Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Final Implementation Report, Fiscal Year 2021 Work Plan and Budget, Fiscal Year 2019 Accomplishment Report

June 2020

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 2021 Work Plan and Budget, Fiscal Year 2019 Accomplishment Report

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

June 2020

ACRONYMS AND ABBREVIATIONS

AKN	Avian Knowledge Network
ALS	aerial laser scanning
AMM	Avoidance and Minimization Measure
AMP	Adaptive Management Program
ARCC	Aquatic Research Conservation Center (Arizona Game and Fish Department)
AZGFD	Arizona Game and Fish Department
BBCA	Big Bend Conservation Area
BLCA	Beal Lake Conservation Area
BLM	Bureau of Land Management
BO	Biological and Conference Opinion
CDFW	California Department of Fish and Wildlife
CEM	conceptual ecological model
Center	Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico
CESA	California Endangered Species Act
CI	confidence interval
Cibola NWR Unit #1	Cibola National Wildlife Refuge Unit #1 Conservation Area
CMM	Conservation Area Management Measure
Commission	California State Lands Commission
CRWUA	Colorado River Water Users Association
CVCA	Cibola Valley Conservation Area
CVIDD	Cibola Valley Irrigation and Drainage District
eDNA	environmental DNA
ESA	Endangered Species Act
FMA	Funding and Management Agreement
FMC	Freeport Minerals Corporation
FY	fiscal year
Glen Canyon Dam AMP	Glen Canyon Dam Adaptive Management Program
HCP	Habitat Conservation Plan
HMF	Habitat Maintenance Fund
HMM	Hart Mine Marsh
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
m	meter(s)
MAPS	Monitoring Avian Productivity and Survivorship
MEFF	mobile electronic field form
Metropolitan	The Metropolitan Water District of Southern California
Middle Bill Williams River NWR	Middle Bill Williams River National Wildlife Refuge
mm	millimeter(s)
Mora NFH	Mora National Fish Hatchery
MOU	Memorandum of Understanding
MRM	Monitoring and Research Measure
MVCA	Mohave Valley Conservation Area
N/A	not applicable
NDVI	normalized difference vegetation index
NPS	National Park Service
pH	acidity or alkalinity of a solution
PIT	passive integrated transponder
ppm	parts per million
PVER	Palo Verde Ecological Reserve
PVER-South	Palo Verde Ecological Reserve-South
PVID	Palo Verde Irrigation District
PWCA	Pretty Water Conservation Area
Reclamation	Bureau of Reclamation
RISE	Reclamation Information Sharing Environment
RMF	Remedial Measures Fund
Section 26	Section 26 Conservation Area
SNP	single nucleotide polymorphism (aka “snip”)
sootywing	MacNeill’s sootywing skipper (*Pholisora gracielae* = *Hesperopsis gracielae* [MacNeill])
TL	total length
UAS	unmanned aerial system
USFWS	U.S. Fish and Wildlife Service
WET	Water Education for Teachers
Willow Beach NFH	Willow Beach National Fish Hatchery

YCNHAC	Yuma Crossing National Heritage Area Corporation
YEW	Yuma East Wetlands
YMCA	Yuma Meadows Conservation Area
1997 BO	1997 Biological and Conference Opinion

Symbols

>	greater than
≥	greater than or equal to
<	less than
≤	less than or equal to
µS/cm	microsiemens per centimeter
%	percent
+	plus (at least)

LCR MSCP: 27 COVERED AND 5 EVALUATION SPECIES

Conservation Measure	Common Name	Scientific Name
BEVI	Arizona Bell's vireo	*Vireo bellii arizonae*
BLRA	California black rail	*Laterallus jamaicensis coturniculus*
BONY	Bonytail	*Gila elegans*
CLNB*	California leaf-nosed bat	*Macrotus californicus*
CLRA	Yuma clapper rail	*Rallus longirostris yumanensis* (also known as Yuma Ridgway's rail = *R. obsoletus yumanensis*)
CRCR	Colorado River cotton rat	*Sigmodon arizonae plenus*
CRTO*	Colorado River toad	Bufo *alvarius* = Incilius alvarius
DETO	Desert tortoise (Mojave population)	*Gopherus agassizii*
DPMO*	Desert pocket mouse	*Chaetodipus penicillatus sobrinus*
ELOW	Elf owl	*Micrathene whitneyi*
FLSU	Flannelmouth sucker	*Catostomus latipinnis*
FTHL	Flat-tailed horned lizard	*Phrynosoma mcalli*
GIFL	Gilded flicker	*Colaptes chrysoides*
GIWO	Gila woodpecker	*Melanerpes uropygialis*
HUCH	Humpback chub	*Gila cypha*
LEBI	Western least bittern	*Ixobrychus exilis hesperis*
LLFR*	Lowland leopard frog	*Rana yavapaiensis* = *Lithobates yavapaiensis*
MNSW	MacNeill's sootywing skipper	*Pholisora gracielae* = *Hesperopsis gracielae* (MacNeill)
NMGS	Northern Mexican gartersnake	*Thamnophis eques megalops*
PTBB*	Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens* = *Plecotus townsendii pallescens* = *C. townsendii townsendii*[1]
RASU	Razorback sucker	*Xyrauchen texanus*
RLFR	Relict leopard frog	*Rana onca*
STBU	Sticky buckwheat	*Eriogonum viscidulum*
SUTA	Summer tanager	*Piranga rubra*
THMI	Threecorner milkvetch	*Astragalus geyeri* var. *triquetrus*
VEFL	Vermilion flycatcher	*Pyrocephalus rubinus*
WIFL	Southwestern willow flycatcher	*Empidonax traillii extimus*
WRBA	Western red bat	*Lasiurus blossevillii*
WYBA	Western yellow bat	*Lasiurus xanthinus*
YBCU	Yellow-billed cuckoo	*Coccyzus americanus occidentalis*
YHCR	Yuma hispid cotton rat	*Sigmodon hispidus eremicus*
YWAR	Sonoran yellow warbler	*Dendroica petechia sonorana* = *Setophaga petechia sonorana*

* Evaluation species.

[1] Genetic analyses on the pale Townsend's big-eared bat indicate that the lower Colorado River is likely in the range of the Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*) rather than the pale Townsend's big-eared bat (Piaggio and Perkins 2005). The bats recorded along the lower Colorado River will be referred to as pale Townsend's big-eared bats in this report, as the nomenclature change has not yet been verified by the U.S. Fish and Wildlife Service.

Piaggio, A.J. and S.L. Perkins. 2005. Molecular phylogeny of North American long-eared bats (Vespertilionidae: *Corynorhinus*); inter- and intraspecific relationships inferred from mitochondrial and nuclear DNA sequences. Molecular Phylogenetics and Evolution 37:762–775.

LIST OF COMMON AND SCIENTIFIC NAMES

Common Name	Scientific Name
Amphibians	
Colorado River toad	*Bufo alvarius = Incilius alvarius*
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 townsendii*
Western red bat	*Lasiurus blossevillii*
Western yellow bat	*Lasiurus xanthinus*
Birds	
Arizona Bell's vireo	*Vireo bellii arizonae*
Bell's vireo	*Vireo bellii*
Brown-headed cowbird	*Molothrus ater*
California black rail	*Laterallus jamaicensis coturniculus*
Cormorant	*Phalacrocorax auritus*
Elf owl	*Micrathene whitneyi*
European starling	*Sturnus vulgaris*
Flycatcher	*Empidonax traillii*
Gila woodpecker	*Melanerpes uropygialis*
Gilded flicker	*Colaptes chrysoides*
Great blue heron	*Ardea herodias*
Hermit warbler	*Setophaga occidentalis*
Kentucky warbler	*Geothlypis formos*
Ladder-backed woodpecker	*Dryobates scalaris*
Sonoran yellow warbler	*Dendroica petechia sonorana = Setophaga petechia sonorana*
Southwestern willow flycatcher	*Empidonax traillii extimus*
Summer tanager	*Piranga rubra*
Townsend's warbler	*Setophaga townsendi*
Vermilion flycatcher	*Pyrocephalus rubinus*
Western least bittern	*Ixobrychus exilis hesperis*
Willow flycatcher	*Empidonax traillii*
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*)

Common Name	Scientific Name
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*
Invertebrates	
MacNeill's sootywing skipper	*Pholisora gracielae = Hesperopsis gracielae* (MacNeill)
Quagga mussel	*Dreissena bugensis*
Plants	
Alfalfa	*Medicago sativa*
Arrowweed	*Pluchea sericea*
California bulrush	*Schoenoplectus californicus*
Cattail	*Typha* spp.
Common three-square bulrush	*Schoenoplectus pungens*
Five-hook bassia	*Bassia hyssopifolia*
Fremont cottonwood	*Populus fremontii*
Golden algae	*Prymnesium parvum*
Goodding's willow	*Salix gooddingii*
Honey mesquite	*Prosopis glandulosa*
Mediterranean grass	*Schismus* spp.
Mesquite	*Prosopis* spp.
Olney's three-square bulrush	*Scirpus olneyii*
Phragmites	*Phragmites australis*
Quailbush	*Atriplex lentiformis*
Saguaro	*Carnegiea gigantea*
Sahara mustard	*Brassica tournefortii*
Saltcedar	*Tamarix* spp.
Sixweeks fescue	*Vulpia octoflora*
Softstem bulrush	*Scripus tabermontani*
Sticky buckwheat	*Eriogonum viscidulum*
Threecorner milkvetch	*Astragalus geyeri* var. *triquetrus*
Willow	*Salix* spp.

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

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E Reports Published in Fiscal Year 2019

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 27 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 in 2003 dollars, as outlined in the Funding and Management Agreement (FMA), 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 United States 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 website (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 website (www.lcrmscp.gov). During FY19, Seth Shanahan, Southern Nevada Water Authority, served as Chair of the Steering Committee, and Vineetha Kartha, Arizona Department of Water Resources, 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 FY19, a summary of work underway during FY20, and proposed work to be performed during FY21. It also documents research and monitoring activities undertaken in support of the LCR MSCP and incidental take for covered actions implemented during FY19. 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
2020	$22,164,000	1.501	2018	$33,268,164	$16,634,082	$16,634,082
2021	$19,982,000	1.518	2019	$30,332,676	$15,166,338	$15,166,338

[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.

