

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 (pale 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, and the BLCA. 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 to determine the age, sex, and reproductive status of the covered and evaluation bat species.

Previous Activities: Conservation areas were monitored from FY07 to FY16 using acoustic and/or capture techniques. Western red bats have been detected at the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, Planet Ranch, the PVER, and Yuma East Wetlands (YEW). Western yellow bats have been detected at the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, Planet Ranch, the PVER, and YEW. California leaf-nosed bats have been detected at the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the PVER, Planet Ranch, and YEW. Pale Townsend's big-eared bats have been detected at the BLCA, Cibola NWR Unit #1, the CVCA, Planet Ranch, and the PVER. Surveys for covered and evaluation bat species were also conducted at the 'Ahakhav Tribal Preserve under Work Task F4 (acoustic monitoring FY08–16 and bat captures FY07–15). The 'Ahakhav Tribal Preserve was included to increase the number of restoration areas being monitored early in the program in case bat species were detected infrequently and additional Fremont cottonwood-Goodding's willow riparian forest would be needed to identify bat roosting and foraging habitat characteristics.

FY17 Accomplishments: Acoustic monitoring consisted of using long-term bat detector stations to record echolocation calls of bats every night from June to August. The stations used to collect data were at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, YEW, and Hunters Hole. At the PVER and CVCA, two stations were used to cover these large conservation areas. An additional station was also operated at the 'Ahakhav Tribal Preserve. Western red bats, western yellow bats, and California leaf-nosed bats were detected at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, YEW, and Hunters Hole. One pale Townsend's big-eared bat call was recorded at the CVCA during August 2017. California leaf-nosed bats were the only covered or evaluation species detected at the 'Ahakhav Tribal Preserve.

Capture surveys were conducted at four LCR MSCP conservation areas (BLCA, PVER, CVCA, and Cibola NWR Unit #1) once a month from June to August. Seven California leaf-nosed bats were captured at the BLCA. The August survey was cancelled at the BLCA due to inclement weather. Four California leaf-nosed bats, one western red bat, and one western yellow bat were captured at the PVER. One California leaf-nosed bat, three western red bats, and one western yellow bat were captured at the CVCA. Six California leaf-nosed bats were captured at Cibola NWR Unit #1.

FY18 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 not be conducted in FY18, as sufficient data to document

species presence are being collected using the acoustic stations. FY18 will be the last year that the ‘Ahakhav Tribal Preserve acoustic stations will be operated under Work Task F4.

It is anticipated that obligations will exceed the budgeted amount in order to reflect the actual costs of acoustic monitoring and bat captures.

Proposed 19 Activities: Bat presence at the conservation areas will continue to be monitored. Data will be analyzed, presence documented, and activity level rates calculated.

Proposed project obligation estimates will increase in FY19 to cover the actual costs of acoustic monitoring and bat captures.

Pertinent Reports: The reports titled *Post-Development Bat Monitoring of Conservation Areas and the ‘Ahakhav Tribal Preserve Along the Lower Colorado River, 2013–2014 Capture Surveys* and *Post-Development Bat Monitoring of Conservation Areas and the ‘Ahakhav Tribal Preserve Along the Lower Colorado River, 2015 Capture Surveys* are posted on the LCR MSCP Web site. The FY16 and FY17 annual reports will be posted upon completion.

Work Task F5: Post-Development Monitoring of Fishes at Conservation Areas

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$250,000	$362,211.47	$2,029,301.63	$500,000	$450,000	$450,000	$500,000

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

Start Date: FY07

Expected Duration: FY55

Long-Term Goal: Post-development monitoring

Conservation Measures: BONY5 and RASU6

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: Fishes 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 50-year 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, 2,000 large bonytail, and 27,000 young-of-the-year bonytail; a limited portion of these stockings was marked with passive integrated transponder (PIT) tags. Shortly after renovation efforts, non-native fishes were observed in the backwater. Subsets of native fishes stocked were contacted through annual surveys, but long-term survival has been low. Populations of stocked razorback suckers declined rapidly within the first several months post-release and eventually leveled off near 100 individuals. In 2012, stockings were discontinued at Beal Lake, and fisheries surveys were reduced to relative abundance and biomass estimates for all species within the backwater. Non-native fishes were the dominant species in the lake, accounting for almost 90% of the total fishes. A large fishkill was observed in February 2013, and water samples confirmed a golden algae bloom. The backwater was isolated from Topock Marsh following the detection of golden algae; however, this closure resulted in a rapid increase in specific conductivity, which approached 11,000 microsiemens per centimeter (µS/cm) in FY14. Improvements to the water delivery system were completed following this event, and specific conductivity decreased to approximately 2,200 µS/cm in FY16. The non-native fish community has rebounded since the fishkill and is once again comprised of multiple non-native fish species. Native fish monitoring activities have been suspended since 2013 due to the lack of native fishes, but water quality has been monitored continuously, and all parameters have remained within the known ranges of acceptability for native fishes.

Routine monitoring of the Big Bend Conservation Area (BBCA) has been conducted monthly from February through May each year since FY11 and has included electrofishing, trammel netting, remote PIT scanning, and larval light trapping in areas where there have been historical contacts of native fishes. Sonic- and radio-tagged flannelmouth suckers released locally as part of Work Task C53 have been found within the dense California or softstem bulrush stands at the BBCA backwater for extended periods. Water quality was recorded 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.

FY17 Accomplishments: The water quality at Beal Lake was monitored throughout the backwater using permanently deployed multi-parameter instruments. Observed water quality was similar to recent years, and specific conductivity has remained at appropriate levels for native fishes since changes in water delivery were completed in FY16 under Work Task E1. Golden algae were not detected during routine spring sampling, and the results of this effort continue to show relatively low levels of plankton biomass overall. No fish monitoring or

augmentation activities were conducted at Beal Lake in FY17. Beal Lake does not currently contain a population of native fishes, and stockings are expected to occur following planned dredging activities and replenishment of hatchery stocks.

Routine monitoring at the BBCA continued in FY17; netting resulted in the capture of two razorback suckers and seven bonytail. Remote PIT scanning resulted in the contact of one razorback sucker and six bonytail. All bonytail contacted via netting and scanning were from an April 2017 release in Laughlin Lagoon. Larval razorback and flannelmouth suckers were captured at rates higher than in FY16, but they were similar to the years prior to FY15. A permanent remote PIT scanner was installed in the summer of FY16 with limited success; improvements to this scanning station were made in FY17. The permanent scanning station has been fully functioning since April 2017. Water quality parameters remained within thresholds for all native fishes.

Obligations exceeded the proposed budget in FY17, as costs for water quality monitoring equipment were greater than expected. Water quality instrumentation acquired in FY17 will support long-term, continuous monitoring at the BBCA, Beal Lake, and the Imperial Ponds Conservation Area.

FY18 Activities: Monitoring of the Imperial ponds was moved from Work Task C25 following FY17. Activities will include population monitoring via remote PIT scanners, annual winter surveys using a variety of capture gear, larval/young-of-year monitoring through spring and summer, and continuous water quality monitoring.

The initial winter surveys were completed in December 2017 and included hoop netting, minnow trapping, electrofishing, and trammel netting. Adults were captured from each of the ponds, and all fishes exhibited good growth since they were stocked and appeared healthy, with little to no signs of disease or parasites. Subadult bonytail were contacted in Ponds 2, 5, and 6, indicating a successful spawn in each of the bonytail ponds. The recruits in Pond 2 were more abundant and much smaller in size compared to the few that were contacted in Ponds 5 and 6.

Monitoring activities at Beal Lake will be focused on water quality. Golden algae sampling will not be conducted in FY18, as no golden algae were detected during the previous 4 years of sampling (FY14–17). Sampling may resume following future native fish stockings. All native fish work at Beal Lake has been postponed until dredging activities scheduled for FY18–19 are completed.

The BBCA will be monitored at a level similar to that in FY17.

Obligations in FY18 are expected to be less than budgeted, as reduced efforts are planned at Beal Lake until dredging activities are completed.

Proposed FY19 Activities: The activities from FY18 will continue.

Monitoring at Beal Lake will focus on water quality. Native fish stockings will resume following the completion of dredging activities in FY20. The proposed estimate for this work task has been reduced in FY19–20 accordingly.

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.

Activities at the Imperial ponds will include population monitoring via remote PIT scanners, annual winter surveys using a variety of capture gear, larval/young-of-year monitoring through spring and summer, and continuous water quality monitoring.

Pertinent Reports: The report titled *Beal Lake Species Abundance and Biomass* will be posted on the LCR MSCP Web site upon completion.

Work Task F6: Post-Development Monitoring of MacNeill's Sootywing Skippers at Conservation Areas

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$80,000	$22,198.36	$524,555.15	$40,000	$20,000	$20,000	$20,000

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

Start Date: FY09

Expected Duration: FY55

Long-Term Goal: Post-development monitoring for MacNeill's sootywing skippers (sootywings)

Conservation Measures: MNSW1 and MRM2 (MNSW)

Location: Habitat conservation areas, Reaches 3–5

Purpose: To monitor vegetation, plant quality, and populations of sootywings in habitat created for this species

Connections with Other Work Tasks (Past and Future): Habitat requirements were studied under Work Task C7 (closed). System-wide monitoring of sootywings in existing habitat along the lower Colorado River and in habitat created for other species that contain quailbush will be conducted under Work Task D14 starting in FY19.

Project Description: To monitor the presence and habitat use of sootywings in conservation areas that have the appropriate land cover type available

Previous Activities: Habitat created for sootywings at the Cibola Valley Conservation Area and Palo Verde Ecological Reserve was surveyed for adults from FY09 to FY13. Sootywings were detected, though the number detected varied greatly from year to year. Vegetation was monitored in FY13 to document the characteristics of host and nectar plants, including species, plant height, and width. Survey methods were updated further in FY14 to refine measurements of potential habitat and the length of time surveys should be conducted to effectively detect sootywing presence. Habitat measurements included those of quailbush, nectar plant metrics, soil moisture, 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% of sampled intervals.

Sootywings have been detected at the Beal Lake Conservation Area, the Cibola Valley Conservation Area, the Palo Verde Ecological Reserve, the Cibola National Wildlife Refuge Unit #1 Conservation Area, and Hart Mine Marsh in Reaches 3–5, and also at Hunters Hole in Reach 7. Sootywings have not yet been detected during surveys at the Big Bend Conservation Area (BBCA); the site has few, small quailbush, which may explain the lack of sootywing detections.

FY17 Accomplishments: Conservation areas were surveyed for sootywing presence in March, April, May, and July in Reaches 3–5 using the same methods as in FY14–16. Surveys occurred at the BBCA and the Pretty Water Conservation Area. In addition, a survey was conducted at the Cibola National Wildlife Refuge Island Unit to see if sootywings had survived the Three Slashes Fire of 2011 or recolonized the habitat that has emerged since the fire. Sootywings were detected at the Pretty Water Conservation Area and the Cibola National Wildlife Refuge Island Unit in April. No sootywings were detected at the BBCA in April or May of FY17 or during any surveys conducted during FY15 or FY16; therefore, surveys were terminated at this conservation area after May 2017. The site has few, small quailbush, which may explain the lack of sootywing detections. A site visit was conducted at Parker Dam Camp, but surveys were not conducted because existing habitat was not found.

Obligations were less than anticipated, as less surveys were required. No habitat was found at Parker Dam Camp, and surveys were stopped at the BBCA, as no sootywings have been detected around the few quailbush after several years of surveys.

FY18 Activities: Presence surveys for sootywings will be conducted in March, April, June, and July in potential habitat at the Cibola Valley Conservation Area and the Palo Verde Ecological Reserve. If sootywings are detected before the July survey, surveys in the remaining months will not be conducted.

Proposed FY19 Activities: The honey mesquite land cover type at conservation areas in Reaches 3–5 will be surveyed every other year to monitor for continued presence of sootywings. Presence surveys for sootywings will be conducted in potential habitat during March, April, May, and July. If sootywings are detected before the July survey, surveys in the remaining months will not be conducted.

Pertinent Reports: The *Monitoring MacNeill's Sootywings at the Cibola Valley Conservation Area and Palo Verde Ecological Reserve, 2012 Annual Report* and *Monitoring of the MacNeill's Sootywing and its Habitats, 2015 Annual Report* are posted on the LCR MSCP Web site. Annual reports will be posted upon completion.

Work Task F7: Marsh Bird Monitoring at Conservation Areas

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$40,000	$30,633.05	$132,225.17	$40,000	$40,000	$40,000	$50,000

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 and MRM2 (BLRA, CLRA, and LEBI)

Location: Presence surveys will be conducted at newly developed marsh habitat sites, including Hart Mine Marsh on the Cibola National Wildlife Refuge (Cibola NWR); the Imperial Ponds Conservation Area (IPCA) on the Imperial National Wildlife Refuge; the Beal Lake Conservation Area (BLCA) on the Havasu National Wildlife Refuge; the Big Bend Conservation Area (BBCA), Nevada; the Laguna Division Conservation Area (LDCA), and Yuma East Wetlands, 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 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 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, the IPCA (Field 18 and the Imperial ponds), the LDCA, and

Yuma East Wetlands after inclusion into the LCR MSCP. From FY05 to FY16, the Bureau of Reclamation partnered with U.S. Fish and Wildlife to share the costs and labor needed to conduct the surveys.

FY17 Accomplishments: Marsh bird surveys were conducted during March, April, and May at the LDCA and Yuma East Wetlands. Surveys at the BBCA, the IPCA (Field 18 and the Imperial ponds), and Hart Mine Marsh were conducted once in March and twice in April. Surveys were conducted twice at the BLCA (Beal Lake and Willow Marsh) in April.