FY21 Contributions and Adjustments

As outlined in table 1-1, the annual funding commitment for FY21 is $19,982,000, based on the 2003 estimate, and $30,332,676 after the composite inflation index of 1.518 is applied. In accordance with Section 8.3 of the FMA, the Federal share of the cost for FY21 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 FY21 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.—FY21 Contribution Schedule

Funding Entity	FY21 Contributions	FY21 Adjusted Contributions
Federal	$15,166,338.00	$15,166,338.00
Non-Federal	$15,166,338.00	$15,166,338.00
California	*$7,583,169.00*	*$7,183,572.58*
Arizona	*$3,791,584.50*	*$4,590,777.34*
Nevada	*$3,791,584.50*	*$3,391,988.08*
Total	**$30,332,676.00**	**$30,332,676.00**

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 and The Metropolitan Water District of Southern California (Metropolitan) 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 San Diego County Water Authority 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 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 FY19 is $36,967,064.61. 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 5.12.3). 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 FY19 contributions, total funds contributed through FY19 with interest, FY20 contributions, and FY21 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	FY19 Contribution	Cumulative through FY19[1]	FY20 Contribution	FY21 Projected Contribution
California	$573,916.00	$4,589,566.41	$597,398.00	$604,164.00
Arizona	$286,958.00	$1,849,270.61	$298,699.00	$302,082.00
Nevada	$286,958.00	$2,703,995.03	$298,699.00	$302,082.00
	$1,147,832.00	$9,142,832.05	$1,194,796.00	$1,208,328.00

[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 FY19. No additional funds were contributed in FY19, but $9,730,000 was withdrawn to secure land and water for the Dennis Underwood Conservation Area. No additional funding was contributed in FY20 or projected to be contributed in FY21. A detailed accounting of the Land and Water Fund can be found in attachment D-3c.

Table 1-4.—Land and Water Fund Contributions

Funding Partner	FY19 Contribution	Cumulative through FY19	FY20 Contribution	F21 Projected Contribution
Reclamation	$0	$5,670,000	$0	$0

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, which provides specific guidelines for the calculation of in-kind credit for goods and services. No in-kind contributions were provided in FY19.

California Endangered Species Act Permit

The California partners are responsible for meeting the terms of the CESA permit. While Reclamation, other Federal agencies, 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.

A Memorandum of Agreement between Reclamation and the California partners was signed in April 2005 that acknowledges 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 FY21 Program Activities and FY19 Accomplishments

The minimum funding required in the LCR MSCP documents for FY21 is $30,332,676: $15,166,338 Federal and $15,166,338 non-Federal. Reclamation is proposing an annual program budget of $26,485,652.00 (table 1-5). The proposed annual program budget is less than the minimum required funding due to current construction capability. The balance will be held in reserve by Reclamation and used in future years to complete conservation measure requirements, especially habitat creation and management activities. If additional work is identified that does not increase the budget above the minimum required funding, Reclamation will implement the work and report it in the FY21 accomplishment report.

Table 1-5.—FY21 Proposed Program Funding

Program Area	FY21 Funding
Program Administration	$1,545,324
Fish Augmentation	$2,060,000
Species Research	$766,000
System Monitoring	$3,135,000
Conservation Area Development and Management	$13,561,000
Post-Development Monitoring	$2,695,000
Adaptive Management Program	$1,390,000
Funding Accounts – Remedial Measures	$1,208,328
Public Outreach	$125,000
Subtotal	$26,485,652
Land and Water Fund Contribution	$0
Total	**$26,485,652**

Table 1-6 shows the following by work task: FY19 approved estimates and actual accomplishment, cumulative program expenditures (FY04–19), FY20 approved program funding, FY21 proposed program funding, and out-year funding for FY22 and FY23. 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	FY19 Approved Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Projected Estimate[1]	FY23 Projected Estimate[1]
A	**Program Administration**							
A1	Program Administration	$1,467,956.00	$1,133,593.18	$15,723,254.31	$1,528,018.00	$1,545,324.00	$1,545,324.00	$1,545,324.00
Closed[2]	Work Tasks Pre-FY19			$130,535.22				
		$1,467,956.00	**$1,133,593.18**	**$15,853,789.53**	**$1,528,018.00**	**$1,545,324.00**	**$1,545,324.00**	**$1,545,324.00**
B	**Fish Augmentation**							
B1	Lake Mohave Razorback Sucker Larvae Collections	$215,000.00	$216,528.83	$2,961,855.03	$215,000.00	$215,000.00	$215,000.00	$215,000.00
B2	Willow Beach National Fish Hatchery	$325,000.00	$326,397.91	$4,653,204.60	$325,000.00	$325,000.00	$325,000.00	$325,000.00
B3	Achii Hanyo Native Fish Rearing Facility	$170,000.00	$170,190.62	$1,818,848.60	$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	$256,244.89	$3,246,432.59	$260,000.00	$260,000.00	$260,000.00	$260,000.00
B5	Bubbling Ponds Fish Hatchery	$475,000.00	$500,850.04	$4,451,404.72	$475,000.00	$150,000.00	$0.00	$0.00
B6	Lake Mead Fish Hatchery	$350,000.00	$536,445.62	$1,808,314.56	$525,000.00	$585,000.00	$585,000.00	$585,000.00
B7	Lakeside Rearing Ponds	$200,000.00	$187,448.44	$2,740,823.05	$150,000.00	$150,000.00	$150,000.00	$150,000.00
B8	Fish Tagging Equipment	$135,000.00	$147,859.37	$1,460,307.76	$135,000.00	$135,000.00	$135,000.00	$135,000.00
B12	Maintenance of Alternate Bonytail Broodstock	$70,000.00	$65,734.38	$244,906.04	$70,000.00	$70,000.00	$70,000.00	$70,000.00
Closed[2]	Work Tasks Pre-FY19		$0.00	$987,445.58				
		$2,200,000.00	**$2,407,700.10**	**$24,373,542.53**	**$2,325,000.00**	**$2,060,000.00**	**$1,910,000.00**	**$1,910,000.00**

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY19 Approved Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Projected Estimate[1]	FY23 Projected Estimate[1]
C	**Species Research**							
C2	Sticky Buckwheat and Threecorner Milkvetch Conservation	$11,000.00	$15,564.32	$163,656.39	$11,000.00	$11,000.00	$11,000.00	$11,000.00
C14	Humpback Chub Program Support	$1,000.00	$7,500.00	$288,216.61	$60,000.00	$60,000.00	$60,000.00	$60,000.00
C59	Selenium Monitoring in Created Backwater and Marsh Habitats	$160,000.00	$160,260.22	$468,712.35	$160,000.00	$60,000.00	$0.00	$0.00
C60	Habitat Manipulation	$175,000.00	$161,453.42	$549,826.62	$175,000.00	$175,000.00	$175,000.00	$175,000.00
C61	Evaluation of Alternative Stocking Methods for Fish Augmentation	$10,000.00	($2,391.06)	$638,512.21	$10,000.00	$10,000.00	$0.00	$0.00
C64	Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail	$450,000.00	$442,497.69	$2,366,684.41	$450,000.00	$450,000.00	$450,000.00	$450,000.00
Closed[2]	Work Tasks Pre-FY19		($16,397.56)	$27,871,344.32				
		$807,000.00	**$768,487.03**	**$32,346,952.91**	**$866,000.00**	**$766,000.00**	**$696,000.00**	**$696,000.00**
D	**System Monitoring**							
D1	Marsh Bird Surveys	$40,000.00	$32,614.21	$437,495.48	$40,000	$40,000	$40,000	$40,000
D2	Southwestern Willow Flycatcher Presence/ Absence Surveys	$200,000.00	$321,685.83	$10,412,379.99	$340,000.00	$420,000.00	$340,000.00	$340,000.00
D5	Monitoring Avian Productivity and Survivorship	$250,000.00	$299,283.00	$3,888,963.22	$250,000.00	$250,000.00	$250,000.00	$250,000.00
D6	System Monitoring of Riparian Obligate Avian Species	$500,000.00	$258,540.61	$2,972,830.12	$500,000.00	$530,000.00	$530,000.00	$530,000.00
D7	Yellow-billed Cuckoo System-Wide Monitoring	$50,000.00	$54,267.18	$7,039,053.52	$50,000.00	$50,000.00	$50,000.00	$50,000.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY19 Approved Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Projected Estimate[1]	FY23 Projected Estimate[1]
D8	Razorback Sucker and Bonytail Stock Assessment	$1,125,000.00	$1,292,410.96	$9,594,742.03	$1,125,000.00	$1,125,000.00	$1,125,000.00	$1,125,000.00
D9	System Monitoring of Covered Bat Species	$100,000.00	$96,950.99	$2,526,012.61	$100,000.00	$100,000.00	$100,000.00	$100,000.00
D10	System Monitoring of Rodent Populations	$40,000.00	$25,446.36	$345,749.33	$0.00	$0.00	$0.00	$0.00
D14	System-Wide Monitoring of MacNeill's Sootywing Skippers	$20,000.00	$14,109.52	$14,109.52	$20,000.00	$20,000.00	$0.00	$0.00
D15	Genetic Monitoring and Management of Native Fish Populations	$0.00	$0.00	$0.00	$600,000.00	$600,000.00	$400,000.00	$400,000.00
Closed[2]	Work Tasks Pre-FY19		$0.00	$1,791,815.19				
		$2,325,000.00	**$2,395,308.66**	**$39,023,151.01**	**$3,025,000.00**	**$3,135,000.00**	**$2,835,000.00**	**$2,835,000.00**
E	**Conservation Area Development and Management**							
E1	Beal Lake Conservation Area	$900,000.00	$1,314,564.68	$5,942,122.03	$900,000.00	$500,000.00	$450,000.00	$450,000.00
E4	Palo Verde Ecological Reserve	$500,000.00	$671,772.91	$11,348,421.66	$650,000.00	$850,000.00	$850,000.00	$850,000.00
E5	Cibola Valley Conservation Area	$850,000.00	$582,260.92	$13,692,484.08	$600,000.00	$350,000.00	$350,000.00	$350,000.00
E9	Hart Mine Marsh	$250,000.00	$181,125.19	$7,621,151.63	$250,000.00	$1,150,000.00	$150,000.00	$150,000.00
E13	McAllister Lake	$400,000.00	$7,409.61	$188,232.31	$400,000.00	$100,000.00	$400,000.00	$40,000.00
E14	Imperial Ponds Conservation Area	$350,000.00	$407,789.63	$11,583,200.74	$350,000.00	$500,000.00	$350,000.00	$2,000,000.00
E16	Conservation Area Site Selection	$200,000.00	$690,397.37	$8,011,282.03	$150,000.00	$60,000.00	$60,000.00	$60,000.00
E17	Topock Marsh Pumping	$1,000.00	$0.00	$554,091.96	$1,000.00	$1,000.00	$1,000.00	$1,000.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY19 Approved Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Projected Estimate[1]	FY23 Projected Estimate[1]
E18	Law Enforcement and Wildland Fire Support	$250,000.00	$204,434.32	$2,314,191.57	$250,000.00	$250,000.00	$250,000.00	$250,000.00
E21	Planet Ranch	$4,000,000.00	$4,244,489.40	$15,934,258.33	$4,000,000.00	$1,000,000.00	$750,000.00	$750,000.00
E24	Cibola National Wildlife Refuge Unit #1 Conservation Area	$900,000.00	$945,231.23	$7,934,779.88	$1,000,000.00	$2,000,000.00	$4,000,000.00	$4,000,000.00
E25	Big Bend Conservation Area	$20,000.00	$32,089.41	$1,256,918.33	$60,000.00	$60,000.00	$50,000.00	$50,000.00
E27	Laguna Division Conservation Area	$120,000.00	$61,353.64	$27,715,209.41	$120,000.00	$100,000.00	$100,000.00	$100,000.00
E28	Yuma East Wetlands	$275,000.00	$225,864.96	$2,950,228.89	$275,000.00	$275,000.00	$275,000.00	$275,000.00
E31	Hunters Hole	$30,000.00	$24,621.46	$559,343.83	$30,000.00	$30,000.00	$30,000.00	$330,000.00
E33	Pretty Water Conservation Area	$30,000.00	$33,951.14	$1,823,282.55	$20,000.00	$20,000.00	$20,000.00	$20,000.00
E35	Mohave Valley Conservation Area	$1,750,000.00	$1,263,978.39	$10,326,731.83	$160,000.00	$300,000.00	$100,000.00	$100,000.00
E36	Parker Dam Camp	$40,000.00	$8,000.00	$17,591.82	$5,000.00	$5,000.00	$5,000.00	$5,000.00
E37	Palo Verde Ecological Reserve-South	$100,000.00	$68,295.77	$78,323.06	$500,000.00	$0.00	$0.00	$0.00
E38	Three Fingers Lake	$100,000.00	$53,795.06	$342,885.39	$10,000.00	$10,000.00	$10,000.00	$10,000.00
E39[3]	Dennis Underwood Conservation Area	$10,230,000.00	$11,325,356.98	$11,338,500.28	$1,500,000.00	$1,500,000.00	$350,000.00	$350,000.00
E40	Yuma Meadows Conservation Area	$4,000,000.00	$399,228.48	$425,707.12	$2,000,000.00	$1,500,000.00	$1,000,000.00	$1,000,000.00
E41	Section 26 Conservation Area	$0.00	$0.00	$0.00	$400,000.00	$3,000,000.00	$2,500,000.00	$2,000,000.00
Closed[2]	Work Tasks Pre-FY19		$0.00	$5,531,635.42				
		$25,296,000.00	**$22,746,010.55**	**$147,490,574.15**	**$13,631,000.00**	**$13,561,000.00**	**$12,051,000.00**	**$13,141,000.00**