One California black rail was detected at Field 18 on the IPCA during the April 27 survey. This was the only detection of a California black rail at a conservation area.

Western Least Bittern Detections

Conservation Area	Survey 1 (March)	Survey 2 (April)	Survey 3 (late April – May)
Beal Lake Conservation Area			
Beal Lake	NS[1]	7	7
Willow Marsh	NS	0	0
Big Bend Conservation Area	0	0	0
Hart Mine Marsh	3	14	8
Imperial Ponds Conservation Area			
Field 18	0	0	0
Imperial ponds	0	0	1
Laguna Division Conservation Area	1	4	6
Yuma East Wetlands	0	0	2

[1] NS = not surveyed.

Yuma Clapper Rail Detections

Conservation Area	Survey 1 (March)	Survey 2 (April)	Survey 3 (late April – May)
Beal Lake Conservation Area			
Beal Lake	NS[1]	2	2
Willow Marsh	NS	2	1
Big Bend Conservation Area	0	0	0
Hart Mine Marsh	8	16	10
Imperial Ponds Conservation Area			
Field 18	0	2	2
Imperial ponds	0	0	0
Laguna Division Conservation Area	1	3	3
Yuma East Wetlands	2	5	3

[1] NS = not surveyed.

FY18 Activities: Marsh bird surveys will be conducted on conservation areas. These sites will include the BLCA (Beal Lake and Willow Marsh), Hart Mine Marsh on the Cibola NWR, the IPCA (Field 18 and the Imperial ponds), the BBCA, Yuma East Wetlands, and the LDCA. Surveys at Hart Mine Marsh and Field 18 and the Imperial ponds are conducted in cooperation with the U.S. Fish and Wildlife Service. Data will be entered into the LCR MSCP database and analyzed.

Proposed FY19 Activities: Marsh bird surveys will be conducted on conservation areas that have a marsh habitat component in sufficient acreage, vegetation type, and suitability. These sites will include the BLCA (Beal Lake and Willow Marsh), Hart Mine Marsh on the Cibola NWR, the IPCA (Field 18 and the Imperial ponds), the BBCA, Yuma East Wetlands, and the LDCA. Surveys at Hart Mine Marsh and Field 18 and the Imperial ponds are conducted in cooperation with the U.S. Fish and Wildlife Service. Data will be entered into the LCR MSCP database and analyzed.

Pertinent Reports: The *Marsh Bird Surveys at Conservation Areas, 2014–2016 Annual Report* is posted on the LCR MSCP Web site.

Work Task F8: Reptile and Amphibian Monitoring at Conservation Areas

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$0	$0	$0	$25,000	$25,000	$25,000	$25,000

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

Start Date: FY18

Expected Duration: FY55

Long-Term Goal: Post-development monitoring for northern Mexican gartersnakes, Colorado River toads, and lowland leopard frogs

Conservation Measures: MRM2 (NMGS), CRTO1, and LLFR1

Location: Presence surveys will be conducted at newly developed marsh habitat sites and adjacent Fremont cottonwood-Goodding's willow (hereafter cottonwood-willow) habitat where northern Mexican gartersnakes may be present, including the Beal Lake Conservation Area on the Havasu National Wildlife Refuge, and Planet Ranch, Arizona.

Purpose: To monitor the use of created marsh habitat by covered reptile and evaluation amphibian species

Connections with Other Work Tasks (Past and Future): Monitoring will be conducted to support conservation area development work tasks where northern Mexican gartersnakes may be present, including Work Tasks E1 and E21.

Project Description: Presence surveys for northern Mexican gartersnakes and their prey (including Colorado River toads and lowland leopard frogs) will be conducted at newly developed marsh habitat sites and nearby cottonwood-willow habitat, where northern Mexican gartersnakes may be present.

Previous Activities: This is a new start in FY18.

FY17 Accomplishments: This is a new start in FY18.

FY18 Activities: Pre-construction presence surveys may be conducted for northern Mexican gartersnakes at Planet Ranch in areas with marsh habitat, nearby cottonwood-willow habitat, and rocky areas where northern Mexican gartersnakes may be present. Pre-construction surveys and monitoring will be conducted, as needed, for maintenance activities at the Beal Lake Conservation Area.

Proposed FY19 Activities: Pre-construction presence surveys and monitoring for northern Mexican gartersnakes will be conducted at proposed or current conservation areas in marsh habitat, nearby cottonwood-willow habitat, and rocky areas where northern Mexican gartersnakes may be present.

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

Work Task F9: Southwestern Willow Flycatcher Monitoring at Conservation Areas

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$0	$0	$0	$100,000	$500,000	$500,000	$500,000

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

Start Date: FY18

Expected Duration: FY55

Long-Term Goal: Post-development monitoring of southwestern willow flycatchers

Conservation Measures: MRM1, MRM2, and MRM4 (WIFL)

Location: Conservation areas in Reaches 1–7 along the lower Colorado River (LCR), and lower Bill Williams River

Purpose: To monitor southwestern willow flycatcher populations at LCR MSCP conservation areas

Connections with Other Work Tasks (Past and Future): Work Task D2 included post-development and system-wide monitoring of southwestern willow flycatcher population numbers and demographics along the LCR from FY05 to FY17. Monitoring of southwestern willow flycatchers will be split into separate work tasks beginning in FY18, with system-wide monitoring continuing under Work Task D2 and post-development monitoring conducted under Work Task F9.

Project Description: Presence surveys are conducted at LCR MSCP conservation areas in Reaches 1–7 along the LCR and the lower Bill Williams River.

Previous Activities: Presence surveys and life history studies of southwestern willow flycatchers have been conducted along the LCR since 1996 and since FY05 under Work Task D2.

FY17 Accomplishments: This is a new start in FY18.

FY18 Activities: Presence surveys for southwestern willow flycatchers will be conducted at LCR MSCP conservation areas and the Middle Bill Williams River National Wildlife Refuge (E21) containing the Fremont cottonwood-Goodding's willow (hereafter cottonwood-willow) land cover type under Work Task D2. If southwestern willow flycatchers are observed displaying breeding behavior, surveys will be conducted in an attempt to confirm breeding. Color banding of southwestern willow flycatchers will occur at conservation areas where resident birds are confirmed to be present.

Proposed FY19 Activities: Presence surveys for southwestern willow flycatchers will be conducted at LCR MSCP conservation areas and the Middle Bill Williams River National Wildlife Refuge (E21) containing the cottonwood-willow land cover type. If southwestern willow flycatchers are observed displaying breeding behavior, surveys will be conducted in an attempt to confirm breeding. Color banding of southwestern willow flycatchers will occur at conservation areas where resident birds are confirmed to be present.

Obligations in FY19 increase, as surveys previously conducted on LCR MSCP conservation areas under Work Task D2 are now under this work task.

Pertinent Reports: N/A

Work Task F10: Yellow-billed Cuckoo Monitoring at Conservation Areas

FY17 Estimates	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$0	$0	$0	$600,000	$650,000	$650,000	$650,000

Contact: Barbara Raulston, (702) 293-8396, braulston@usbr.gov

Start Date: FY18

Expected Duration: FY55

Long-Term Goal: Post-development monitoring for yellow-billed cuckoos

Conservation Measures: MRM1 and MRM2 (YBCU)

Location: Protocol-level surveys are conducted in suitable habitat at LCR MSCP conservation areas

Purpose: To conduct surveys to monitor existing yellow-billed cuckoo populations at LCR MSCP conservation areas

Connections with Other Work Tasks (Past and Future): Yellow-billed cuckoo monitoring on LCR MSCP conservation areas was previously conducted under Work Task D7. Monitoring will be now be split into separate work tasks beginning in FY18, with system-wide monitoring continuing under Work Task D7 and post-development monitoring conducted under this work task.

Project Description: Yellow-billed cuckoos use Fremont cottonwood-Goodding's willow (hereafter 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-willow habitat at least 2 years old.

Previous Activities: This is a new start in FY18.

FY17 Accomplishments: This is a new start in FY18.

FY18 Activities: Call-playback surveys for yellow-billed cuckoos will be conducted at conservation areas planted with cottonwood-willow habitat 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 may be resighted, and nests may be found incidentally to these activities.

Proposed FY19 Activities: Call-playback surveys will be conducted at conservation areas planted with cottonwood-willow habitat 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 may be resighted, and nests may be found incidentally to these activities.

Obligations are expected to increase in FY19 due to the additional cottonwood-willow land cover type on conservation areas.

Pertinent Reports: N/A

WORK TASKS – SECTION G

Adaptive Management Program

Work Task G1: Data Management

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$1,000,000	$1,277,295.14	$6,509,405.60	$1,000,000	$1,250,000	$750,000	$750,000

Contact: Jimmy Knowles, (702) 293-8172, jknowles@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 and associated tools to consolidate, organize, document, store, and distribute scientific information related to the LCR MSCP

Connections with Other Work Tasks (Past and Future): Data 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, field data collection systems, 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.

Mobile data loggers and software for collection of data in the field were acquired. These units standardize data collection across LCR MSCP projects. Mobile electronic field forms (MEFFs)/data dictionaries for data collection were developed and are now used for most field data collection.

FY17 Accomplishments: Maintenance and updates to the LCR MSCP Web site continued, including posting of all published reports, Steering Committee information, and status updates for ongoing projects. Initial steps were taken to prepare the LCR MSCP Web site for a complete redesign and migration to a content management system.

The native fish databases continued to be maintained in their current formats. The two databases are (1) the native fish augmentation database, which includes initial stocking/tagging information as well as recontacts via netting or electrofishing, and (2) the remote scanning database, which includes recontacts via remote sensing. Improvements were planned to be made to the remote scanning database to provide for additional data input and data querying features. Efforts to incorporate this into the LCR MSCP database continued, including refinement of schema and standardization of attributes.

Data collection processes were reviewed, updated, and maintained. MEFFs were created (or updated) and tested for most wildlife research and monitoring projects that involved field data collection. Documentation for all MEFFs was created so that end-users had the necessary reference materials for proper MEFF use. Additionally, the LCR MSCP trained end-users in how to use the MEFFs for field data collection.

The LCR MSCP databases 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.). 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 (D6).

Quality assurance measures for field data collection processes were maintained, with full audit trails from raw field data to final production data. MEFF data viewers were also developed or updated during FY17 in support of projects for most wildlife research and monitoring projects that involved field data collection. The data viewers allowed field surveyors to view collected data in tables and to perform queries shortly after field collection as part of the quality assurance process.

Efforts to restructure and more effectively maintain all LCR MSCP data continued in FY17. All data collected using first generation MEFFs were transferred to an enterprise database system. These data previously resided in single-year, single-project databases and now reside in a single database, which allows for cross-project data management and analysis. These efforts to transition to an enterprise system will provide improved accessibility for LCR MSCP staff and other stakeholders.

Field data collection devices and supporting software were maintained to support data collection activities. To ensure that the LCR MSCP is using appropriate technologies for data collection and taking advantage of more efficient and versatile hardware and software, field data collection alternatives were evaluated during FY17. A new field data collection platform was chosen based on its ability to (1) integrate with current LCR MSCP systems, including the enterprise system mentioned above, (2) provide almost immediate access to data using cloud-based storage systems, and (3) be used on a wide variety of devices due to its cross-platform support. MEFFs developed using this new system will be considered second-generation MEFFs. Field testing took place using this new platform for small mammals (D10 and F3) and breeding bird surveys (F2). Support for the purchase of MEFF development tools, new hardware and software technologies, global navigation satellite system (GNSS) devices, and other supporting software continues.

An independent evaluation of all data management processes took place in FY17. The evaluation had three components: (1) identify overarching framing questions to inform adaptive management and data management processes and practices, (2) identify pertinent datasets that will be used for adaptive management purposes, and (3) provide technical review of current data collection and management practices. The overall goal of this exercise is to provide the necessary information to develop a digital information management system that will allow the LCR MSCP to make informed management decisions throughout the 50-year term of the program.

In FY16, the Bureau of Reclamation (Reclamation) decided to transfer server administration for the collaboration portal that the LCR MSCP utilizes to Denver, Colorado. This centralization effort also involved a major version upgrade. In preparation for this upgrade and centralization (to occur in FY18), the LCR MSCP continued efforts to reorganize the content that is being maintained in this system, with the goal of making all project information easier to find and more

accessible. Obligations were more than approved because funds were obligated during FY17 for work that will be completed in FY18. This work will include software development activities for the collaboration portal. Delays caused by technical issues resulted in this work being postponed to FY18.

FY18 Activities: Maintenance and updates to the LCR MSCP Web site continue, including posting of all published reports, Steering Committee information, and status updates for ongoing projects. Initial steps are ongoing to prepare the LCR MSCP Web site for a complete redesign and migration to a content management system.

The native fish databases continue to be maintained in their current formats. Several improvements are being made to the remote scanning database, which will provide for easier upload of data and advanced querying capabilities. Work continues in order to incorporate these data into the LCR MSCP database. Native fish stocking data in legacy formats continue to be evaluated, and the draft schema continues to be modified. Test imports continue to be performed on these data to simulate transfer into the LCR MSCP database.

The field data collection processes continue to be updated and/or maintained. During FY18, several projects are being transitioned to the second generation MEFF platform (the new field data collection platform evaluated and selected in FY17). These include most wildlife research and monitoring projects that involve field data collection. Equipment (data collection devices and GNSS receivers) compatible with the second-generation MEFF platform was purchased to support the transition to the new platform. New documentation is also being developed to assist end-users in the proper operation of the new field data collection platform.

Recommendations from the data management evaluation completed in FY17 are being reviewed and evaluated for potential implementation. If deemed feasible and beneficial, recommendations will be scheduled for implementation. In parallel with the implementation of the recommendations, efforts continue to migrate all data management to enterprise systems that provide advanced functionality and improved accessibility. The enterprise system includes several components that are compatible with each other: data storage, data sharing, field data collection, data security, and data analysis. The enterprise system is fully compatible with the field data collection platform, which will result in greater efficiencies and reduced time between data collection and data analysis.

The LCR MSCP has been participating in the Reclamation Information Sharing Environment (RISE) (https://water.usbr.gov/docs/RISE.pdf). RISE is an open data initiative sponsored by Reclamation, with the goal of sharing Reclamation's data in consistent, open, machine-readable formats via a centralized, sustainable public data portal. This will help provide reasonable access to data to members of the Steering Committee for monitoring the progress and performance of the LCR MSCP.

The migration and upgrade of the collaboration portal was completed in early FY18. The LCR MSCP continues to organize the content contained in the collaboration portal and perform maintenance tasks involved with the migration and upgrade. Workflows are being developed using this platform to make internal work processes more efficient, transparent, and trackable. Content contained in the portal are also being catalogued and indexed so that all project information is easier to find and is more accessible.

Proposed FY19 Activities: A complete redesign of the Web site is scheduled for completion during FY19. During the redesign, the current Web site will continue to be maintained and updated until the new one has been completed.

The native fish databases will continue to be maintained in their current format. Incorporation of these data into the LCR MSCP database is scheduled to take place in FY19. It is also anticipated that native fish stocking data in legacy formats will be incorporated into the LCR MSCP database in FY19. Field collection of native fish stocking data and other fisheries related data will be updated to use second-generation MEFFs during FY19.

Any wildlife or restoration field data collection project not using MEFFs will be updated to second-generation MEFFs during FY19. Implementation of the enterprise system will continue. Automation of field data, post-processing, and publishing of data for internal use and external sharing will also continue.

Implementation of recommendations from the data management analysis will continue.

Participation in the RISE project will continue.

Pertinent Reports: N/A

Work Task G3: Adaptive Management Research Projects

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$300,000	$4,493.69	$2,752,164.23	$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: BONY2, BONY5, RASU2, and RASU6

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.

The LCR MSCP 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.

FY17 Accomplishments: Closeout activities were performed for two research projects performed during FY16: (1) contribution to razorback sucker species status assessment (SSA) and (2) development of single nucleotide polymorphisms (SNP) markers. The contribution to the razorback sucker SSA was a one-time contribution to 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 development of SNP markers was transitioned to Work Task C40.

FY18 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.

Proposed FY19 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: Reports will be posted on the LCR MSCP Web site upon completion.

Work Task G4: Science/Adaptive Management Strategy

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$400,000	$692,311.87	$1,796,329.55	$400,000	$400,000	$400,000	$400,000

Contact: Jimmy Knowles, (702) 293-8172, jknowles@usbr.gov

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: To ensure successful and efficient implementation of the LCR MSCP conservation measures

Conservation Measures: All conservation measures related to habitat creation and management, 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 27 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 and/or conceptual ecological models (CEMs).

Additional work may be generated from the evaluation of research conducted under Work Task G3.

The LCR MSCP participates 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 planning 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. This includes internal and external peer review of all reports and data products. The peer review process ensures that all research and monitoring complies with the LCR MSCP science strategy and the U.S. Department of the Interior Code of Scientific and Scholarly Conduct. This process also ensures that research and monitoring meets the needs of the LCR MSCP as outlined in the Habitat Conservation Plan and other program documents.

Previous Activities: The science strategy was developed in August 2006 and finalized in October 2007. Colorado River Terrestrial and Riparian as well as 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 report titled *LCR MSCP Five-Year Monitoring and Research Priorities*: *2013–2017* 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.

FY17 Accomplishments: 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 1-8 in the “Overview” section of this document. In cooperation with work being performed under Work Task F1, the habitat creation accomplishment tracking process is being automated to provide standardized accounting of habitat creation accomplishment on an annual basis.

The Adaptive Management Group (AMG) conducted a scientific peer review of approximately 40 reports, which were posted on the LCR MSCP Web site in FY17. These reviews were accomplished through the established internal and external peer review process.

The AMG provided feedback and input to other LCR MSCP groups on study plan design, statistical analyses of results, and technical and scientific writing standards. When appropriate, this information was shared with external partners to assist in their research, monitoring, and report writing activities.

In coordination with Work Task G1, an independent review of the current data management and adaptive management processes was conducted. This review will result in the development of broad-framing questions to inform the Adaptive Management Program (AMP). During this review, LCR MSCP managers participated in a workshop to develop these overarching framing questions that will inform the AMP.

Members of the AMG attended and participated in both Colorado River Terrestrial and Riparian as well as Colorado River Aquatic Biologists meetings.

Obligations were more than approved due to the quantity of reports and other documents needing review being more than expected. Additional funds were also obligated in FY17 for work that will be completed in FY18.

FY18 Activities: Research and monitoring activities continue to be reviewed and evaluated internally as well as through independent, external reviewers. The analytical methods and survey intensity for system-wide avian monitoring (D6) are being reviewed, and the vegetation classifications for avian survey plots is being updated.

With the completion of the first editions of most 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. The CEMs will also be used to evaluate all ongoing research and monitoring efforts. This will involve the development of adaptive management plans for each research and monitoring effort. The development of these plans was a recommendation from the data management/ adaptive management review that was conducted during FY17. Components of these plans will include a research or monitoring question, a summary of data to be collected to answer the research or monitoring question, how the data will be used to answer the question, adaptive management triggers/thresholds for monitoring efforts, and potential adaptive management actions. These plans will feed into the development of the conservation area management plans for each conservation area.

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, results will be used to refine the conservation area management plans.

Based on the results from the initial, independent review of genetic research (completed in FY16) for razorback suckers, an additional review will be completed by an independent panel of five genetic experts. This additional effort will include reviewing all genetic data collected to-date, examining the current methods in the context of the goals/needs/objectives of the LCR MSCP, and taking into account the current available technology. The purpose of this expanded, more detailed review is to identify the level of effort and long-term needs for monitoring fish genetics and to address any additional questions that resulted from the initial review. Once this review is complete, plans for implementing the recommended genetics monitoring plan will be formulated. The panel of experts will also be available to review proposals to accomplish the provided recommendations.

Preparation of the LCR MSCP Five-Year Monitoring and Research Priorities Report 2018–22 continues and will be completed this fiscal year. 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.

Members of the AMG attended and participated in the Colorado River Aquatic Biologists meeting and the Priorities in Riparian Restoration Workshop hosted by Utah State University.

Proposed FY19 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.

Information from the CEMs will continue to be used for analyses of current and proposed management actions. Further development of decision support tools will also continue. Adaptive management plans will continue to be developed and refined for each monitoring and research effort. Information from these analyses and tools will be used to develop additional conservation area management plans and refine existing plans. Following the concurrence of management guidelines, each conservation area management plan will be developed and implemented accordingly.

The monitoring and research priorities report will be reviewed to ensure that the priorities in the report are still priorities for the program and that efforts are in line with the priorities.

Pertinent Reports: N/A

Work Task G6: Conceptual Ecological Models

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$40,000	$97,582.09	$24,391.45	$40,000	$40,000	$40,000	$40,000

Contact: Jimmy Knowles, (702) 293-8172, jknowles@usbr.gov

Start Date: FY16

Expected Duration: FY55

Long-Term Goal: Species research and monitoring

Conservation Measures: BEVI1, BLRA1, BLRA2, BONY2, BONY5, CLNB1, CLNB2, CLRA1, CLRA2, CRCR1, CRCR2, CRTO1, CRTO2, CRTO3, DPMO1, ELOW1, FLSU1, GIFL1, GIWO1, LEBI1, LLFR1, LLFR2, LLFR3, MNSW1, MNSW2, MRM1, MRM2, MRM3, PTBB1, PTBB2, RASU2, RASU6, SUTA1, VEFL1, WIFL1, WIFL2, WRBA1, WRBA2, WYBA1, WYBA3, YBCU1, YBCU2, YHCR1, YHCR2, and YWAR1

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 (closed), 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 informing 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: First editions of CEMs for most covered species were finalized in FY16. The species accounts updated in FY14 under Work Task C3 (closed) were finalized and published during FY16. Information from these species accounts were incorporated into the CEMs for covered species during FY16.

FY17 Accomplishments: The CEM developed in FY14 for the razorback sucker was updated to reflect new information about the species, and standardized text was incorporated to match the new CEM format.

Obligations were greater than approved due to funds being obligated for work that will be performed in FY18.

FY18 Activities: Updates to all existing CEMs are being completed (except for the razorback sucker, which was updated in FY17). The literature is being reviewed for new information, and biologists (LCR MSCP and other experts throughout the southwestern United States) are being consulted to incorporate their input as subject matter experts. The CEMs are also being updated to include information specific to the constraints of the LCR MSCP and the conditions that exist through the LCR MSCP planning area. These updates will be included as addendums. When more substantial updates are performed, new versions of the CEMs will be generated.

The CEMs are being used to identify knowledge gaps. These knowledge gaps will be addressed in the 5-year monitoring and research priorities report that is being developed under Work Task G4.

The LCR MSCP will participate in a workshop on how to use the species-specific CEMs 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. Once the analyses are complete, the CEMs will be used in the development of conservation area management plans.

CEMs for the five LCR MSCP evaluation species (Colorado River toad, lowland leopard frog, California leaf-nosed bat, pale Townsend's big-eared bat, and the desert pocket mouse are being developed and will be completed in FY18.

Proposed FY19 Activities: Updates to CEMs will be made as new information is received, with literature searches being performed at least once per year. Initial steps to develop decision support tools will be completed. These decision support tools will help model the impacts that management actions have on created habitat and the covered species.

Pertinent Reports: CEMs are posted on the LCR MSCP Web site.

WORK TASKS – SECTION H

Funding Accounts

Work Task H1: Habitat Maintenance Fund

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17*	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$0	$0	$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: BLRA2, CLRA2, 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): This is a stand-alone requirement 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 was 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 by the LCR MSCP. Current fund balances and project expenditures are detailed in attachment D-3a.

For HMF projects, the LCR MSCP serves as the funding source but will not directly implement 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 to (1) improve the infrastructure to manage water levels for rail species at Topock Marsh and Mittry Lake and (2) enhance degraded rail habitat in Topock Gorge and Reach 5.

Previous Activities: Required annual funding contributions have been completed. In coordination with the U.S. Fish and Wildlife Service (USFWS) Arizona 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.

Discussions with the USFWS Arizona Ecological Services Field Office and Region 2 Refuges Regional Office resulted in an agreement to leverage remaining Avoidance and Minimization Measure 2 (AMM2) funds (E17) of approximately $2.1 million and contributions from the HMF to complete infrastructure improvements at Topock Marsh.

FY17 Accomplishments: In FY17, no funds were expended from the HMF for project purposes. The total dollar value of the HMF at the end of FY17, with interest, was $33,771,897.09.

Preliminary discussions continued for a proposed project at Mittry Lake. A project team was assembled and included representatives from the Arizona Game and Fish Department, the Bureau of Land Management, and Reclamation's Yuma Area Office to scope the project and assemble a proposal. If a project is agreed upon by the project team, Reclamation's Yuma Area Office will be the lead. Funds from the HMF will not be used until a proposal is reviewed and accepted by both the USFWS and the LCR MSCP Program Manager.

FY18 Activities: Project expenditures are not anticipated to occur in FY18.

The USFWS is in the process of developing a 10-year plan to reset marshes, which at the time of the signing of the Record of Decision (2005), were suitable for marsh birds covered under the LCR MSCP and makes them eligible for funding through the HMF. The LCR MSCP is providing general support and guidance to the USFWS regarding development of a proposal to manage and reset marshes for the next 10 years, but it will not be the implementing entity.

Topock Marsh: No activities will be conducted until the USFWS submits a proposal to make infrastructure improvements to benefit marsh birds covered under the LCR MSCP. The HMF will not be used until those decisions are made both at the local and regional levels.

Mittry Lake: No activities will be conducted until Reclamation's Yuma Area Office submits a proposal to make infrastructure improvements to benefit marsh birds covered under the LCR MSCP.

Proposed FY19 Activities: No activities will be conducted at Topock Marsh or Mittry Lake until proposals are received by LCR MSCP.

Implementation of a 10-year plan to reset marshes on refuges on the lower Colorado River is anticipated. Obligations may occur to fund these marsh resets as well as the procurement of equipment to support those management actions.

Pertinent Reports: N/A

Work Task H2: Remedial Measures Fund

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY17*	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$1,108,828	$1,108,828	$6,207,475.38	$1,122,360	$1,147,832	$1,147,832	$1,147,832

* 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: BEVI1, BLRA1, BONY2, BONY3, CLRA1, CRCR2, ELOW1, FLSU1, GIFL1, GIWO1, LEBI1, MNSW2, RASU2, RASU3, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, YHCR2, and YWAR1

Location: Lower Colorado River (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.

FY17 Accomplishments: A total of $1,108,828 was deposited into three non-Federal interest-bearing accounts among Arizona, California, and Nevada. It consisted of $277,207 of funding from Arizona, $277,207 from Nevada, and $554,414 from California. The total dollar value of the Remedial Measures Fund at the end of FY17, with interest, was $6,315,323.07. No funds have been withdrawn from the Remedial Measures Fund to date.

FY18 Activities: A total of $1,122,360 will be deposited into three non-Federal interest-bearing accounts among Arizona, California, and Nevada.

Proposed FY19 Activities: A total of $1,147,832 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

FY17 Estimate	FY17 Actual Obligations	Cumulative Expenditures Through FY16	FY18 Approved Estimate	FY19 Proposed Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate
$125,000	$133,126.02	$749,060.99	$125,000	$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 provide education and increase support for the LCR MSCP

Conservation Measures: N/A

Location: N/A

Purpose: To communicate with, coordinate, and educate 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: The LCR MSCP 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.