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY19 Approved Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Projected Estimate[1]	FY23 Projected Estimate[1]
F	**Post-Development Monitoring**							
F1	Habitat Monitoring at Conservation Areas	$700,000.00	$447,229.73	$6,491,228.00	$700,000.00	$600,000.00	$600,000.00	$600,000.00
F2	Avian Monitoring at Conservation Areas	$450,000.00	$411,774.03	$3,120,797.09	$450,000.00	$475,000.00	$475,000.00	$475,000.00
F3	Rodent Monitoring at Conservation Areas	$65,000.00	$80,097.23	$676,237.21	$65,000.00	$65,000.00	$65,000.00	$65,000.00
F4	Bat Species Monitoring at Conservation Areas	$140,000.00	$68,278.84	$1,354,029.11	$140,000.00	$90,000.00	$90,000.00	$90,000.00
F5	Post-Development Monitoring of Fishes at Conservation Areas	$450,000.00	$395,696.03	$2,898,559.24	$450,000.00	$400,000.00	$400,000.00	$400,000.00
F6	Post-Development Monitoring of MacNeill's Sootywing Skippers at Conservation Areas	$20,000.00	$15,943.78	$581,620.11	$20,000.00	$20,000.00	$20,000.00	$20,000.00
F7	Marsh Bird Monitoring at Conservation Areas	$40,000.00	$38,311.68	$208,641.22	$10,000.00	$10,000.00	$10,000.00	$10,000.00
F8	Reptile and Amphibian Monitoring at Conservation Areas	$25,000.00	$1,211.89	10,911.47	$25,000.00	$25,000.00	$25,000.00	$25,000.00
F9	Southwestern Willow Flycatcher Monitoring at Conservation Areas	$500,000.00	$352,596.64	$359,167.53	$360,000.00	$360,000.00	$360,000.00	$360,000.00
F10	Yellow-billed Cuckoo Monitoring at Conservation Areas	$650,000.00	$652,369.99	$1,191,143.06	$650,000.00	$650,000.00	$650,000.00	$650,000.00
		$3,040,000.00	**$2,463,509.84**	**$16,892,334.04**	**$2,870,000.00**	**$2,695,000.00**	**$2,695,000.00**	**$2,695,000.00**

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY19 Approved Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Projected Estimate[1]	FY23 Projected Estimate[1]
G	**Adaptive Management Program**							
G1	Data Management	$1,250,000.00	$892,299.95	$8,620,497.02	$1,000,000.00	$850,000.00	$750,000.00	$750,000.00
G3	Adaptive Management Research Projects	$300,000.00	$59,455.02	$2,877,655.71	$100,000.00	$100,000.00	$100,000.00	$100,000.00
G4	Science/Adaptive Management Strategy	$400,000.00	$302,803.39	$2,800,159.04	$400,000.00	$400,000.00	$400,000.00	$400,000.00
G6	Conceptual Ecological Models	$40,000.00	$40,488.91	$145,280.59	$40,000.00	$40,000.00	$40,000.00	$40,000.00
		$1,990,000.00	**$1,295,047.27**	**$14,443,592.36**	**$1,540,000.00**	**$1,390,000.00**	**$1,290,000.00**	**$1,290,000.00**
H	**Funding Accounts**							
H1[4]	Habitat Maintenance Fund	$0.00	$0.00	$32,466,770.00	$0.00	$0.00	$0.00	$0.00
H2[4]	Remedial Measures Fund	**$1,147,832.00**	**$1,147,832.00**	**$8,477,667.38**	**$1,194,796.00**	**$1,208,328.00**	**$1,208,328.00**	**$1,208,328.00**
		$1,147,832.00	**$1,147,832.00**	$40,944,437.38	**$1,194,796.00**	**$1,208,328.00**	**$1,208,328.00**	**$1,208,328.00**
I	**Public Outreach**							
I1	Public Outreach	$125,000.00	$112,752.67	$1,003,571.49	$125,000.00	$125,000.00	$125,000.00	$125,000.00
Closed	Work Tasks Pre-FY19		$0.00	$61,059.68				
		$125,000.00	**$112,752.67**	**$1,064,631.17**	**$125,000.00**	**$125,000.00**	**$125,000.00**	**$125,000.00**
	Program Total:	**$38,398,788.00**	**$34,470,241.30**	**$332,433,005.08**	**$27,104,814.00**	**$26,485,652.00**	**$24,355,652.00**	**$25,445,652.00**

[1] FY21 and FY22 numbers are not adjusted for inflation.
[2] Closed work tasks are shown in attachment D-4.
[3] Resolution 19-002 was approved by the Steering Committee on April 24, 2019.
[4] H1 and H2 cumulative expenditures 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; 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 FY21, 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 FY22 or FY23, (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 FY19, Reclamation estimated work tasks totaling $38,398,788. Actual LCR MSCP accomplishment (obligations) for FY19 was $34,470,241.30. Actual accomplishment was less than the minimum accomplishment due to construction and management costs that were less than anticipated at several conservation areas, including the Mohave Valley Conservation Area (MVCA) completed in FY19 (E35) and the Cibola Valley Conservation Area (CVCA) (E5). Additional savings were realized in the Adaptive Management Program from data management (G1), research (G3), and habitat monitoring (F1). In accordance with the FMA, Reclamation incurred a funding credit of $2,012,002.08 for FY19 (attachment D-2e). Cumulative program accomplishment (expenditures) through FY19 was $332,433,005.08 (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 the 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 FY19 was 6,437 acres.

Table 1-7.—Conservation Area Land Cover Type

Land Cover Type	Management Unit	Established Acres, FY19	Established Acres, Total[1]
Cottonwood-willow	E1 Beal Lake Conservation Area (Arizona)	0	120
	E4 Palo Verde Ecological Reserve (California)	0	945
	E5 Cibola Valley Conservation Area (Arizona)	0	457
	E21 Planet Ranch (Arizona)	0	396
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area (Arizona)	57	843
	E27 Laguna Division Conservation Area (California and Arizona)	0	1,130
	E28 Yuma East Wetlands (Arizona)	0	183
	E31 Hunters Hole (Arizona)	0	43
Total		**57**	**4,117**
Honey Mesquite	E4 Palo Verde Ecological Reserve (California)	0	78
	E5 Cibola Valley Conservation Area (Arizona)	125	808
	E27 Laguna Division Conservation Area (California and Arizona)	0	43
	E28 Yuma East Wetlands (Arizona)	0	103
	E33 Pretty Water Conservation Area (California)	0	566
	E36 Parker Dam Camp	0	80
	E39 Dennis Underwood Conservation Area (California)	122	122
Total		**247**	**1,800**
Marsh	E9 Hart Mine Marsh (Arizona)	0	255
	E14 Imperial Ponds Conservation Area (Arizona)	0	13
	E28 Yuma East Wetlands (Arizona)	0	94
Total		**0**	**362**
Backwater	E14 Imperial Ponds Conservation Area (Arizona)	0	80
	E25 Big Bend Conservation Area (Nevada)	0	15
	E40 Mohave Valley Conservation Area (California)	63	63
Total		**63**	**158**
	TOTAL	**367**	**6,437**

[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 covered species.