FY17 Accomplishments: LCR MSCP information was exhibited at numerous science education events throughout Las Vegas, Nevada, which included the seventh annual Las Vegas Science and Technology Festival. The LCR MSCP participated in educational events at schools in Henderson, Las Vegas, and Boulder City and hosted an exhibit booth at the Colorado River Water Users Association annual conference and the Colorado River Terrestrial and Riparian annual meeting. This year, the LCR MSCP participated in the Arizona Game and Fish Department's Outdoor Expo, in Phoenix, Arizona. This event drew more than 46,600 attendees during the 2 days that the LCR MSCP participated.

The LCR MSCP provided tours of conservation areas for the Water Education Foundation, which operates annual Colorado River tours each March. The LCR MSCP participated in two continuing education workshops, through a partnership between the National Park Service and Bureau of Reclamation, called Project WET (Water Education for Teachers) by presenting program overviews. These workshops focus on explaining water science and related issues to Nevada (emphasizing the Colorado River) teachers and provide information to be used in classrooms.

The LCR MSCP received 94 hours of volunteer labor during the year. Volunteers participated in post-development monitoring at some sites, including bat mist netting, bird mist netting (Monitoring Avian Productivity and Survivorship), and razorback sucker monitoring on Lake Havasu. These volunteers provide some labor for the LCR MSCP, engage the public and youth in conservation work, and foster relationships between the community and the program.

FY18 Activities: The LCR MSCP will continue to participate in educational events, science and conservation-themed community events, and several conferences, including the Arizona Game and Fish Department's Outdoor Expo in March and Project WET workshops.

Proposed FY19 Activities: Emphasis for outreach will continue to focus on LCR MSCP stakeholder education, with interaction in local communities. The LCR MSCP will continue to support one to three large events per year, such as the Colorado River Water Users Association conference 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 plans to participate in Project WET workshops and 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 2017 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 2017

B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2017

B-3: LCR MSCP Non-Federal Covered Activities and Incidental Take Summary, Fiscal Year 2017

C Recommendations from Resource Agencies

D Financial Statement

D-1: Required Contributions

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 2017

Attachment A – Letter from Central Arizona Water Conservation District

CAP
CENTRAL ARIZONA PROJECT

May 24, 2018

Joseph A. Vanderhorst
Deputy General Counsel
Metropolitan Water District of Southern California
P.O. Box 54153
Los Angeles, CA 90054-0153

Christopher S. Harris
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 2019, both annually and quarterly, are shown by state below. The inflation index used is 1.442.

FY19 is year 14 of the program and the fourth year of Arizona's 20 year payback period.

FY 2019 Non-Federal Share (2003 $)	$11,082,000
FY 2019 Inflation Index	1.442
FY 2019 Non-Federal Share (Escalated $)	$15,980,244

FY 2019 Non-Fed	Arizona Payback	Other Work Tasks	Remedial Measures	Total Non-Fed Payment Due
Arizona	$ 759,180.56	$3,708,103.00	$ 286,958.00	$ 4,754,241.56
Nevada	(379,590.28)	3,708,103.00	286,958.00	3,615,470.72
California	(379,590.28)	7,416,206.00	573,916.00	7,610,531.72
Totals	$ 0.0	$14,832,412.00	$1,147,832.00	$15,980,244.00

P.O. Box 43020 – Phoenix, AZ 85080-3020 • 23636 North Seventh Street – Phoenix, AZ 85024 • 623-869-2333 • www.cap-az.com

FY 2019 Quarterly Payments		Arizona Payback	Other Work Tasks	Remedial Measures	Total Non-Fed Payment Due
Arizona	Q1	$ 189,795.14	$ 927,025.75	$ 71,739.50	$1,188,560.39
	Q2	189,795.14	927,025.75	71,739.50	1,188,560.39
	Q3	189,795.14	927,025.75	71,739.50	1,188,560.39
	Q4	189,795.14	927,025.75	71,739.50	1,188,560.39
	FY Totals	$ 759,180.56	$3,708,103.00	$286,958.00	$4,754,241.56
Nevada	Q1	$ (94,897.57)	$ 927,025.75	$ 71,739.50	$ 903,867.68
	Q2	(94,897.57)	927,025.75	71,739.50	903,867.68
	Q3	(94,897.57)	927,025.75	71,739.50	903,867.68
	Q4	(94,897.57)	927,025.75	71,739.50	903,867.68
	FY Totals	$ (379,590.28)	$3,708,103.00	$286,958.00	$3,615,470.72
California	Q1	$ (94,897.57)	$1,854,051.50	$143,479.00	$1,902,632.93
	Q2	(94,897.57)	1,854,051.50	143,479.00	1,902,632.93
	Q3	(94,897.57)	1,854,051.50	143,479.00	1,902,632.93
	Q4	(94,897.57)	1,854,051.50	143,479.00	1,902,632.93
	FY Totals	$ (379,590.28)	$7,416,206.00	$573,916.00	$7,610,531.72

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
Douglas Dunlap, Manager-Finance and Accounting, CAP
Dana Sedig, Supervisor-Financial Operations, CAP

Section 8.1.1 - Fiscal Year 2019 Final Inflation Calculation for Lower Colorado River Multi-Species Conservation Program (Actual Indices through September 2017)

Item		Description / Formula		Values		Result
FY	=	Federal Fiscal Year Being Adjusted for Inflation		2019		2019
FY-2	=	Federal Fiscal Year for 2 years prior to Federal Fiscal Year Being Adjusted for Inflation		2017		2017
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	=	236.0/ 152.1	=	1.552
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		**138.745** / 104.243	=	**1.331**
Base Year for GDPIP	=	*Validate base year of GDPIP (Original index year = 2000)*	=	2009		
		Adjust published numbers for 2017 (113.614) to match base year of 2000. Ajustment formula is (113.614 / 81.887) X 100 = 138.745		113.614	=	138.745
		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		(1.552+1.331)/2	=	**1.442**
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 1.442	=	$15,980,244
Federal Indexed Funding Obligation for FY	=	(Federal Funding Obligation for FY) X (Inflation Index for FY)		$11,082 X 1.442	=	$15,980,244

All $ are in thousands

Individual State's share in $				
California Share - 50%		50%	$	7,990,122.00
Arizona Share - 25%		25%	$	3,995,061.00
Nevada Share - 25%		25%	$	3,995,061.00
Total Non-Federal Share			$	15,980,244.00

Arizona Payback ($10,529,550/20yrs = $526,477.50 X 1.442 =	$	759,180.56
California	$	(379,590.28)
Nevada	$	(379,590.28)

Total Non-Federal Share for FY19		
California Share	$	7,610,531.72
Arizona Share	$	4,754,241.56
Nevada Share	$	3,615,470.72
Total Non-Federal Share	$	15,980,244.00

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product

[Index numbers, 2009=100] Seasonally adjusted

Bureau of Economic Analysis

Last Revised on: April 27, 2018 - Next Release Date May 30, 2018

Line		2016				2017				2018
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
1	**Gross domestic product**	110.582	111.249	111.628	112.19	112.746	113.029	113.614	114.275	114.837
2	**Personal consumption expenditures**	109.981	110.55	111.029	111.577	112.192	112.268	112.693	113.453	114.216
3	Goods	101.161	101.216	101.066	101.39	102.061	101.126	101.306	101.747	102.246
4	Durable goods	89.52	88.892	88.106	87.399	87.61	86.816	86.266	85.82	85.47
5	Nondurable goods	107.061	107.543	107.798	108.783	109.742	108.73	109.387	110.415	111.476
6	Services	114.66	115.506	116.325	116.995	117.579	118.206	118.766	119.702	120.61
7	**Gross private domestic investment**	106.379	106.815	107.05	107.587	107.999	108.667	109.16	109.439	110.207
8	Fixed investment	107.232	107.631	107.953	108.382	108.805	109.482	109.996	110.273	111.072
9	Nonresidential	104.739	104.801	104.726	104.892	105.291	105.779	106.078	106.226	106.565
10	Structures	114.916	115.703	115.623	116.287	117.175	118.284	119.597	120.17	121.167
11	Equipment	99.575	99.549	99.763	99.651	99.831	100.032	100.083	100.146	100.207
12	Intellectual property products	105.35	105.085	104.594	104.848	105.252	105.758	105.779	105.788	106.126
13	Residential	117.609	119.299	121.155	122.593	123.114	124.515	125.874	126.659	129.275
14	Change in private inventories	---	---	---	---	---	---	---	---	---
15	**Net exports of goods and services**	---	---	---	---	---	---	---	---	---
16	Exports	103.263	104.228	104.809	105.512	106.164	106.132	107.002	108.511	109.55
17	Goods	98.511	99.794	100.392	100.871	101.521	101.365	102.446	103.76	104.819
18	Services	113.426	113.728	114.281	115.474	116.13	116.372	116.776	118.714	119.702
19	Imports	100.39	100.688	101.432	101.827	103.372	103.126	103.23	104.781	107.141
20	Goods	99.37	99.676	100.623	101.077	102.896	102.44	102.282	103.877	106.53
21	Services	105.544	105.806	105.631	105.76	106.053	106.77	108.085	109.434	110.397
22	**Government consumption expenditures and gross investment**	111.888	112.608	112.919	113.291	114.625	115.088	115.741	116.602	117.528
23	Federal	110.162	110.438	110.571	110.782	112.266	112.763	113.077	113.561	114.687
24	National defense	108.977	109.236	109.368	109.562	110.883	111.28	111.404	111.812	112.755
25	Nondefense	112.095	112.396	112.531	112.767	114.493	115.138	115.739	116.338	117.744
26	State and local	113.086	114.084	114.507	114.98	116.222	116.665	117.531	118.629	119.43
	Addendum:									
27	Gross national product	110.673	111.34	111.721	112.284	112.827	113.108	113.692	114.352	---

BUREAU OF LABOR STATISTICS

Follow Us | What's New | Release Calendar | Blog

Search BLS.gov

Home | Subjects | Data Tools | Publications | Economic Releases | Students | Beta

Databases, Tables & Calculators by Subject

SHARE ON:

Change Output Options: From: 2008 To: 2018 GO

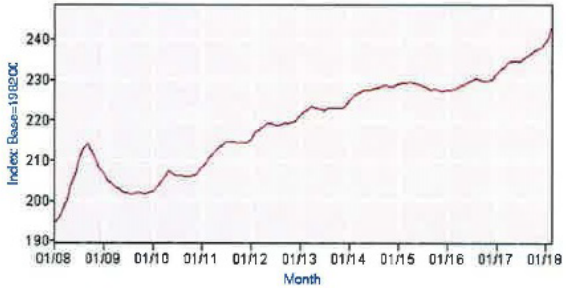
☑ include graphs ☐ include annual averages

More Formatting Options

Data extracted on: May 8, 2018 (9:35:53 AM)