Table 1-8 shows the total creditable acres for each species habitat creation conservation measure by conservation area through FY17. Lidar data are not yet available to perform the habitat creation accomplishment analysis for riparian and marsh covered species in FY19. Work Task F1 provides additional information.

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

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

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

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres, FY17[1]	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[4]	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	
	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	
	E4 Palo Verde Ecological Reserve	0	985	
	E5 Cibola Valley Conservation Area	0	670	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	271	
	E28 Yuma East Wetlands	0	286	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,410[3]**	**> 100%**
GIFL1 (4,050 acres)	E1 Beal Lake Conservation Area	0	119	
	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	
	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[3]**	**> 100%**

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

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres, FY17[1]	Creditable Acres, Total	Percent of Acres Creditable by Species Conservation Measure
VEFL1 (5,208 acres)	E1 Beal Lake Conservation Area	0	119	
	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	
	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	
	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	
	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[3]**	**> 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[3]**	**> 100%**

[1] Starting in FY14, the LCR MSCP began the transition from using terrestrial vegetation measurements to remotely sensed measurements (lidar). The habitat creation accomplishment analysis was not performed for FY19 since this lidar data were not available. Work Task F1 provides additional information.

[2] 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 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.

[3] The total for creditable acres established exceeds the species habitat creation conservation measure requirements. For many species, creditable acres established beyond conservation measure requirements is due to habitat creation efforts for other species. A portion of the creditable acres will be actively managed to meet species' habitat needs.

[4] BLRA1 – The LCR MSCP 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 FY19.

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 FY19 is reported in attachment B. The USFWS Section 10 Permit and the 2005 BO authorize incidental take resulting from Federal covered actions, 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 FY19. As described in the 2005 BO, the surrogate measures for incidental take are listed below.

   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, FY19	Total Number of Razorback Suckers
2	6,185	132,201
Total	**6,185**	**132,201**

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

Reach	Number of Razorback Suckers, FY19	Total Number of Razorback Suckers
3	6,060	100,146
4 and 5	13,090	112,267
Total	**19,150**	**212,413**

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

Reach	Number of Bonytail, FY19	Bonytail Program
2	220[1]	2,330[1]
3	1,026	60,065
4 and 5	7,013	46,125
Total	**8,259**	**108,520**

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

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY19 Approved	FY20 Approved	FY21 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	D1 F7 G1 G4 G6	D1 F7 G1 G4 G6	D1 F7 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C59 C60 F1 F7 G1 G4 G6	C59 C60 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 E39 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 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	D2 D5 F9 G1 G4 G6	D2 D5 F9 G1 G4 G6	D2 D5 F9 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D2 D5 F1 F9 G1 G4 G6	C60 D2 D5 F1 F9 G1 G4 G6	C60 D2 D5 F1 F9 G1 G4 G6
	MRM4	Brown-headed cowbird evaluation	D2 F9 G1 G4	D2 F9 G1 G4	D2 F9 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
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	FY19 Approved	FY20 Approved	FY21 Proposed
Bonytail	BONY1	Coordinate conservation efforts with the USFWS and recovery programs	A1	A1	A1
	BONY2	Create 360 acres of bonytail habitat	C60 E1 E13 E14 E16 E21 E25 E35 E40 G1 G4 G6 H2	C60 D15 E1 E13 E14 E16 E21 E25 E35 E40 E41 G1 G4 G6 H2	C60 D15 E1 E13 E14 E16 E21 E25 E35 E40 E41 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 C61 C64 G1 G4 H2	B2 B3 B4 B6 B7 B8 B12 C61 C64 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 C64 E40 G1 G4	B2 B3 B4 B6 B7 B8 B12 C64 E40 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 C59 C60 C61 C64 D8 F5 G1 G4 G6	B7 B8 C59 C60 C61 C64 D8 D15 F5 G1 G4 G6	B7 B8 C59 C60 C61 C64 D8 D15 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	FY19 Approved	FY20 Approved	FY21 Proposed
Razorback Sucker	RASU1	Coordinate conservation efforts with the USFWS and recovery programs	A1	A1	A1
	RASU2	Create 360 acres of razorback sucker habitat	C60 E1 E13 E14 E16 E21 E25 E35 E40 G1 G4 G6 H2	C60 D15 E1 E13 E14 E16 E21 E25 E35 E40 E41 G1 G4 G6 H2	C60 D15 E1 E13 E14 E16 E21 E25 E35 E40 E41 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 C61 C64 G1 G4 H2	B1 B2 B3 B4 B5 B6 B7 B8 C61 C64 D15 G1 G4 H2	B1 B2 B3 B4 B5 B6 B7 B8 C61 C64 D15 G1 G4 H2
	RASU4	Develop (if necessary) additional rearing capacity	B2 B3 B4 B5 B6 B7 B8 C64 E40 G1 G4	B2 B3 B4 B5 B6 B7 B8 C64 E40 G1 G4	B2 B3 B4 B5 B6 B7 B8 C64 E40 G1 G4
	RASU5	Support ongoing Lake Mohave conservation efforts	B1 B2 B7 B8 C61 G1 G4	B1 B2 B7 B8 C61 D15 G1 G4	B1 B2 B7 B8 C61 D15 G1 G4
	RASU6	Monitor, research, and adaptively manage augmentations and created habitat	B7 B8 C59 C60 C61 C64 D8 F5 G1 G4 G6	B7 B8 C59 C60 C61 C64 D8 D15 F5 G1 G4 G6	B7 B8 C59 C60 C61 C64 D8 D15 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	FY19 Approved	FY20 Approved	FY21 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 E39 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 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	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 E39 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 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	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	F3 G1 G6	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	FY19 Approved	FY20 Approved	FY21 Proposed
Colorado River Cotton Rat	CRCR1	Status/habitat surveys – define habitat first 5 years	D10 F3 G1 G4 G6	F3 G1 G4 G6	F3 G1 G4 G6
	CRCR2	**Create 125 acres – Creditable acres established exceed requirement**	C60 E1 E4 E5 E9 E16 E21 E24 E36 E38 F1 G1 G4 G6 H2	C60 E1 E4 E5 E9 E16 E21 E24 E36 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	C60 D10 F1 F3 G1 G4 G6	C60 F1 F3 G1 G4 G6	C60 F1 F3 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
Yuma Hispid Cotton Rat	YHCR1	Status/habitat surveys – define habitat first 5 years	D10 F3 G1 G4 G6	F3 G1 G4 G6	F3 G1 G4 G6
	YHCR2	**Create 76 acres – Creditable acres established exceed requirement**	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	C60 D10 F1 F3 G1 G4 G6	C60 F1 F3 G1 G4 G6	C60 F1 F3 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 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	D1 F7 G1 G4 G6	D1 F7 G1 G4 G6	D1 F7 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C59 C60 F1 F7 G1 G4 G6	C59 C60 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	FY19 Approved	FY20 Approved	FY21 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	D1 F7 G1 G4 G6	D1 F7 G1 G4 G6	D1 F7 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C59 C60 D1 F1 F7 G1 G4 G6	C59 C60 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 E39 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 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	D5 D7 F10 G1 G4 G6	D5 D7 F10 G1 G4 G6	D5 D7 F10 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C55 C60 D5 D7 F1 F10 G1 G4 G6	C55 C60 D5 D7 F1 F10 G1 G4 G6	C60 D5 D7 F1 F10 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	FY19 Approved	FY20 Approved	FY21 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 E39 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 E39 F1 G1 G4 G6 H2
	ELOW2	Install elf owl boxes before Gila woodpeckers established	G1 G4	G1 G4	G1 G4
	MRM1	Define habitat characteristics	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D5 F1 F2 G4 G6	C60 D5 F1 F2 G4 G6	C60 D5 F1 F2 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
Gilded Flicker	GIFL1	Create 4,050 acres in Reaches 3–7	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	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E39 F1 G1 G4 G6 H2
	GIFL2	Install artificial snags until vegetation has matured			
	MRM1	Define habitat characteristics	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D5 F1 F2 G1 G4 G6	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	FY19 Approved	FY20 Approved	FY21 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 E39 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 E39 F1 G1 G4 G6 H2
	GIWO2	Install artificial snags			
	MRM1	Define habitat characteristics	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D5 F1 F2 G1 G4 G6	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 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	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D5 F1 F2 G1 G4 G6	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	FY19 Approved	FY20 Approved	FY21 Proposed
Arizona Bell's Vireo	BEVI1	Create 2,983 acres	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	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C55 C60 D5 F1 F2 G1 G4 G6	C55 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
Sonoran Yellow Warbler	YWAR1	Create 4,050 acres	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	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D5 F1 F2 G1 G4 G6	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	FY19 Approved	FY20 Approved	FY21 Proposed
Summer Tanager	**SUTA1**	**Create 602 acres – Creditable acres established exceed requirement**	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	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E39 F1 G1 G4 G6 H2
	MRM1	Define habitat characteristics	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6	D5 D6 F2 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D5 F1 F2 G1 G4 G6	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	C60 E16 E25 E35 G1 G4 G6 H2	C60 E16 E25 E35 E41 G1 G4 G6 H2	C60 E16 E25 E35 E41 G1 G4 G6 H2
	FLSU2	**$80,000 per year for 5 years – Completed**			
	FLSU3	Develop management needs/strategies	G1 G4	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	FY19 Approved	FY20 Approved	FY21 Proposed
MacNeill's Sootywing Skipper	MNSW1	Status surveys/habitat – define habitat first 5 years	D14 F6 G1 G4 G6	D14 F6 G1 G4 G6	D14 F6 G1 G4 G6
	MNSW2	**Create 222 acres – Creditable acres established exceed requirement**	C60 E1 E4 E5 E16 E37 E39 G1 G4 G6	C60 E1 E4 E5 E16 E37 E39 G1 G4 G6	C60 E1 E4 E5 E16 E39 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D14 F1 F6 G1 G4 G6	C60 D14 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 G6	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	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)	G1 G4 G6	G1 G4 G6	G1 G4 G6
	MRM1	Define 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 habit affected by wildfire	G1 G4	G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY19 Approved	FY20 Approved	FY21 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 G6	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	F8 G1 G4 G6	F8 G1 G4 G6	F8 G1 G4 G6
	CRTO2	Protect existing occupied habitat	G1 G4 G6	G1 G4 G6	G1 G4 G6
	CRTO3	Research to establish in unoccupied habitat	G1 G4 G6	G1 G4 G6	G1 G4 G6
Lowland Leopard Frog	LLFR1	Distribution surveys, habitat affinity, limiting factors	F8 G1 G4 G6	F8 G1 G4 G6	F8 G1 G4 G6
	LLFR2	Protect existing occupied habitat	G1 G4 G6	G1 G4 G6	G1 G4 G6
	LLFR3	Research to establish in unoccupied habitat	G1 G4 G6	G1 G4 G6	G1 G4 G6
Northern Mexican Gartersnake	NMGS1	Create 1,496 acres	E1 E28 G1 G4	E1 E28 G1 G4	E1 E28 G1 G4
	NMGS2	Implement measures to avoid/minimize take	G1 G4	G1 G4	G1 G4
	MRM2	Monitor and adaptively manage created habitat	F8 G1 G4	F8 G1 G4	F8 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
Other					
Topock Marsh Pumping	**AMM2**	**Avoid flow-related impacts on covered species – Completed**	E17	E17	E17
Law Enforcement and Wildland Fire Support	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 August 12, 2019, consistency letter from the USFWS for the *Final Implementation Report, Fiscal Year 2020 Work Plan and Budget, Fiscal Year 2018 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 FY19.

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 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 FY19, CESA program requirements were also met for FY19.

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 rails and 70 acres for California black rails. 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]) total length (TL) will be stocked into Reaches 4 and 5 of the LCR in California.

In fulfillment of item 6:

- Through FY19, 1,023 acres of riparian replacement habitat, including 945 acres of the cottonwood-willow and 78 acres of the 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 8:

- Through FY19, 63 acres of backwater replacement habitat at the MVCA met all requirements for backwater replacement habitat under the CESA permit.

In fulfillment of item 11:

- Through FY19, 112,267 razorback suckers and 46,125 bonytail (305 mm or greater TL) have been stocked into Reaches 4 and 5 (see tables 1-9b–c.). Since the start of the LCR MSCP, 158,392 native fishes have been stocked into Reaches 4 and 5 of the LCR in California.

OVERVIEW OF WORK TASKS

Fish Augmentation, Research, and Monitoring

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

Conservation Area Development, Maintenance, and Adaptive Management

FISH AUGMENTATION, RESEARCH, AND MONITORING

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 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, Section B and species habitat goals tend to drive the efforts described in other sections. Under Section C, information is gathered on how to more efficiently augment native fish populations (Section B) and how to build effective habitats for native fishes (Section E). Section D provides feedback on the success of the Fish Augmentation Program and may also identify areas in which additional research is needed (Section C). Under Section F, the relative success of created habitats is evaluated and may also provide data to make adaptive management recommendations (Section G). 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). Similarly, a monitoring regime that is implemented within the system as part of research investigations may eventually become covered under Section D. 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. The 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 FY19, 320,933 native fishes have been stocked toward completing this goal. This includes 108,520 bonytail that have been stocked into Reaches 2–5 (BONY3) and 212,413 razorback suckers that have been stocked into Reaches 3–5 (RASU3). In addition, 132,201 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 is 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 (Work Task B1) and reared at the Willow Beach National Fish Hatchery (Willow Beach NFH) in Arizona (Work Task B2) and the Lake Mead Fish Hatchery in Nevada (Work Task B6). 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) (Work Task B4). Additional fish rearing capacity is located at the Achii Hanyo Native Fish Rearing Facility in Arizona (Work Task B3), the Bubbling Ponds Fish Hatchery in Arizona (Work Task B5), and the Overton Wildlife Management Area in Nevada (Work Task B11 [closed]).

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 and implemented by the USFWS. 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 (Work Task B12). 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 result in the loss of the bonytail broodstock maintained at the Center.

FY19 Accomplishments

A total of 33,594 native fishes were stocked into the LCR, which included 6,185 razorback suckers and 220 bonytail stocked into Reach 2; 6,060 razorback suckers and 1,026 bonytail stocked into Reach 3; and 13,090 razorback suckers and 7,013 bonytail stocked into Reaches 4 and 5 (see table 1-9a-c). Key accomplishments for fish augmentation have been summarized by work task.

- *Work Task B1 – Lake Mohave Razorback Sucker Larvae Collections*: A collection goal of 43,000 larvae was established in FY19 to augment hatchery stocks, prepare for future increases in razorback sucker augmentation goals, and to provide additional fish as a contingency for unforeseen events. A total of 44,806 wild razorback sucker larvae were collected from four areas of Lake Mohave and delivered to the Willow Beach NFH and Lake Mead Fish Hatchery for rearing.

- *Work Task B2 – Willow Beach National Fish Hatchery*: A total of 2,448 razorback suckers were stocked into Reach 2. The Willow Beach NFH received 28,857 razorback sucker larvae for further grow-out.

- *Work Task B3 – Achii Hanyo Native Fish Rearing Facility*: A total of 2,741 native fishes were stocked, including 876 razorback suckers in Reach 2, 999 razorback suckers in Reach 3, and 866 bonytail in Reach 4. The Achii Hanyo Native Fish Rearing Facility transferred 2,491 bonytail to the Lake Mead Fish Hatchery for further grow-out and received 15,000 fingerling bonytail from the Center.

- *Work Task B4 – Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico*: A total of 3,879 bonytail were stocked, which included 1,026 bonytail in Reach 3 and 2,853 bonytail in Reach 4. The Center maintained broodstocks of razorback suckers and bonytail and transferred 55,000 larval razorback suckers to the Bubbling Ponds Fish Hatchery, 15,000 bonytail fry to the Achii Hanyo Native Fish Rearing Facility, and 10,000 fingerling bonytail to the Lake Mead Fish Hatchery for further grow-out.

- *Work Task B5 – Bubbling Ponds Fish Hatchery*: A total of 18,122 razorback suckers were stocked. This included 5,061 in Reach 3 and 13,061 in Reach 4. The Bubbling Ponds Fish Hatchery received 55,000 larval razorback suckers from the Center and transferred 4,284 juvenile razorback suckers to the Lake Mead Fish Hatchery for further grow-out.

- *Work Task B6 – Lake Mead Fish Hatchery*: A total of 5,876 native fishes were stocked, which included 2,333 razorback suckers and 220 bonytail stocked into Reach 2, and 29 razorback suckers and 3,294 bonytail stocked into Reach 4. The Lake Mead Fish Hatchery received 15,949 razorback sucker larvae from Lake Mohave and 4,284 juvenile razorback suckers from the Bubbling Ponds Fish Hatchery for further grow-out.

- *Work Task B7 – Lakeside Rearing Ponds*: A total of 528 razorback suckers were stocked into lakeside rearing ponds in early FY19. Spring and late summer pond harvests resulted in 86 razorback suckers captured and repatriated into Lake Mohave. Harvested fish ranged from 340–525 mm TL and had a mean TL of 434 mm.

- *Work Task B12 – Maintenance of Alternate Bonytail Broodstock*: Funding was provided to maintain the alternate bonytail broodstock (refuge population) at the Mora National Fish Hatchery. Broodstock survival was 97.9% through the end of FY19.

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 FY19 under work tasks described in "Species Research (Section C)" below.

FY20 Activities

Fish augmentation activities will continue to focus on maximizing production, increasing the size (TL) of stocked fishes, preparing for future increases in native fish augmentation goals, augmenting current hatchery stocks, and safeguarding these stocks against unforeseen events.

Approximately 33,000 razorback sucker larvae will be captured from Lake Mohave and delivered to the Willow Beach NFH and Lake Mead Fish Hatchery. The Willow Beach NFH will also transfer approximately 10,000 fingerling razorback suckers to the Achii Hanyo Native Fish Rearing Facility and approximately 7,000 fingerling razorback suckers to the Lake Mead Fish Hatchery for further grow-out.

The Willow Beach NFH will continue working toward meeting the current rearing goal of 8,000 razorback suckers per year with an average TL > 400 mm. Based on the fish currently on station, approximately 6,500 will be available for repatriation into Lake Mohave in FY20.

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

The Bubbling Ponds Fish Hatchery will produce approximately 12,000 razorback suckers for augmentation in Reaches 3–5. Surplus fish that do not meet the minimum stocking size may be transferred to other hatchery facilities for additional grow-out.

The Lake Mead Fish Hatchery is expected to produce up to 6,000 razorback suckers and 4,000 bonytail for augmentation in Reaches 2–5. It will continue to expand production of native fishes with the goal of providing approximately 18,000 fishes per year. Efforts to expand the electrical capabilities at the hatchery, which will support additional razorback sucker larval rearing capacity, will continue in FY20. Hatchery improvements and increased annual production of fishes will require additional funding for operations and a corresponding increase in budget obligations in FY20 and future years.

Proposed FY21 Activities

Fish augmentation activities will continue to focus on maximizing production to meet augmentation goals and improving rearing practices to safeguard current and future hatchery stocks. Specific activities related to fish augmentation are described in Work Tasks – Section B (Fish Augmentation). Infrastructure repairs, improvements, and expansion may be necessary at partnering facilities to secure current production and to meet the increases needed to support experimental stocking goals.

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 fulfillment of conservation measures, and (3) develop alternatives to conservation actions through the Adaptive Management Program (AMP) that will allow researchers to quantify existing knowledge, identify data gaps, and design and implement species research to fill the data gaps. Conceptual ecological models (CEMs) have been developed for razorback suckers, bonytail, and flannelmouth suckers (under Work Tasks G4 and G6) and will further assist in identifying these data gaps and in helping to prioritize and redefine research topics.