PPI Commodity Data

```
Series Id:      WPUID612
Not Seasonally Adjusted
Series Title:   PPI Commodity data for Intermediate demand by commodity type-Materials and components for construction, 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
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	227.5	227.8	228.3	228.7	229.1	229.7	230.3	230.0	229.7	229.7	230.1
2017	231.5	232.5	233.2	234.4	234.6	234.8	234.7	235.6	236.0	237.0	237.5	237.7(P)
2018	239.3(P)	240.9(P)	243.7(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
Lower Division States	Arizona, California, and Nevada
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
PPR	Present Perfected Rights
Reclamation	Bureau of Reclamation
RRA	Reclamation Reform Act
SDCWA	San Diego County Water Authority
SIB	Southerly International Boundary
SLR	San Luis Rey
yd^2	square yards
YMC	Yuma Mesa conduit

Attachment B – Description of Take

B1: Federal Flow-Related Covered Actions and Accomplishments, Calendar Year 2017

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 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 2017, the Lake Mead elevation varied between 1078.92 and 1089.78 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	In 2017, water deliveries were made to users in Arizona, California, and Nevada (Lower Division States) to satisfy the States' basic apportionments for delivery of Colorado River water. Arizona consumptively used 2,509,503 acre-feet, California consumptively used 4,026,515 acre-feet, and Nevada consumptively used 243,425 acre-feet. In 2017, unused entitlement within the Lower Division States was made available to the junior priority entitlement holders; however, 191,805 of Arizona's unused apportionment, and 56,575 acre-feet of Nevada's unused apportionment, was left in Lake Mead.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 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) pursuant to the Colorado River Basin Project Act • 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 Bureau of Reclamation (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 AOP for 2017, which documented the operating tier for Lake Mead under the Interim Guidelines, was issued on December 14, 2016. 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 2017. ICS was created in 2017. 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 2017.
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]	2017 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 the Warren H. Brock Reservoir were made to satisfy beneficial use requirements of entitlement holders in the United States and/or 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/or 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: 3,406,692,315 kilowatthours (kWh) • Davis Dam: 1,073,505,000 kWh • Parker Dam: 437,666,000 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]	2017 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	• Reclamation's execution and administration of individual LCWSP contracts	• Participate in the development of, and consult in the execution of, individual contracts under the LCWSP	In 2017, 7,377 acre-feet of water was pumped by the LCWSP well field. The 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 the Metropolitan Water District of Southern California (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 the Secretary of the Interior determines that sufficient mainstream water is available to satisfy in excess of 7.5 maf acre-feet of consumptive use in the Lower Division States of Arizona, California, and Nevada • 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 the Northerly International Boundary (NIB) • Determination of quantity of water delivered at the 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 the 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 MWD's entitlement in Lake Mead to accommodate delivery of water pursuant to Minutes of the 1944 Water Treaty	A total of 1,500,000 acre-feet was delivered to Mexico pursuant to the 1944 Water Treaty and related Minutes as follows: Delivery at the limitrophe = 3,781 acre-feet Delivery at SIB = 130,554 acre-feet Diversion channel discharge = 296 acre-feet Delivery at NIB = 1,365,369 acre-feet A total of 16,688 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 126,701 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]	2017 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 2017* was published on May 15, 2018. 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 = 3,316,919 acre-feet Measured returns = 652,111 acre-feet Unmeasured returns = 155,305 acre-feet Consumptive use = 2,509,503 acre-feet **California**: Diversions = 4,467,987 acre-feet Measured returns = 477,759 acre-feet Unmeasured returns = 79,922 acre-feet Consumptive use = 4,026,515 acre-feet* *includes 116,209 acre-feet delivered from Warren H. Brock Reservoir **Nevada**: Diversions = 470,271 acre-feet Measured returns = 225,314 acre-feet Unmeasured returns = 1,532 acre-feet Consumptive use = 243,425 acre-feet
2.2.2 Future Flow-Related Covered Actions				

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 Accomplishments[2, 3]
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 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. There were no reductions in deliveries pursuant to Article II(B)(3) of the Decree.
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.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 Accomplishments[2, 3]
Flow Changes Below Hoover Dam to Davis Dam (Table 2-14, after page 2-26)	—	—	—	**Pilot System Conservation Program:** • Tohono O'odham Nation – 10,080 acre-feet • Colorado River Indian Tribes – 8,572 acre-feet • City of Bullhead City – 40 acre-feet • Coachella Valley Water District (CVWD) – 152 acre-feet • City of Needles – 146 acre-feet **Drought Response Conservation:** • Gila River Indian Community – 80,000 acre-feet **Arizona unused apportionment voluntarily left in Lake Mead** – 191,805 acre-feet **ICS[*]:** • Creation of extraordinary conservation ICS by MWD – 315,649 acre-feet • Creation of extraordinary conservation ICS by the Imperial Irrigation District (IID) – 21,983 acre-feet [*] ICS Creation amounts are provisional until verified by Reclamation. **Additional Conservation[**]:** • Creation of excess conservation by IID – 35,399 acre-feet [**] Water conserved by IID and left in Lake Mead. **Reclamation Yuma Desalting Plant** – 170 acre-feet Collectively, conservation efforts have contributed to a net reduction in flow below Hoover Dam of 663,996 acre-feet. 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]	2017 Accomplishments[2, 3]
Flow Changes Below Davis Dam to Parker Dam (Table 2-15, after page 2-26)	—	—	—	**Pilot System Conservation Program:** • Tohono O'odham Nation – 10,080 acre-feet • Colorado River Indian Tribes – 8,572 acre-feet • CVWD – 152 acre-feet • City of Needles – 146 acre-feet **Drought Response Conservation:** • Gila River Indian Community – 80,000 acre-feet **Arizona unused apportionment voluntarily left in Lake Mead** – 191,805 acre-feet **ICS[*]:** • Creation of extraordinary conservation ICS by MWD – 315,649 acre-feet • Creation of extraordinary conservation ICS by IID – 21,983 acre-feet [*] ICS Creation amounts are provisional until verified by Reclamation. **Additional Conservation[**]:** • Creation of excess conservation by IID – 35,399 acre-feet [**] Water conserved by IID and left in Lake Mead. **Reclamation Yuma Desalting Plant** – 170 acre-feet Collectively, conservation efforts have contributed to a net reduction in flow below Davis Dam of 663,956 acre-feet. 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]	2017 Accomplishments[2, 3]
Flow Changes Below Parker Dam to Imperial Dam (Table 2-16, after page 2-26)	—	—	—	**Pilot System Conservation Program:** • Colorado River Indian Tribes (Arizona) – 8,572 acre-feet • CVWD – 152 acre-feet **ICS[*]:** • Creation of extraordinary conservation ICS by MWD – 119,379 acre-feet[**] • Creation of extraordinary conservation ICS by IID – 21,983 acre-feet [*] ICS creation amounts are provisional until verified by Reclamation. [**] For the Parker Dam – Imperial Dam reach, MWD's ICS creation amount includes only conservation from the PVID/MWD Forbearance and Fallowing Program (119,379 acre-feet) **Additional Conservation[***]:** • Creation of excess conservation by IID – 58,954 acre-feet [***] Water conserved by IID; of this amount, 35,399 acre-feet were left in Lake Mead and 23,555 acre-feet were delivered to MWD. **Colorado River Water Delivery Agreement Conservation:** IID transferred to San Diego County Water Authority (SDCWA) – 100,000 acre-feet • **IID All-American Canal Lining Conservation** – 67,700 acre-feet – IID transfer to SDCVWA – 56,200 acre-feet – IID transfer to MWD/SLT settlement parties – 11,500 acre-feet

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 Accomplishments[2, 3]
Flow Changes Below Parker Dam to Imperial Dam (Table 2-16, after page 2-26) **(continued)**				**CVWD Coachella Canal Lining Project Conservation** – 27,626 acre-feet • CVWD transferred to SDCWA – 23,126 acre-feet – CVWD transferred to MWD/San Luis Rey (SLR) settlement parties – 4,500 acre-feet • IID reduction for miscellaneous Present Perfected Rights (PPRs) – 9,913 acre-feet • CVWD reduction from miscellaneous PPRs – 2,471 acre-feet **MWD/Bard Water District Seasonal Fallowing Program** – 2,310 acre-feet **Water Transfers** – 3,765 acre-feet **Reclamation Yuma Desalting Plant** – 170 acre-feet Collectively, conservation efforts have contributed to a net reduction in flow below Parker Dam of 422,995 acre-feet. Values are provided on a consumptive use basis.
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.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 Accomplishments[2, 3]
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	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. 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 Central Arizona Water Conservation District (CAWCD) and 5th priority Arizona water contractors 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. The 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.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 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 1,415,613 acre-feet. On January 10, 2017, the San Carlos Apache Tribe and the Pascua Yaqui Tribe entered into a lease for the delivery of up to 2,230 acre-feet of San Carlos Apache Tribe CAP water to the Pascua Yaqui Tribe during calendar year 2017. On February 23, 2017, the Fort McDowell Indian Community and the town of Gilbert entered into a lease for the delivery of 13,933 acre-feet of Fort McDowell Indian Community CAP water to the town of Gilbert during calendar year 2017. On April 25, 2017, the San Carlos Apache Tribe and the town of Gilbert entered into a lease for the delivery of 29,341 acre-feet of San Carlos Apache Tribe CAP water to the town of Gilbert during calendar year 2017. On April 13, 2017, the Valencia Water Company, LLC, assigned and transferred its CAP water entitlement of 43 acre-feet per year to the city of Buckeye. The city of Buckeye's Subcontract No. 07-XX-30-W0510 was amended to increase the city of Buckeye's annual CAP water entitlement from 25 acre-feet per year to 68 acre-feet per year. On April 23, 2017, the Ak-Chin Indian Community and Del Webb Corporation entered into a lease for the delivery of 1,800 acre-feet of the Ak-Chin Indian Community's CAP water to the Del Webb Corporation during calendar year 2017.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 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	**IID extraordinary conservation delivered to MWD** – 23,555 acre-feet **Water Transfers** – 3,765 acre-feet 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. **1988 IID/MWD Conservation** • Transfer to MWD – 105,000 acre-feet **IID Transferred to SDCWA** – 100,000 acre-feet **IID All-American Canal Lining Conservation** – 67,700 are-feet • IID Transfer to SDCWA – 56,200 acre-feet • IID Transfer to MWD/SLR settlement parties – 11,500 acre-feet **Coachella Canal Lining Project Conservation** – 27,626 acre-feet • CVWD transferred to SDCWA – 23,126 acre-feet • CVWD transferred to MWD/SLR settlement parties – 4,500 acre-feet **IID intra-priority 3 transfer to CVWD** – 45,000 acre-feet **IID reduction for miscellaneous PPRs** – 9,913 acre-feet **CVWD reduction for miscellaneous PPRs** – 2,471 acre feet
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 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	No off-stream storage of water took place in 2017.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 Accomplishments[2, 3]
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	No changes.
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	On April 4, 2017, Reclamation approved an inclusion of approximately 87.61 acres of land from the Central Irrigation and Drainage District service area.
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	The Valencia Water Company, LLC, Central Arizona Project Subcontract No. 10-XX-30-W0550 was terminated on April 13, 2017.
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 2017.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2017 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 2017.

B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2017

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, 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 fiscal year (FY) 2017.
Protected Bankline Maintenance and Care of Unprotected Banklines (page 2-43)	—	• Protected bankline location and maintenance	—	6		32.8	Phragmites Arrowed Saltcedar	1	1, 3, and 6	Regrade the slope and placed riprap to stabilize bankline.

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	—	7	Morales Dam	21.5	None	0	1, 3, and 6	Levee retaining wall repair (adjacent to MOFE III).