FY19 Accomplishments

Fish research work tasks presented in this section detail the accomplishments for FY19. Much of the research performed under Section C represents long-term research studies. In many cases, research under Section C has been ongoing, as several years of data may be necessary to adequately detect trends. Some of the more significant findings for FY19 native fish research include:

Post-Stocking Distribution, Habitat Use, and Survival

- *Work Task C64 –Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail*: Ongoing work in Lake Mohave (Reach 2) indicated that sonic-tagged razorback suckers routinely move between lake zones and spawning areas, often traveling more than 20 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 and throughout the spawning season. Ninety-nine sonic-tagged bonytail have also been released into Reach 2 since FY16. Monitoring of these fishes 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. Telemetry and passive integrated transponder (PIT) scanning 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.

  Remote PIT scanning surveys completed in Topock Marsh (Reach 3) indicated that fish use the entire marsh throughout the year but congregate around the main inflow into the marsh during the summer months. Remote scanning resulted in 1,013 contacts from 189 unique razorback suckers. The continued presence of razorback suckers in the marsh prompted a stocking of 20 sonic-tagged bonytail in FY18 to evaluate post-stocking habitat use and survival. No bonytail from this or other stockings were contacted in Topock Marsh in FY19.

  In Reach 4, 20 subadult razorback suckers and 20 subadult bonytail were implanted with short-term (3-month) acoustic telemetry tags to examine dispersal patterns immediately following release. Ten adult razorback suckers were implanted with long-term (36-month) tags to examine dispersal over a longer period. Thirty of these fishes were contacted outside their release backwater and represented individuals from each group. The largest proportion of these fishes dispersed only a short distance across the river channel and into another backwater, and all but one fish demonstrated a tendency for downstream dispersal. Remote PIT scanning and electrofishing surveys were also conducted throughout the year and resulted in contacts with 1,861 razorback suckers and 347 bonytail. Of these, 337 razorback suckers and 106 bonytail were contacted in the main channel. In previous years, the largest numbers of river contacts were 15 razorback suckers and 9 bonytail. The increase in river contacts is largely due to the discovery of a razorback sucker aggregation site in January, where 307 razorback suckers and 3 bonytail were contacted. This observation may be significant, as it suggests a potential new razorback sucker spawning location in the reach. Razorback

sucker capture and contact data collected during the year generated a population estimate of 169 individuals (95% confidence interval [CI] from 157 to 180). No bonytail population estimate could be generated due to limited recontacts.

Habitat Requirements and Assessment

- *Work Task C59 –Selenium Monitoring in Created Backwater and Marsh Habitats*: Analyses of FY18 samples were completed, and summary data were reported in FY19. Average selenium concentrations in sediment, periphyton, invertebrates, and whole-body fish samples from Hart Mine Marsh (HMM), the Imperial ponds, and McAllister Lake remained below their respective USFWS thresholds for protecting fish and wildlife, and hazard assessments for these components ranged from moderate to no hazard. Similar results were reported for the majority of these components from the Big Bend Conservation Area (BBCA); however, average selenium concentrations in whole-body fish samples exceeded the USFWS threshold for protecting fish and wildlife during each quarter of FY18. Average selenium concentrations in periphyton, invertebrates, and whole-body fish samples from the BBCA were consistently higher than those of other sites, and hazard assessments for these components ranged from moderate to high. Sampling was again conducted at all project sites in FY19. Whole-body fish, invertebrate, periphyton, sediment, and water samples were collected, and sample analyses will be completed and reported in FY20.

- *Work Task C61—Evaluation of Alternative Stocking Methods for Fish Augmentation:* Predator avoidance trials continued at the Arizona Game and Fish Department's Aquatic Research Conservation Center. Experimental trials to evaluate survival of conditioned native fishes in the presence of predators and artificial habitat were completed. Razorback sucker and bonytail survival were observed to be higher during these trials than during previous trials evaluating only conditioning or artificial habitat.

FY20 Activities

Research in FY20 will continue to focus on evaluating post-stocking survival and habitat use and needs of native fishes. Because recontact rates for stocked fishes are low, intensive research will be coordinated with fish augmentation stockings to observe immediate post-stocking dispersal and habitat selection. These observations will help determine subsequent sampling locations, with the goal of maximizing recontacts. Native fishes, particularly subadult razorback suckers, are often not contacted for several years following stocking. Multi-year studies are typically needed to allow these fish to mature and incorporate with spawning aggregations so that survival and the effects of stocking treatments can be adequately assessed.

Recently acquired data have indicated that there is a large self-sustaining population of humpback chubs in the western Grand Canyon. This population may represent a significant contribution toward conservation efforts, but to date, no quantitative evaluation has been conducted in this large section of the river that is outside historic aggregation sites. In FY20, the USFWS Arizona Fish and Wildlife Conservation Office plans to develop a study design for conducting annual, closed mark-recapture efforts to estimate the abundance of humpback chubs in select reaches of the western Grand Canyon. Advanced funding for this work will be provided through Work Task C14 in FY20, and field work is expected to begin in FY21.

Predator avoidance trials will continue at the Aquatic Research Conservation Center. Pilot trials evaluating avian predator conditioning are expected to be completed in spring 2020, when razorback sucker and bonytail fry become available from the Southwestern Native Aquatic Resources and Recovery Center, Dexter, New Mexico.

Assessments of movement, distribution, and riverine habitat use by razorback suckers and bonytail will continue under Work Task C64. This work will include sonic telemetry and remote PIT scanning in coordination with research-specific or general augmentation stockings in Reaches 2–4. The results will be used to improve future monitoring strategies, suggest potential stocking locations, track post-stocking survival, and generate abundance estimates when possible.

Previous research findings that have identified ways of improving fish propagation and culturing will be incorporated into regular practices whenever possible and practical. As additional research is completed, 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. Study results from long-term research may also generate additional work under Section C, and 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.

No new Species Research (Section C) work tasks are beginning in FY20.

Proposed FY21 Activities

Research efforts will continue to focus on three major areas: (1) identifying locations 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 evaluate habitat use and post-stocking survival. Five years of native fish research

in Reach 4 (Work Task C64) will be completed in FY21. Results from this research will be reviewed, and findings may be used to refine or develop additional native fish research in this reach.

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 completed 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.

FY19 Accomplishments

Population estimates reported for razorback suckers are provided in table 1-11. Some population estimates are calculated differently based on the availability of data. Reach 1 (Lake Mead) population estimates are calculated using multi-year netting captures only. The remaining reaches (Reaches 2–5) use PIT scanning contacts to provide population estimates. 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 population estimates provided are for the time period preceding the reporting year and are based on the defined mark-recapture period (table 1-11). No population estimates were calculated for bonytail due to limited post-stocking contacts.

Table 1-11.—Population Estimates for Razorback Suckers by LCR MSCP River Reach in FY19

Reach	Mark-Recapture Period	Razorback Sucker Population Estimate
Reach 1 (Lake Mead)	07/01/2017 to 06/30/2019	248
Reach 2 (Lake Mohave)	01/01/2018 to 04/30/2019	3,649
Reach 3	01/01/2018 to 04/30/2019	4,791
Reaches 4 and 5	01/01/2018 to 04/30/2019	147

Routine monitoring of the Lake Mead razorback sucker population was conducted. Trammel netting during the spawning season resulted in the capture of 46 razorback suckers: 3 from Las Vegas Bay, 9 from Echo Bay, 22 from the Muddy River/Virgin River inflow, and 12 from the Colorado River inflow area.

Of the 46 razorback suckers captured, 15 were recaptured fish. The remaining fish were untagged, presumed to be wild-spawned individuals, and included three juvenile fish. The ages of wild razorback suckers captured from all monitoring areas ranged from 3 to 10 years old. The razorback sucker population in Lake Mead was estimated at 248 individuals (95% CI from 160 to 385) for the 2017–19 data collection period. Larvae and juvenile fish were observed, along with active spawning, in four separate areas in the lake. A total of 304 larvae were captured throughout the season. Larval collections in Reach 1 were conducted to monitor spawning success, estimate larval abundance, and collect samples for genetic analyses. The majority of captured larvae were returned to the lake following each sampling period. No bonytail were contacted during the study year, and they are considered absent from Reach 1.

Annual razorback sucker roundups were conducted in Lake Mohave in November and March. During these efforts, a combined 225 razorback suckers were captured using trammel nets. Ten additional razorback suckers were also captured during April gill net surveys. Electrofishing surveys were conducted in the river section of Lake Mohave (upstream of the Willow Beach NFH) in October and December and again in July through September. Eighty-two razorback suckers were captured.

Remote PIT scanning recorded 96,575 contacts throughout Lake Mohave. After duplicate PIT tags contacted in multiple lake sections were removed from analyses, a total of 4,408 unique fish were contacted in 37,258 hours of scan time. This is a 13% increase over the 3,835 unique PIT tags contacted in 37,903 hours of scan time in 2018. Based on 2018–19 remote PIT scanning, the lake-wide Lake Mohave repatriate population was estimated at 3,649 individuals (95% CI from 3,552 to 3,745).

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. Fall and spring netting surveys were conducted throughout Topock Gorge and upper Lake Havasu. All survey methods conducted in Reach 3 resulted in the capture or contact of 5,552 unique razorback suckers, 51 bonytail, and 25 flannelmouth suckers. Reach 3 had a razorback sucker population estimate of 4,791 (95% CI from 4,328 to 5,254).

Capture and contact data for Reaches 4 and 5 are primarily obtained through work being conducted under Work Task C64. Supplemental PIT scanning and electrofishing are conducted under Work Task D8 in an effort to increase contacts and locate potential spawning aggregates. In FY19, 1,861 unique razorback suckers and 347 unique bonytail were contacted. Electrofishing was conducted from the I-10 bridge to the wash fans downstream from the C-10 backwater, resulting in the detection of a potential spawning aggregation in the river near the C-7 backwater. Monitoring at this location resulted in the contact of 307 razorback suckers and 3 bonytail. Data from FY18 and FY19 were used to generate a

razorback sucker population estimate of 147 individuals (95% CI from 123 to 171). Due to the limited number of bonytail recontacts, no population estimate could be generated.