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 FY17.
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 FY17.
Stockpiles (page 2-49; Table 2-37, page 2-49)	—	• Location of three future stockpiles	—							No implementation in FY17.
Riprap Placement and Haul Roads (page 2-50)	—	• Haul roads and riprap storage location and maintenance	—	7	Limitrophe	0 to 24	None	0	1, 3, and 6	Limitrophe: 59.2 miles (mi)
				6	Yuma	24 to 50	None	0	1, 3, and 6	Yuma: 158.1 mi
				6	Laguna	24 to 50	None	0	1, 3, and 6	Laguna: 3 mi
				6	Gila River Area	24 to 50	None	0	1, 3, and 6	Gila River Area: 19.4 mi
				4	Cibola	87 to 193	None	0	1, 3, and 6	Cibola: 67.6 mi
				4	Palo Verde	87 to 193	None	0	1, 3, and 6	Palo Verde: 0.0 mi
				3	Mohave Valley	193 to 276	None	0	1, 3, and 6	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	South Gila Well Field	34	None	0	1, 3, and 6	Maintenance work on SG-7, SG-10, SG-713, and SG-714. Pilot hole drilled at SG-4.
		• Maintenance of open channel drains and outfall channels		7	Yuma Valley Well Field	A0 – A29	None	0	1, 3, and 6	Maintenance work on YV-7, YV-13, YV-16 ½, YV-23, and YV-25.
		• Maintenance and replacement of gauging stations, survey line markers, and boat ramps		7	MODE	26	None	0	1, 3, and 6	Strand Avenue Bridge crossing the MODE was replaced, and a box culvert was installed.
		• Senator Wash penstock repairs		5	Senator Wash	C 51.2	None	0	1, 3, and 6	Two culverts were removed from Middle Pond, and two low-flow crossings were established. Culverts will be replaced in the future.
Maintenance Activities at the Southerly International Boundary (page 2-52)	—			7	242 Well Field and Conveyance System	0–5	None	5	1, 3, and 6	Maintenance work performed on various wells in the 242 well field. Work to improve/develop the conveyance system and road maintenance were also performed.
2.2.3.3 Backwater Maintenance (page 2-53; Table 2-37, page 2-54)	—	• Backwater maintenance	—							No implementation in FY17.

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	
Mohave Division (page 2-55; Table 2-38, page 2-56)	—	• Backwater maintenance	—							No implementation in FY17.
Parker Division (page 2-57; Table 2-39, page 2-57)	—	• Backwater maintenance	—	4 4	‘Ahakhav Aha Quin	172.85–174.15 144.5–146	Cattails Arrowweed Saltcedar	3 10	1, 3, and 6 1, 3, and 6	Inlet and outlet replaced at ‘Ahakhav. Aha Quin West Channel cleared of sediment.
Palo Verde Division (page 2-58; Table 2-40, page 2-58)	—	• Backwater maintenance	—							No implementation in FY17.
Cibola Division (page 2-58; Table 2-41, page 2-59)	—	• Backwater maintenance	—							No implementation in FY17.
Imperial Division (page 2-59; Table 2-42, page 2-59)	—	• Backwater maintenance	—							No implementation in FY17.
Laguna Division (page 2-60; Table 2-43, page 2-60)	—	• Backwater maintenance	—							No implementation in FY17.
Yuma Division (page 2-60; Table 2-44, page 2-61)	—	• Backwater maintenance	—							No implementation in FY17.
Limitrophe Division Mitigation Obligations (page 2-61; Table 2-45, page 2-62)	—	—	—							No implementation in FY17.
2.2.3.4 Limitrophe Division Maintenance (page 2-62)	—	—	—							No implementation in FY17.
2.2.4 Future Non-Flow-Related Actions (page 2-63)	—	—	—							

Federal Covered Actions *Biological Assessment* Chapter 2	Covered Actions Summary			Covered Actions Implemented						Notes
	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions	Reach	Location	River Miles	Habitat Type Impacted	Number of Acres Impacted	Complied with Avoidance and Minimization Measures	
2.2.4.1 Topock Marsh (page 2-63)	—	—	—							No implementation in FY17.
2.2.4.2 Laguna Reservoir (page 2-63)	—	—	—	6	Laguna Dam	49.0	Cattails	0	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 FY17.
2.2.4.4 Proposed Jetties (page 2-67; Table 2-48, page 2-67)	—	—	—							No implementation in FY17.
2.3 WESTERN AREA POWER ADMINISTRATION										No implementation in FY17.
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 Athel California fan palm Fountain grass Mexican paloverde Prennial pepperweed Tamarisk	2 acres 0.1 acre Small infestations		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 enhance-ment of grow-out ponds, construction of docks, and creation of angler enhancement structures			Lake Mohave			1,250 square feet		Enhancement of fish habitat, through submersion of brush or polyvinyl chloride structures, to create structural diversity, at Box, Carp, Princess, Shoshone, and Solicitor Coves in partnership with the Nevada Division of Wildlife.
2.4.4 Boating Access (page 2-72)		• Maintenance and enhance-ment of boating access on Lake Mead and Lake Mohave								No implementation in FY17.
2.5 BUREAU OF INDIAN AFFAIRS										
2.5.2.1 Ongoing Irrigation System Operation and Maintenance (page 2-74)		• Irrigation system operation and maintenance for existing irrigation projects		3	Fort Mohave	—	None	0	1 and 3	Continued existing practices.
				3	Chemehuevi	—	None	0	1 and 3	Continued existing practices.
				4	Colorado River Indian Tribe	—	None	0	1 and 3	Continued existing practices.
				6	Fort Yuma	—	None	0	1 and 3	Continued existing practices.
				7	Cocopah	—	None	0	1 and 3	Continued existing practices.

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 FY17.
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 FY17.
2.5.3.2 Future Water Conservation Practices (page 2-85)		• Installation, operation, and maintenance of new equipment								No implementation in FY17.
2.5.3.3 Future Farmland Development (page 2-85)		• Develop additional agricultural acreage, including construction of irrigation systems								No Implementation in FY17.
2.5.3.6 Future Wildland Fire Management (page 2-88)		• Implementation of new fuel management projects								No implementation in FY17.

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	
2.6 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 2017

Non-Federal Covered Activities *Habitat Conservation Plan* Chapter 2	Covered Activities Summary	Covered Activities Implemented						Notes
		Reach	Location	River Miles	Habitat Type Impacted	Number of Acres Impacted	Complied with Avoidance and Minimization Measures	
2.2 ARIZONA								
2.2.1 Ongoing Flow-Related Covered Activities[1] (page 2-4)	• Diversion of up to 2.8 maf of Arizona's full annual entitlement, plus surplus, plus Arizona's share of any unused apportionment, plus the volume of return flow, as applicable • 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 FY17.

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 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: 2 nights gillnets **Yuma Region:** Lake Havasu: 3 nights electrofishing and 2 days of flathead catfish electrofishing **Palo Verde/Cibola Division:** 3 days electrofishing **Imperial Division:** 3 nights electrofishing in backwaters and 2 days of electrofishing during the Flathead survey **Mittry Lake:** 2 nights electro-fishing
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.

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	
Law Enforcement Patrol Activities (page 2-9)	• Administer law enforcement and boating safety program using watercraft patrols							An estimated 5,281 hours of watercraft law enforcement. Includes all Arizona Game and Fish Department Regions III and IV watercraft law enforcement patrols within the LCR MSCP action area.
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	13.76 acres 4.53 acres Only emergency work during marsh bird breeding season March 15 – July 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 FY17.

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	
2.4.3.1 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 22 habitat modules were placed on approximately 0.1 acre at Princess, Prospect, Shoshone, and Solicitor Coves on Lake Mohave as part of a cooperative project with the National Park Service and the Arizona Game and Fish Department.
	• Aquatic, wetland, and riparian revegetation enhancement activities	—	—	—	—	—	—	No implementation in FY17.
	• 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 enforce-ment 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
Fish and Wildlife Service
Arizona Ecological Services Office
9828 N. 31st Avenue, C3
Phoenix, Arizona 85051-2517
Telephone: (602) 242-0210 Fax: (602) 242-2513

In reply refer to:

OFFICIAL FILE COPY RECEIVED 7/24/2017		
REPLY DATE		
DATE	INITIALS	CODE
7/24/17		8000
CLASSIFICATION		
PROJECT		
CONTROL NO.		
FOLDER I.D.		
KEYWORD		

AESO/SE
22410-2004-F-0161

July 14, 2017

Memorandum

To: John Swett, 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 *Consistency Review for Final Implementation Report, Fiscal Year 2018 Work Plan and Budget, Fiscal Year 2016 Accomplishment Report*

This responds to your memorandum dated July 5, 2015, requesting review by the Fish and Wildlife Service (Service) of the combined document containing the Fiscal Year 2018 Work Plan and Budget, and the Fiscal Year 2016 Accomplishment Report 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)(B) permit dated April 4, 2005, (TE-086834-0) 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 2016 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 2016 (October 1, 2015-September 31, 2016), including the reporting of incidental take that occurred during this period. The LCR MSCP Steering Committee voted to approve the report and submission to the Service on June 28, 2017.

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)(B) permit and the reporting requirements of the terms and conditions 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 2018 Work Plan and Budget contains the work tasks and estimated costs for LCR MSCP implementation during Fiscal Year 2018 beginning on October 1, 2017. 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)(B) permit and biological opinion.

We appreciate the positive working relationship between the Service 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 Jessica Gwinn or me at (602) 242-0210.

Steven L. Spangle

cc (electronic):
Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES, Marty Tuegel)

W:\Jessica Gwinn\LCR MSCP 16-17 WorkplanBudget concurrence 07122017.docx: jkey

Attachment D – Financial Statement

D-1: Required Contributions

	FY06	FY07	FY08	FY09	FY10	Subtotal FY06 – FY10
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
Reclamation 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
Arizona 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
Nevada 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**
California 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	
Reclamation 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
Arizona 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
Nevada 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**	**91,212.48**	**448,791.84**
Metropolitan Water District of Southern California	**613,650.48**	**623,440.04**	**644,564.86**	**0**	**105,624.14**	**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**
California 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	FY16	FY17	Total FY06 – FY17
Reclamation				
Cash	86,558,220.00	15,370,734.00	15,437,226.00	150,425,052.00
Funding Credit	3,800,520.00	0	0	3,800,520.00
Reclamation Total	**90,358,740.00**	**15,370,734.00**	**15,437,226.00**	**154,225,572.00**
Arizona				
Cash	5,506,147.38	4,296,894.80	4,315,482.66	17,389,408.44
Funding Credit	165.12	0	0	165.12
Habitat Maintenance Fund	7,379,692.50	0	0	8,116,692.50
Remedial Measures Fund	667,806.00	276,013.00	277,207.00	1,221,026.00
Arizona Total	**13,553,811.00**	**4,572,907.80**	**4,592,689.66**	**26,727,292.06**
Nevada				
Cash	18,053,715.27	3,201,558.35	3,215,407.92	33,690,816.74
Funding Credit	330.23	0	0	330.23
Habitat Maintenance Fund	7,379,692.50	0	0	8,116,692.50
Remedial Measures Fund	1,237,884.00	276,013.00	277,207.00	1,791,104.00
In-Kind Credit	436,000.00	0	0	872,000.00
Nevada Total	**27,107,622.00**	**3,477,571.35**	**3,492,614.92**	**44,470,943.47**
California				
Cash	**28,693,127.34**	**6,399,331.23**	**6,427,014.00**	**58,366,367.50**
Metropolitan Water District of Southern California	12,095,549.69	3,545,435.31	3,560,772.46	29,125,813.37
Imperial Irrigation District	7,454,596.05	1,268,085.56	1,273,571.15	12,723,609.70
Coachella Valley Water District	4,066,143.30	691,683.03	694,675.17	6,940,150.76
Los Angeles Department of Water and Power	2,304,147.87	391,953.72	393,649.26	3,932,752.10
San Diego County Water Authority	0	0	0	456,454.63
Palo Verde Irrigation District	739,618.77	156,332.10	157,008.37	1,717,511.52
Southern California Public Power Authority	948,766.78	161,392.71	162,090.87	1,619,368.52
Southern California Edison Company	813,228.66	138,336.61	138,935.03	1,388,030.16
Bard	90,358.74	15,370.73	15,437.23	154,225.58
Colorado River Board of California	90,358.74	15,370.73	15,437.23	154,225.58
Needles	90,358.74	15,370.73	15,437.23	154,225.58
Funding Credit				
San Diego County Water Authority	2,168,609.76	368,897.62	370,493.42	2,908,000.80
Metropolitan Water District of Southern California	1,987,279.52	0	0	1,987,279.52
Habitat Maintenance Fund	**14,759,385.00**	**0**	**0**	**16,233,385.00**
Remedial Measures Fund	**2,088,905.38**	**552,026.00**	**554,414.00**	**3,195,345.38**
California Total	**49,697,307.00**	**7,320,254.85**	**7,351,921.42**	**83,027,336.47**
TOTAL	**180,717,480.00**	**30,741,468.00**	**30,874,452.00**	**308,451,144.00**

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 – Revised Inflation Rate

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	1.258[1]	415,743.84
2012	3,006,392.61	330,480.00	1.278[1]	422,353.44
2013	2,675,912.61	330,480.00	1.321[1]	436,564.08
2014	2,345,432.61	330,480.00	1.347[1]	445,156.56
2015	2,014,952.61	330,480.00	1.358	448,791.84
2016	1,684,472.61	265,968.00	1.387	368,897.62
2017	1,418,504.61	265,968.00	1.393	370,493.42
2018	1,152,536.61	265,968.00	1.410	375,014.88