FY20 Activities

Monitoring data will be collected from 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 fishes, and active and passive tracking of sonic-tagged fishes.

Proposed FY21 Activities

Monitoring will be conducted in all reaches, and participation in multi-agency field surveys will continue. Monitoring efforts will primarily use remote PIT scanning technology, as this technology has proven effective in increasing both contact probabilities and the precision of population estimates. The use of sonic and radio telemetry tags will continue to help identify additional locations where native fishes might persist. As research-based work tasks are completed, gaps in native fish community sampling data are expected. Efforts under Section D will fill a portion of these gaps by maintaining the appropriate level of system-wide monitoring for the 50-year term of the LCR MSCP.

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 BBCA, the MVCA, Beal Lake, and the Imperial ponds.

FY19 Accomplishments

Larval sampling was conducted at the BBCA from January through May and resulted in the capture of 12 razorback sucker larvae and 26 flannelmouth sucker larvae. Mobile remote PIT scanners deployed once per month during this same period contacted 23 razorback suckers. No other native fishes were contacted by these units. In addition to the mobile PIT scanners deployed January through May, a single permanent PIT scanner was deployed to scan continuously throughout the year. This unit contacted 40 razorback suckers and 1 bonytail.

Water quality monitoring was also completed quarterly, and all recorded parameters (i.e., temperature, dissolved oxygen, conductivity, and pH) were within suitable ranges for native fishes.

Construction of the MVCA was completed in FY19. Two permanent PIT scanners installed at the inflow and outflow structures ran continuously, but the outflow scanner was only accessible to fishes once the cofferdam was removed at the end of January. In total, the scanners contacted 1,931 razorback suckers and 1 bonytail.

Monitoring of the Imperial ponds consisted of surveys for larval, juvenile, and adult native fishes. Population estimates for PIT-tagged razorback suckers and bonytail were calculated using remote PIT scanning detections. Pond population estimates for razorback suckers ranged from 204–228 individuals in Ponds 1, 3, and 4, and from 75–110 for bonytail in Ponds 2, 5, and 6. Recruits were captured in each bonytail pond, and the majority of captured fish were untagged, which suggests that the actual populations may be larger than estimated. Larval razorback suckers and untagged juveniles were captured in Pond 1, indicating that a successful recruitment event occurred. Limited recruitment has been documented in Pond 3, with the capture of a single recruit, and no recruitment has been observed in Pond 4 to date.

FY20 Activities

Monitoring efforts will continue at the BBCA and will include larval fish collections, intensive remote PIT scanning, and water quality assessments from January through May. Additional monitoring will be completed during the remainder of the year using a single, permanent remote PIT scanner, which will scan continuously, and quarterly trips to record water quality data.

Native fish monitoring at the MVCA will continue via remote PIT scanners that were integrated into the inflow and outflow structures. Scanning data will be used to confirm the presence of native fishes, and supplemental sampling will be completed as needed.

Monitoring of the Imperial ponds will continue to focus on population monitoring and documenting recruitment. Activities will include 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.

Proposed FY21 Activities

The BBCA is scheduled for dredging in FY21, which will likely result in reduced monitoring at this site. Monitoring of native fishes at other conservation areas will continue at levels similar to previous years.

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. Monitoring and research priorities are assessed every 5 years and will include an analysis of new information and an explanation of resulting changes to design or direction that will be made.

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 decision-making 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 make informed management decisions. Native fish stocking and tagging data obtained 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)."

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.

FY19 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.

Scientific peer reviews were conducted for 11 fisheries reports that were subsequently posted on the LCR MSCP website. These reviews ensured that all research and monitoring complies with program, bureau, and departmental scientific integrity policies. This process also ensures that research and monitoring meet the needs of the LCR MSCP as outlined in the HCP and other program documents.

The development of adaptive management plans for each research and monitoring effort continued. 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.

The LCR MSCP *Five-Year Monitoring and Research Priorities Report 2018–22* was completed in FY18 and finalized in early FY19.

Based on the independent review of all genetic data collected to date, and the current methods and available technology, a panel of five genetic experts recommended a plan for updating the genetic monitoring of native fishes. This plan aligns with the goals/needs/objectives of the LCR MSCP and describes the level of effort expected to meet long-term genetic monitoring needs. The panel of experts will be available to review proposals to accomplish the provided recommendations.

FY20 Activities

During FY20, fisheries field data collection will begin the transition to the new platform that was selected in FY17. Maintenance of the native fish databases will continue.

Initial steps for implementing the recommendations from the fish genetics panel will be completed, and the panel will review any proposals received for implementing the genetics monitoring program.

Development of adaptive management plans for each research and monitoring effort continues.

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

Proposed FY21 Activities

Technical, independent, and peer reviews of fisheries projects, as part of the adaptive management process, will continue under the AMP.

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 to refine existing plans.

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

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

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 development and management of habitats that are created under the program and maintenance of existing habitat (Section E). This requires knowledge of the environmental characteristics important for each species (such as vegetation type and structure, breeding site requirements, food sources, and abiotic conditions like temperature and humidity) as well as the environmental conditions required to support the habitat (such as hydrology, soil type, and water depth). It also requires identifying the types and frequency of management activities needed to maintain functional habitats over the 50-year term of the LCR MSCP. Information is gathered from scientific literature and experts (Section G), and when fundamental information is lacking, research projects (Section C) and monitoring activities (Section D and Section F) are implemented to fill those data gaps.

Species' populations are monitored to determine the extent they are using the created habitat (Section F) and other habitat along the LCR and key neighboring watersheds (Section D). Species presence can indicate that created land cover is functioning as habitat and can be used in analysis to identify changes in habitat quality as well as to help identify previously unknown habitat characteristics. Monitoring data can also be used to evaluate the ongoing status of covered species and their habitats in the LCR MSCP planning area to clarify why a species may be present or absent from created habitat and if their presence/absence is related to habitat quality. All of this information may result in changes to the types and frequency of management activities implemented to maintain functional habitats (Section E 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	Pale Townsend's big-eared bat
California black rail	Sonoran yellow warbler
California leaf-nosed bat	Southwestern willow flycatcher
Colorado River cotton rat	Summer tanager
Colorado River toad	Vermilion flycatcher
Elf owl	Western least bittern
Gila woodpecker	Western red bat
Gilded flicker	Western yellow bat
Lowland leopard frog	Yellow-billed cuckoo
MacNeill's sootywing skipper	Yuma clapper rail
Northern Mexican gartersnake	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* report. This report was updated in 2018 with the priorities for FY18–22.

FY19 Accomplishments

In 2019, the LCR MSCP provided funds (Work Task C2) to the National Park Service (NPS) at the Lake Mead National Recreation Area to support implementation of conservation measures for sticky buckwheat (STBU1) and threecorner milkvetch (THMI1). The FY19 funds were used to monitor sticky buckwheat and threecorner milkvetch populations and for invasive species control.

FY20 Activities

The LCR MSCP will provide funds to the NPS at the Lake Mead National Recreation Area to support existing conservation activities for sticky buckwheat and threecorner milkvetch (C2) in accordance with Conservation Measures STBU1 and THMI1. This will include attempting to remove Sahara mustard, native sixweeks fescue, and non-native Mediterranean grass that are stabilizing the dunes at Sandy Cove and degrading threecorner milkvetch habitat. Plots will be treated with mechanical and herbicide methods, and then monitored for effectiveness in controlling Sahara mustard and native and non-native grasses, and to document any threecorner milkvetch that colonize the plots. This should promote more habitat over time for the threecorner milkvetch and provide tools to maintain and improve habitat at sticky buckwheat areas in the future.

Proposed FY21 Activities

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

If additional 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 FY14–18, 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 (sootywings) (F6), and rodents (D10 and F3) focused on documenting presence and, when appropriate, breeding. In FY18, monitoring for southwestern willow flycatchers (D2) followed suit, and efforts were focused on documenting presence and breeding at the system-wide populations and historical nesting areas in Reaches 3–7 and along the Bill Williams River and Alamo Lake. This program-level analysis of system-wide monitoring will continue. 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.

FY19 Accomplishments

System-wide monitoring continued for marsh birds, southwestern willow flycatchers, yellow-billed cuckoos, riparian birds, bats, rodents, and sootywings along the LCR and adjacent river systems.

Marsh bird surveys (D1) were conducted at Topock Gorge and the upper reaches of Lake Havasu during March, April, and May 2019 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. Three covered species were encountered (table 1-12).

Table 1-12.—Marsh Bird Detections in Topock Gorge, FY19

Species	Number of detections per month		
	March	April	May
California black rail	1	0	2
Western least bittern	14	25	44
Yuma clapper rail	63	51	47

System-wide surveys for southwestern willow flycatchers (D2) were conducted at Topock Marsh, Alamo Lake, and the Bill Williams River. A total of 158 southwestern willow flycatchers were detected at 12 of the 76 sites during presence surveys, and 95 territories were documented. Surveyors confirmed that southwestern willow flycatchers were resident or breeding at 12 of the sites (within 3 study areas): Alamo Lake, the Bill Williams River National Wildlife Refuge, and Topock Marsh. Nest monitoring was only conducted at Topock Marsh. Nest success was calculated for seven southwestern willow flycatcher nests at Topock Marsh that contained flycatcher eggs. Five of the seven nests fledged flycatcher young, for a success rate of 71%. This represents the highest number of nests and successful nests at Topock Marsh since 2008, and the number of young produced in 2019 equals the total number produced over the previous decade combined.

System-wide monitoring for yellow-billed cuckoos (D7) involved conducting followup visits to find cuckoos that were tagged with geolocator devices in FY14–15. Eight cuckoos banded in previous years were positively resighted in FY19, but no cuckoos tagged with geolocator devices were found. In addition,

the quality of system-wide habitat and occupancy potential was reviewed to assess the benefit of conducting system-wide surveys for the following year. Cottonwood-willow habitat quality along the Bill Williams River has not fully recovered from impacts due to drought, although cuckoos have returned to the area (see Work Task F10). Yellow-billed cuckoos continue to utilize created habitat at the LCR MSCP conservation areas and continue to occupy new habitat within 1–3 years after planting.