2019	886,568.61	265,968.00	1.442	383,525.86
2020	620,600.61	265,968.00		
2021	354,632.61	265,968.00		
2022	88,664.61	88,664.61		

[1] Revised inflation index.

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 – Revised Inflation Rate

FY	Total 2003 Credits Available	2003 Credits Used	Composite i	Current Year Credits
2011	1,545,719.10	515,239.70	1.258[1]	648,171.54
2012	1,030,479.40	515,239.70	1.278[1]	658,476.34
2013	515,239.70	515,239.70	1.321[1]	680,631.64
2014	0			

[1] Revised inflation index.

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 – 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	(2,863,394.87)	1.083	(2,643,947.25)	2,951,588.79
2007	2,314,455.02	1.122	2,062,794.14	5,014,382.93
2008	(495,025.15)	1.187	(417,038.88)	4,597,344.05
2009	1,833,416.80	1.210	1,515,257.69	6,112,601.73
2010	7,099,834.71[2]	1.294	5,486,734.71	11,599,336.44
2011	796,149.37	1.258[1]	632,869.13	12,232,205.57
2012	(3,105,120.42)	1.278[1]	(2,429,671.69)	9,802,533.88
2013	(2,260,293.50)[2]	1.321[1]	(1,711,047.31)	8,091,486.57
Underfunding 2014	(3,800,520.00)	1.347[1]	(2,821,469.93)	5,270,016.64
2014	(1,054,326.44)	1.347[1]	(782,721.93)	4,487,294.71
2015	1,502,469.24	1.358	1,106,383.83	5,593,678.54
2016	(666,351.00)	1.387	(480,426.10)	5,113,252.44
2017	(724,589.65)	1.393	(520,164.86)	4,593,087.58

[1] Revised inflation index.

[2] Revised based on expenditure adjustment.

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[1]	$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[1]	$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[1]	$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[1]	$5,742,000	$1,186,680.00	$6,928,680.00	$26,310,680.00	
2014 Underfunding Makeup						$654,015		$654,015.00	$26,964,695.00	
2014 Underfunding Overpay							$22,025.64	$22,025.64	$26,986,720.64	$27,619,568.11
2015 Underfunding Makeup							$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
2016										$33,464,227.50
2017										$33,771,897.09
Total	**$25,000,000**	**$24,070,000**	**$930,000**	**$25,000,000**						
Program Total	**$25,000,000**			**$25,000,000**						

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as "Underfunding Makeup."

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]	$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]	$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]	$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]	$1,435,500.00	$296,670	$1,732,170.00	$6,577,670.00	
2014 Underfunding Makeup						$327,007.50		$327,007.50	$6,904,677.50	
2014 Underfunding 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
2016										$8,146,823.02
2017										$8,186,051.73
Total	**$6,250,000**	**$6,017,500**	**$232,500**	**$6,250,000**						
Program Total	**$6,250,000**			**$6,250,000**						

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as "Underfunding Makeup."

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
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]	$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]	$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]	$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]	$1,435,500.00	$296,670.00	$1,732,170.00	$6,577,670.00	
2014 Underfunding Makeup						$327,007.50		$327,007.50	$6,904,677.50	
2014 Underfunding 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
2016										$8,274,230.08
2017										$8,335,230.87
Total	**$6,250,000**	**$6,017,500**	**$232,500**	**$6,250,000**						
Program Total	**$6,250,000**			**$6,250,000**						

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as "Underfunding Makeup."

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[1]	$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[1]	$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[1]	$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[1]	$2,871,000.00	$593,340.00	$3,464,340.00	$13,155,340.00	$13,677,112.47
2015 Underfunding Makeup							$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
2016										$17,043,174.40
2017										$17,250,614.49
Total	**$12,500,000**	**$12,035,000**	**$465,000**	**$12,500,000**						
Program Total	**$12,500,000**			**$12,500,000**						

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as "Underfunding Makeup."

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[1]	$998,298.00	$0	$998,298.00	$998,298.00	$1,001,102.71
2014	$266,000	$266,000	$0	$266,000	1.276[1]	$339,416.00	$0	$339,416.00	$1,337,714.00	
2014 Underfunding Makeup						$37,373.00		$37,373.00	$1,375,087.00	
2014 Underfunding Makeup Additional			$756,381.59	$756,381.59	1.347		$1,018,846.00	$1,018,846.00	$2,393,933.00	
2014 Underfunding Overpay							$38,632.44	$38,632.44	$2,432,565.44	$2,441,713.88
2015 Underfunding Makeup						$37,373.00		$37,373.00	$2,469,938.44	
2015 Underfunding Makeup 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
2016	$796,000	$796,000	$0	$796,000	1.387	$1,104,052.00	$0	$1,104,052.00	$5,098,647.38	$5,154,340.85
2017	$796,000	$796,000	$0	$796,000	1.393	$1,108,828.00	$0	$1,108,828.00	$6,207,475.38	$6,315,323.07
2018	$796,000	$796,000	$0	$796,000	1.410	$1,122,360.00	$0	$1,122,360.00		
2019	$796,000	$796,000	$0	$796,000	1.442	$1,147,832.00	$0	$1,147,832.00		
Total	$4,514,000	$4,514,000	$1,648,780.54	$6,162,780.54						
Program Total	**$13,270,000**			**$13,270,000.00**						

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as "Underfunding Makeup."

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[1]	$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[1]	$84,854.00	$0	$84,854.00	$334,428.50	
2014 Underfunding Makeup						$18,686.50		$18,686.50	$353,115.00	
2014 Underfunding Makeup Additional			$166,580.55	$166,580.55	1.347		$224,384.00	$224,384.00	$577,495.00	
2014 Underfunding 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
2016	$199,000	$199,000	$0	$199,000	1.387	$276,013.00	$0	$276,013.00	$943,819.00	$944,722.67
2017	$199,000	$199,000	$0	$199,000	1.393	$277,207.00	$0	$277,207.00	$1,221,026.00	$1,227,167.99
2018	$199,000	$199,000	$0	$199,000	1.410	$280,590.00	$0	$280,590.00		
2019	$199,000	$199,000	$0	$199,000	1.442	$286,958.00	$0	$286,958.00		
Total	**$1,128,500**	**$1,128,500**	**$166,580.55**	**$1,295,080.55**						
Program Total	**$3,317,500**			**$3,317,500.00**						

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as "Underfunding Makeup."

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[1]	$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[1]	$84,854.00	$0	$84,854.00	$334,428.50	
2014 Underfunding Makeup						$18,686.50		$18,686.50	$353,115.00	
2014 Underfunding Makeup Additional			$589,801.04	$589,801.04	1.347		$794,462.00	$794,462.00	$1,147,577.00	
2014 Underfunding 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
2016	$199,000	$199,000	$0	$199,000	1.387	$276,013.00	$0	$276,013.00	$1,513,897.00	$1,524,135.35
2017	$199,000	$199,000	$0	$199,000	1.393	$277,207.00	$0	$277,207.00	$1,791,104.00	$1,811,095.89
2018	$199,000	$199,000	$0	$199,000	1.410	$280,590.00	$0	$280,590.00		
2019	$199,000	$199,000	$0	$199,000	1.442	$286,958.00	$0	$286,958.00		
Total	**$1,128,500**	**$1,128,500**	**$589,801.04**	**$1,718,301.04**						
Program Total	**$3,317,500**			**$3,317,500.00**						

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as "Underfunding Makeup."

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[1]	$499,149.00	$0	$499,149.00	$499,149.00	$501,926.51
2014	$133,000	$133,000	$0	$133,000.00	1.276[1]	$169,708.00	$0	$169,708.00	$668,857.00	$677,370.74
2015 Underfunding Makeup						$37,373.00		$37,373.00	$706,230.00	
2015 Underfunding Makeup 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
2016	$398,000	$398,000	$0	$398,000	1.387	$552,026.00	$0	$552,026.00	$2,640,931.38	$2,685,482.83
2017	$398,000	$398,000	$0	$398,000	1.393	$554,414.00	$0	$554,414.00	$3,195,345.38	$3,277,059.19
2018	$398,000	$398,000	$0	$398,000	1.410	$561,180.00	$0	$561,180.00		
2019	$398,000	$398,000	$0	$398,000	1.442	$573,916.00	$0	$573,916.00		
Total	**$2,257,000**	**$2,257,000**	**$892,398.95**	**$3,149,398.95**						
Program Total	**$6,635,000**			**$6,635,000.00**						

[1] Original inflation index. The difference between the original inflation index and the revised inflation index is shown as “Underfunding Makeup.”

D-3c: *Land and Water Fund*

FY	Current Year Contributions	Current Year Withdrawals	Cumulative Contributions
2011	$8,900,000	$0	$8,900,000
2012	$4,600,000	$0	$13,500,000
2013	$0	$0	$13,500,000
2014	$0	$0	$13,500,000
2015	$6,100,000	$0	$19,600,000
2016	$4,100,000	$8,300,000	$15,400,000
2017	$0	$0	$15,400,000
2018	$0	$0	$15,400,000
2019	$3,300,000	$0	$18,700,000

D-4: Cumulative Program Accomplishment

D-4a: Program Accomplishment FY04 – FY05

Work Task	FY04 Obligations	FY04 Expenditures	FY05 Obligations	FY05 Expenditures	Subtotal Expenditures FY04 – FY05
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

Work Task	FY04 Obligations	FY04 Expenditures	FY05 Obligations	FY05 Expenditures	Subtotal Expenditures FY04 – FY05
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
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

Work Task	FY04 Obligations	FY04 Expenditures	FY05 Obligations	FY05 Expenditures	Subtotal Expenditures FY04 – FY05
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
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

Work Task	FY04 Obligations	FY04 Expenditures	FY05 Obligations	FY05 Expenditures	Subtotal Expenditures FY04 – FY05
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
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

Work Task	FY04 Obligations	FY04 Expenditures	FY05 Obligations	FY05 Expenditures	Subtotal Expenditures FY04 – FY05
Total E	**$2,332,285.71**	**$1,281,620.71**	**$1,517,881.35**	**$1,344,160.75**	**$2,625,781.46**
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**

D-4b: Program Accomplishment FY06 – FY10

Work Task	FY06 Obligations	FY06 Expenditures	FY07 Obligations	FY07 Expenditures	FY08 Obligations	FY08 Expenditures	FY09 Obligations	FY09 Expenditures	FY10 Obligations	FY10 Expenditures	Subtotal Expenditures FY06 – FY10
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	$1,297,074.74	$1,255,161.41[1]	$5,449,608.25
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**	**$1,297,074.74**	**$1,255,161.41**	**$5,580,143.47**
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

Work Task	FY06 Obligations	FY06 Expenditures	FY07 Obligations	FY07 Expenditures	FY08 Obligations	FY08 Expenditures	FY09 Obligations	FY09 Expenditures	FY10 Obligations	FY10 Expenditures	Subtotal Expenditures FY06 – FY10
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
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

Work Task	FY06 Obligations	FY06 Expenditures	FY07 Obligations	FY07 Expenditures	FY08 Obligations	FY08 Expenditures	FY09 Obligations	FY09 Expenditures	FY10 Obligations	FY10 Expenditures	Subtotal Expenditures FY06 – FY10
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
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

Work Task	FY06 Obligations	FY06 Expenditures	FY07 Obligations	FY07 Expenditures	FY08 Obligations	FY08 Expenditures	FY09 Obligations	FY09 Expenditures	FY10 Obligations	FY10 Expenditures	Subtotal Expenditures FY06 – FY10
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
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

Work Task	FY06 Obligations	FY06 Expenditures	FY07 Obligations	FY07 Expenditures	FY08 Obligations	FY08 Expenditures	FY09 Obligations	FY09 Expenditures	FY10 Obligations	FY10 Expenditures	Subtotal Expenditures FY06 – FY10
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
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

Work Task	FY06 Obligations	FY06 Expenditures	FY07 Obligations	FY07 Expenditures	FY08 Obligations	FY08 Expenditures	FY09 Obligations	FY09 Expenditures	FY10 Obligations	FY10 Expenditures	Subtotal Expenditures FY06 – FY10
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**	**$19,518,279.19**	**$18,411,996.51**	**$75,084,104.10**

[1]Adjustment in A1 of $115 in 2010 due to an expenditure being applied to partner contribution.

D-4c: Program Accomplishment FY04 – FY15

Work Task	FY11 Obligations	FY11 Expenditures	FY12 Obligations	FY12 Expenditures	FY13 Obligations	FY13 Expenditures	FY14 Obligations	FY14 Expenditures	FY15 Obligations	FY15 Expenditures	Expenditures Grand Total FY04 – FY15
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	$10,995,120.59
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**	**$11,125,655.81**
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	$258,129.37[2]	$305,132.56	$308,238.89	$312,306.38	$642,201.69	$3,410,541.16
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**	**$16,263,577.02**
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

Work Task	FY11 Obligations	FY11 Expenditures	FY12 Obligations	FY12 Expenditures	FY13 Obligations	FY13 Expenditures	FY14 Obligations	FY14 Expenditures	FY15 Obligations	FY15 Expenditures	Expenditures Grand Total FY04 – FY15
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
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

Work Task	FY11 Obligations	FY11 Expenditures	FY12 Obligations	FY12 Expenditures	FY13 Obligations	FY13 Expenditures	FY14 Obligations	FY14 Expenditures	FY15 Obligations	FY15 Expenditures	Expenditures Grand Total FY04 – FY15
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
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

Work Task	FY11 Obligations	FY11 Expenditures	FY12 Obligations	FY12 Expenditures	FY13 Obligations	FY13 Expenditures	FY14 Obligations	FY14 Expenditures	FY15 Obligations	FY15 Expenditures	Expenditures Grand Total FY04 – FY15
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
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

Work Task	FY11 Obligations	FY11 Expenditures	FY12 Obligations	FY12 Expenditures	FY13 Obligations	FY13 Expenditures	FY14 Obligations	FY14 Expenditures	FY15 Obligations	FY15 Expenditures	Expenditures Grand Total FY04 – FY15
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
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

Work Task	FY11 Obligations	FY11 Expenditures	FY12 Obligations	FY12 Expenditures	FY13 Obligations	FY13 Expenditures	FY14 Obligations	FY14 Expenditures	FY15 Obligations	FY15 Expenditures	Expenditures Grand Total FY04 – FY15
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**
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**	**$222,611,893.15**

[1]Adjustment in B2 of $85,785,99 in FY13 due to a reversal of an accrual.

D-4d: Program Accomplishment FY04 – FY17

Work Task	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	Expenditures Grand Total FY04 – FY17
A1	$1,188,765.48	$1,140,032.88	$1,196,839.51	$1,169,900.60							$13,305,054.07
G2	$0.00	$0.00	$0.00	$0.00							$130,535.22
Total A	**$1,188,765.48**	**$1,140,032.88**	**$1,196,839.51**	**$1,169,900.60**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$13,435,589.29**
B1	$216,932.74	$195,408.34	$137,699.21	$207,830.04							$2,561,900.75
B2	$309,156.64	$221,205.32	$299,717.05	$254,893.46							$3,886,639.94
B3	$269,149.88	$152,729.68	$19,643.79	$130,928.66							$1,528,072.43
B4	$253,146.40	$156,044.68	$236,605.59	$243,054.67							$2,541,864.43
B5	$731,953.63	$335,097.81	$162,031.14	$441,157.56							$3,515,792.26
B6	$241,051.09	$256,919.15	$280,966.59	$408,840.78							$1,316,858.04
B7	$149,862.21	$162,654.16	$174,790.62	$175,104.04							$2,388,129.07
B8	$140,133.31	$165,503.33	$130,604.88	$51,591.78							$1,095,900.17
B9	$0.00	$0.00	$0.00	$0.00							$3,607.25
B10	$0.00	$0.00	$0.00	$0.00							$554,821.69
B11	$62.19	$62.19	$0.00	$0.00							$429,016.64
B12	$70,499.86	$30,123.36	$76,778.77	$114,158.57							$16,493,644.94
Total B	**$2,381,947.95**	**$1,675,748.02**	**$1,518,837.64**	**$2,027,559.56**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$19,966,884.60**
C1	$0.00	$0.00	$0.00	$0.00							$146,658.15
C2	$11,311.51	$9,416.92	$10,844.47	$2,739.06							$128,007.16
C3	$0.00	$0.00	$0.00	$0.00							$278,663.86
C4	$0.00	$4,898.43	$0.00	$0.00							$119,731.27
C5	$0.00	$0.00	$0.00	$0.00							$553,877.44
C6	$0.00	$0.00	$0.00	$0.00							$101,441.68
C7	$0.00	$0.00	$0.00	$0.00							$544,649.77

Work Task	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	Expenditures Grand Total FY04 – FY17
C8	$0.00	$0.00	$0.00	$0.00							$580,317.78
C9	$0.00	$0.00	$0.00	$0.00							$112,855.62
C10	$0.00	$31,450.75	$0.00	$0.00							$1,096,173.01
C11	$0.00	$27,562.06	$0.00	$0.00							$1,154,850.76
C12	$0.00	$0.00	$0.00	$0.00							$1,036,266.87
C13	$184.39	$232,180.41	$0.00	$0.00							$1,927,788.82
C14	$0.00	$0.00	$229.50	$229.50							$288,216.61
C15	$0.00	$0.00	$0.00	$0.00							$495,740.45
C16	$0.00	$0.00	$0.00	$0.00							$55,332.60
C17	$0.00	$0.00	$0.00	$0.00							$9,750.00
C18	$0.00	$0.00	$0.00	$0.00							$41,981.82
C19	$0.00	$0.00	$0.00	$0.00							$0.00
C20	$0.00	$0.00	$0.00	$0.00							$53,779.96
C21	$0.00	$0.00	$0.00	$0.00							$70,000.00
C22	$0.00	$0.00	$0.00	$0.00							$0.00
C23	$0.00	$0.00	$0.00	$0.00							$356,826.42
C24	$302,717.48	$328,007.72	$349,373.16	$282,033.90							$2,317,424.51
C25	$197,068.70	$156,562.06	$186,861.08	$216,239.86							$2,017,243.48
C26	$0.00	$0.00	$0.00	$0.00							$128,811.07
C27	$801.21	$13,260.91	$0.00	$5,887.09							$457,853.18
C28	$0.00	$0.00	$0.00	$0.00							$153,082.74
C29	$0.00	$0.00	$0.00	$0.00							$206,526.28
C30	$0.00	$0.00	$0.00	$0.00							$340,019.29
C31	$148,968.92	$109,157.90	$145,010.65	$118,591.23							$877,780.46
C32	$99,638.94	$99,638.94	$117,484.11	$117,484.11							$908,080.02

Work Task	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	Expenditures Grand Total FY04 – FY17
C33	$0.00	$0.00	$0.00	$0.00							$531,624.57
C34	$0.00	$0.00	$0.00	$0.00							$124,019.12
C35	$0.00	$0.00	$0.00	$0.00							$520,917.06
C36	$0.00	$0.00	$0.00	$0.00							$251,868.95
C37	$0.00	$0.00	$0.00	$0.00							$291,163.14
C38	$0.00	$0.00	$0.00	$0.00							$6,250.70
C39	$0.00	$0.00	$0.00	$0.00							$1,170,956.14
C40	$274,332.93	$168,168.67	$399,170.09	$171,772.56							$1,100,389.59
C41	$0.00	$0.00	$0.00	$0.00							$186,501.61
C42	$0.00	$0.00	$0.00	$0.00							$460,198.17
C43	$39,374.35	$47,121.13	$4,473.02	$10,459.89							$167,680.65
C44	$0.00	$0.00	$0.00	$0.00							$242,133.66
C45	$0.00	$0.00	$0.00	$0.00							$717,366.60
C46	$0.00	$0.00	$0.00	$0.00							$296,058.13
C47	$0.00	$0.00	$0.00	$0.00							$717,535.15
C48	$0.00	$0.00	$0.00	$0.00							$101,084.94
C49	$0.00	$0.00	$0.00	$0.00							$249,235.78
C50	$0.00	$0.00	$0.00	$0.00							$0.00
C51	$0.00	$0.00	$0.00	$0.00							$42,560.10
C52	$151,012.21	$119,347.25	$169,883.43	$193,058.85							$825,675.70
C53	$112,896.35	$122,886.58	$81,661.52	$103,342.63							$637,118.37
C54	$0.00	$0.00	$0.00	$0.00							$9,110.44
C55	$0.00	$0.00	$0.00	$0.00							$0.00
C56	$0.00	$0.00	$0.00	$0.00							$22,208.29
C57	$3,227.48	$150,244.17	$4,210.82	$4,210.82							$696,333.92

Work Task	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	Expenditures Grand Total FY04 – FY17
C58	$0.00	$0.00	$0.00	$0.00							$30,179.14
C59	$167,129.76	$31,396.71	$169,998.97	$65,937.84							$207,720.00
C60	$11.05	$77,329.28	$230,860.93	$42,373.65							$239,770.48
C61	$175,395.05	$163,661.99	$38,271.69	$123,566.67							$497,122.01
C62	$147,788.13	$165,922.17	$12,554.37	$70,977.85							$488,287.85
C63	$90,290.50	$90,290.50	$141,661.66	$60,524.10							$253,566.11
C64	$656,351.17	$540,791.98	$452,557.00	$334,261.50							$1,377,928.07
C65	$99,329.26	$84,318.17	$135,135.12	$74,131.08							$179,187.51
C66	$83,717.80	$83,717.80	$43,378.83	$43,378.83							$127,096.63
Total C	**$2,761,547.19**	**$2,857,332.50**	**$2,693,620.42**	**$2,041,201.02**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$29,328,579.66**
D1	$36,470.97	$36,470.97	$37,432.99	$37,432.99							$364,376.83
D2	$748,047.05	$760,095.13	$812,409.57	$985,972.16							$9,367,975.99
D3	$0.00	$0.00	$0.00	$0.00							$738,520.29
D4	$0.00	$0.00	$0.00	$0.00							$261,091.38
D5	$234,559.10	$234,559.10	$233,591.60	$233,591.60							$3,319,923.22
D6	$152,057.03	$297,303.10	$21,818.80	$21,818.80							$2,635,887.80
D7	$688,770.88	$860,371.04	$621,507.82	$588,971.56							$6,777,978.78
D8	$943,608.61	$775,008.88	$940,176.70	$964,561.65							$7,463,124.61
D9	$379,451.91	$470,531.02	$125,396.79	$196,587.81							$2,337,352.30
D10	$44,452.69	$44,452.69	$32,248.98	$32,248.98							$288,928.41
D11	$0.00	$0.00	$0.00	$0.00							$269,097.12
D12	$31,285.23	$31,006.41	$17,835.26	$17,835.26							$486,256.04

Work Task	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	Expenditures Grand Total FY04 – FY17
D13	$0.00	$0.00	$0.00	$0.00							$29,381.98
D14	$0.00	$0.00	$0.00	$0.00							$0.00
Total D	**$3,258,703.47**	**$3,509,798.34**	**$2,842,418.51**	**$3,079,020.81**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$34,339,894.75**
E1	$209,035.87	$208,513.89	$205,584.41	$163,333.70							$4,359,323.11
E2	$0.00	$0.00	$0.00	$0.00							$795,399.33
E3	$0.00	$0.00	$0.00	$0.00							$871,228.19
E4	$449,393.91	$424,660.32	$488,325.18	$484,508.12							$10,230,059.70
E5	$661,721.39	$627,510.72	$436,085.32	$478,696.89							$12,457,921.39
E6	$0.00	$0.00	$0.00	$0.00							$119,060.75
E7	$0.00	$0.00	$0.00	$0.00							$330,621.55
E8	$0.00	$0.00	$0.00	$0.00							$860,184.06
E9	$293,218.97	$354,396.15	$131,649.13	$135,626.92							$7,312,979.80
E10	$0.00	$0.00	$0.00	$0.00							$0.00
E11	$0.00	$0.00	$0.00	$0.00							$0.00
E12	$0.00	$0.00	$0.00	$0.00							$76,211.53
E13	$0.00	$0.00	$24,709.69	$24,709.69							$152,046.51
E14	$403,637.91	$339,732.72	$496,526.61	$503,105.02							$10,512,052.06
E15	$0.00	$0.00	$0.00	$0.00							$1,693,981.04
E16	$785,451.33	$771,277.61	$2,966,489.85	$1,678,250.45							$5,403,846.89
E17	$0.00	$104,457.79	$0.00	($769,251.82)							$475,824.63
E18	$179,921.81	$96,635.50	$212,393.13	$171,340.52							$1,876,740.78
E19	$0.00	$0.00	$0.00	$0.00							$0.00
E20	$0.00	$0.00	$0.00	$0.00							$35,000.00
E21	$10,548,669.63	$9,372,466.23	$689,679.10	$1,309,830.18							$11,026,508.63
E22	$0.00	$0.00	$0.00	$0.00							$4,028.00

Work Task	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	Expenditures Grand Total FY04 – FY17
E23	$0.00	$0.00	$0.00	$0.00							$0.00
E24	$843,168.99	$685,408.82	$900,063.09	$753,973.54							$5,918,390.62
E25	$12,101.05	$12,101.05	$29,993.90	$29,993.90							$359,363.15
E25 In-Kind	$0.00	$0.00	$0.00	$0.00							$872,000.00
E26	$0.00	$0.00	$0.00	$0.00							$147.62
E27	$846,914.71	$992,624.60	$179,098.65	$267,944.75							$27,515,124.80
E28	$318,447.52	$410,664.22	$269,402.54	$266,187.67							$2,372,563.15
E29	$0.00	$0.00	$0.00	$0.00							$233,195.88
E30	$0.00	$0.00	$0.00	$0.00							$255,733.98
E31	$42,096.23	$17,811.23	$41,975.85	$39,439.69							$497,692.18
E32	$0.00	$0.00	$0.00	$0.00							$0.00
E33	$322,214.66	$250,882.25	$173,882.03	$205,985.55							$1,724,886.24
E34	$123,672.64	$123,672.64	$11.83	$11.83							$256,843.49
E35	$158,178.28	$236,841.95	$4,765,001.75	$2,970,491.64							$3,532,302.58
E36	$0.00	$0.00	$16,424.69	$16,424.69							$16,424.69
E37	$0.00	$0.00	$10,027.29	$10,027.29							$10,027.29
E38	$0.00	$0.00	$115,742.63	$115,742.63							$115,742.63
E39	$0.00	$0.00	$0.00	$0.00							$0.00
E40	$0.00	$0.00	$0.00	$0.00							$0.00
Total E	**$16,197,844.90**	**$15,029,657.69**	**$12,153,066.67**	**$8,856,372.85**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$112,273,456.25**
F1	$471,224.34	$541,133.66	$839,620.04	$509,888.32							$5,330,401.31
F2	$273,682.73	$273,966.32	$487,309.71	$330,715.45							$2,252,652.83
F3	$63,377.64	$63,377.64	$42,126.44	$42,126.44							$531,391.11
F4	$36,810.41	$36,810.41	$123,507.75	$62,102.16							$1,152,713.33
F5	$241,313.96	$238,890.68	$362,211.47	$268,516.37							$2,029,301.63

Work Task	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	Expenditures Grand Total FY04 – FY17
F6	$49,043.49	$54,639.37	$22,198.36	$22,198.36							$524,555.15
F7	$23,225.44	$23,225.44	$30,633.05	$30,633.05							$132,225.17
F8	$0.00	$0.00	$0.00	$0.00							$0.00
F9	$0.00	$0.00	$0.00	$0.00							$0.00
F10	$0.00	$0.00	$0.00	$0.00							$0.00
Total F	**$1,158,678.01**	**$1,232,043.52**	**$1,907,606.82**	**$1,266,180.15**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$11,953,240.53**
G1	$919,025.71	$840,662.37	$1,277,295.14	$1,107,997.12							$6,509,405.60
G3	$190,240.44	$183,255.64	$4,493.69	$99,375.32							$2,752,164.23
G4	$420,190.00	$311,930.98	$692,311.87	$347,011.93							$1,796,329.55
G6	$27,482.43	$3,359.07	$97,582.09	$21,032.38							$24,391.45
Total G	**$1,556,938.58**	**$1,339,208.06**	**$2,071,682.79**	**$1,575,416.75**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$11,082,290.83**
H1	$0.00	$0.00	$0.00	$0.00							$32,466,770.00
H2	$1,104,052.00	$1,104,052.00	$1,108,828.00	$1,108,828.00							$6,207,475.38
Total H	**$1,104,052.00**	**$1,104,052.00**	**$1,108,828.00**	**$1,108,828.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$38,674,245.38**
I1	$106,930.04	$96,930.04	$133,126.02	$143,126.02							$749,060.99
G5	$0.00	$0.00	$0.00	$0.00							$61,059.68
Total I	**$106,930.04**	**$96,930.04**	**$133,126.02**	**$143,126.02**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$810,120.67**
GRAND Totals	**$29,715,407.62**	**$27,984,803.05**	**$25,626,026.38**	**$21,267,605.76**							**$271,864,301.96**

Attachment E – Reports Published in Fiscal Year 2017

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-4	Relict Leopard Frog Monitoring and Management, 2015 Annual Report
C-24	Elf Owl Home Range and Habitat Study, 2015 Annual Report
C-52	Development of Appropriate Radio Telemetry Techniques for Gilded Flickers in Quartzsite, Arizona, 2014
C-62	Lowland Leopard Frog and Colorado River Toad Habitat and Ecology Study, 2015 Annual Report
C-64	Population Status and Distribution of Razorback Suckers and Bonytail Downstream from Palo Verde Diversion Dam, 2017 Interim Report
D-1	Marsh Bird Survey, 2014 Annual Report
D-2	Southwestern Willow Flycatcher Presence/Absence Surveys, 2015 Annual Report
D-2	Southwestern Willow Flycatcher Presence/Absence Surveys, 2016 Annual Report
D-5	MAPS Breeding Season Final Report, 2014–2015
D-6	Lower Colorado River Riparian Bird Surveys, 2015 Annual Report
D-7	Yellow-billed Cuckoo Presence/Absence Surveys, 2016 Annual Report
D-8	Razorback Sucker Studies on Lake Mead, Nevada, and Arizona, 2014–2015
D-8	Razorback Sucker Studies on Lake Mead, Nevada, and Arizona, 2015–2016
D-8	Comparative Survival of Repatriated Razorback Suckers in Lower Colorado River Reach 3, 2014–2016
D-9	System-Wide Acoustic Monitoring of LCR MSCP Bat Species, 2014
D-9	System-Wide Acoustic Monitoring of LCR MSCP Bat Species, 2015
D-9	System-Wide Acoustic Monitoring of LCR MSCP Bat Species, 2016
D-10	Post-Development System Monitoring of Rodent Populations, 2015 Annual Report

Work Task	Report Title
D-12	Development and Implementation of a Repeatable Monitoring Plan for Lowland Leopard Frogs and Colorado River Toads on the Lower Colorado River, 2015 Annual Report
D-12	Development and Implementation of a Repeatable Monitoring Plan for Lowland Leopard Frogs and Colorado River Toads on the Lower Colorado River, 2016 Annual Report
E-1	Beal Lake Conservation Area, 2013 Annual Report
E-4	Palo Verde Ecological Reserve, 2013 Annual Report
E-24	Cibola National Wildlife Refuge Unit #1 Conservation Area, Fiscal Year 2013 Annual Report
E-25	Big Bend Conservation Area, 2013 Annual Report
E-35	Mohave Valley Conservation Area Restoration Development and Monitoring Plan
F-3	Small Mammal Colonization of Restoration Sites, 2015 Annual Report
F-4	Post-Development Monitoring of Covered Bat Species, Capture Surveys, 2013–2014 Annual Report
F-4	Post-Development Bat Monitoring of Conservation Areas and the ‘Ahakhav Tribal Preserve Along the Lower Colorado River, 2015 Capture Surveys