Multi-species survey protocols have been developed to monitor other riparian birds covered under the LCR MSCP. Under Work Task D5, banding of migrating and breeding birds was conducted using the Monitoring Avian Productivity and Survivorship (MAPS) protocol to gather specific breeding and body condition information and to compare 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 the Beal Lake Conservation Area (BLCA) and Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1). There were 220 birds captured at the BLCA and 153 captured at Cibola NWR Unit #1. This included three LCR MSCP species. At the BLCA, new captures included six Bell's vireos, six yellow warblers, and two summer tanagers. Three color-banded yellow warblers that were banded earlier in the 2019 season were recaptured at the BLCA, and one color-banded summer tanager was recaptured at the BLCA, which was initially banded at the conservation area in 2011. New captures at Cibola NWR Unit #1 included one yellow warbler and two summer tanagers. No previously banded covered species were recaptured at Cibola NWR Unit #1 in FY19. The covered species detected here are also being documented under post-development riparian bird surveys (F2).

Surveys were conducted for gilded flickers under Work Task D6 within 10 kilometers of LCR MSCP conservation areas at Bill Williams National Wildlife Refuge, Parker Dam Camp, and along Laguna Dam Road between the Yuma Proving Grounds and the Mittry Lake Wildlife Area just east of the Laguna Division Conservation Area (LDCA). Suitable habitat was found in all these locations; however, no gilded flickers were detected. Gilded flicker observations by biologists from other agencies were made at the north side of Lincoln Ranch on June 25; at the PVER on June 12 and July 28; and at Mittry Lake on February 5. The monitoring protocol evaluation for Arizona Bell's vireos, elf owls, Gila woodpeckers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers continued. The monitoring goals and objectives were finalized, and the vegetation map was prepared using remote sensing tools. Potential analysis and survey methods continued to be analyzed for suitability and cost efficiency. A power analysis of multiple survey methods was conducted. This evaluation will ensure that monitoring methods and statistical analyses are meeting the LCR MSCP long-term objectives.

Under Work Task D9, acoustic monitoring stations were operated from June to August to detect bat presence at Havasu National Wildlife Refuge-Pintail Slough, the Bill Williams River National Wildlife Refuge, the ‘Ahakhav Tribal Preserve, the Cibola National Wildlife Refuge-Island Unit, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, Yuma East Wetlands (YEW), and Hunters Hole. Stations where each bat species were detected are listed in table 1-13.

Table 1-13.—System-Wide Acoustic Bat Monitoring Conducted in FY19

System-Wide Stations	Western Red Bat	Western Yellow Bat	California Leaf-nosed Bat	Pale Townsend’s Big-eared Bat
Havasu National Wildlife Refuge-Pintail Slough	X	-	-	-
Bill Williams River National Wildlife Refuge	X	-	X	X
‘Ahakhav Tribal Preserve	X	-	-	-
Cibola National Wildlife Refuge-Island Unit	X	-	X	-
Picacho State Recreation Area	X	-	X	-
Mittry Lake Wildlife Area	X	X	X	-
Yuma East Wetlands	X	X	X	-
Hunters Hole	-	X	X	-

X = detected; - = not detected.

System-wide surveys were conducted for Yuma hispid cotton rats (D10) to determine if the species utilizes marsh habitat. Traps were set in the marsh at YEW, but no Yuma hispid cotton rats were detected. This knowledge gap remains. Work Task D10 was closed in FY19. Future monitoring at YEW and the LDCA (F3) may shed light on Yuma hispid cotton rat use of marsh habitat.

Cottonwood-willow land cover at the PVER and CVCA containing quailbush shrubs were surveyed for the presence of sootywings (D14). They were detected in Phases 4 and 5 at the PVER in dense stands of quailbush and Phases 3 and 9 at the CVCA in quailbush that is dispersed throughout much of the phases.

FY20 Activities

System-wide monitoring of marsh birds, southwestern willow flycatchers, yellow-billed cuckoos, riparian birds, bats, rodents, and sootywings will continue along the LCR.

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

System-wide surveys for southwestern willow flycatchers (D2) will be conducted at Topock Marsh, the Bill Williams River, and Alamo Lake. Nest monitoring will be conducted at Topock Marsh.

Yellow-billed cuckoo (D7) presence surveys will be conducted on the Bill Williams River. Habitat conditions at Topock Marsh will be assessed.

Some multi-species surveys used to monitor other avian species covered under the LCR MSCP will continue in FY20. Under Work Task D5, the MAPS banding stations will continue to operate at the BLCA and Cibola NWR Unit #1 during the breeding season. Color banding of LCR MSCP covered species will continue to be implemented to detect repeated selection of conservation area as breeding sites and to monitor productivity, recruitment, and survival.

Gilded flicker surveys will be conducted in potential habitat to seek populations near LCR MSCP conservation areas that might colonize the new habitat in the future. System-wide breeding bird surveys (D6) will be conducted in FY20. 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.

Eight acoustic monitoring stations will be operated along the LCR (D9). Data will be collected and analyzed for covered and evaluation species presence during the summer peak activity periods. Monitoring will occur at Havasu National Wildlife Refuge-Pintail Slough, the Bill Williams River National Wildlife Refuge, the ‘Ahakhav Tribal Preserve, the Cibola National Wildlife Refuge-Island Unit, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, YEW, and Hunters Hole.

System-wide monitoring of sootywings (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.

Proposed FY21 Activities

System-wide monitoring of marsh birds, southwestern willow flycatcher, riparian birds, bats, rodent populations, and sootywings along the LCR will continue.

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

System-wide surveys for southwestern willow flycatchers (D2) will be conducted at Topock Marsh, the Bill Williams River, and Alamo Lake. Nest monitoring will be conducted at Topock Marsh.

Yellow-billed cuckoo (D7) presence surveys will be conducted on the Bill Williams River. System-wide cottonwood-willow habitat will be checked to see if condition improves and whether conducting yellow-billed cuckoo surveys at those areas could benefit the LCR MSCP.

Multi-species surveys to monitor additional avian species covered under the LCR MSCP will continue. Under Work Task D5, collection of productivity, recruitment, and survival data on avian species utilizing restoration sites will continue. System-wide breeding bird surveys under Work Task D6 will continue.

Eight acoustic monitoring stations will be operated along the LCR (D9). Data will be collected and analyzed for covered and evaluation species presence during the summer peak activity periods. Monitoring will occur at Havasu National Wildlife Refuge-Pintail Slough, the Bill Williams River National Wildlife Refuge, the ‘Ahakhav Tribal Preserve, the Cibola National Wildlife Refuge-Island Unit, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, YEW, and Hunters Hole.

System-wide monitoring for sootywings (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.

FY19 Accomplishments

In FY19, monitoring for LCR MSCP covered species use was conducted at 13 conservation areas (table 1-14). Post-development monitoring was conducted for targeted covered species, including southwestern willow flycatchers (F9), yellow-billed cuckoos (F10), avian species (F2), marsh birds (F7), rodents (F3), bats (F4), and insects (F6). In addition to the covered species post-development monitoring that took place during FY19, long-term vegetation monitoring was conducted at all conservation areas using 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, which are being developed under Work Task C60, and describe vegetation structure throughout the canopy with the ability to identify structural diversity and successional growth stages.

Presence surveys for southwestern willow flycatchers (F9) were conducted at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, the Middle Bill Williams River National Wildlife Refuge (Middle Bill Williams River NWR), Planet Ranch, the LDCA, YEW, and Hunters Hole. Migratory willow flycatchers were detected at all of these conservation areas, but no resident southwestern willow flycatchers were detected. Nest monitoring and color banding activities were not conducted.

Post-development monitoring for yellow-billed cuckoos (F10) continued in FY19 with presence surveys at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, YEW, the LDCA, the Middle Bill Williams River NWR, Planet Ranch, and Hunters Hole. Followup visits to determine breeding status were conducted at conservation areas where breeding has yet to be documented or has not been documented recently. There were 263 detections of cuckoos throughout the LCR MSCP conservation areas. Cuckoos were detected at the BLCA, the Middle Bill Williams River NWR, the PVER, the CVCA, Cibola NWR Unit #1, YEW, the LDCA, Planet Ranch, and Hunters Hole. There were 20 confirmed, 26 probable, and 31 possible breeding territories estimated in FY19 and 17 nests found incidentally during presence surveys and followup surveys. No breeding territories were confirmed at the BLCA. There were eight confirmed breeding territories, including six nests, at the PVER. There were seven confirmed territories, including seven nests at Cibola NWR Unit #1, and three confirmed territories and three nests at the CVCA. There was one confirmed territory with one nest found at YEW, documenting nesting there for the second year. The birds at YEW were banded to determine if the same pair will nest at this conservation area again in FY20 or if new pairs are using it each year.

Under Work Task D5, MAPS banding at the BLCA and Cibola NWR Unit #1 detected Bell's vireos, yellow warblers, and summer tanagers. New captures at the BLCA included six Bell's vireos, six yellow warblers, and one summer tanager. There was one color-banded summer tanager recaptured at the BLCA, which was originally banded in 2011. There were also one Bell's vireo and

Table 1-14.—LCR MSCP Covered Species Post-Development Monitoring Conducted in FY19

Conservation Area	Marsh Birds	Southwestern Willow Flycatcher	Yellow-billed Cuckoo	Other Covered Riparian Birds	Bats	Rodents	MacNeill's Sootywing Skipper	Northern Mexican Gartersnake and Amphibians
Beal Lake Conservation Area	X[1]	X	X	X	X	X	-	X[2]
Big Bend Conservation Area	X[2]	-	-	-	-	-	-	-
Cibola National Wildlife Refuge Unit #1 Conservation Area	-	X	X	X	X	X	-	-
Cibola Valley Conservation Area	-	X	X	X	X	X	X	-
Hart Mine Marsh	X	-	-	-	-	X	-	-
Hunters Hole	-	X	X	X	X[3]	X	-	-
Imperial National Wildlife Refuge	X	-	-	-	-	-	-	-
Laguna Division Conservation Area	X[3]	X	X	X	-	X	-	-
Palo Verde Ecological Reserve	-	X	X	X	X	X	X	-
Parker Dam Camp	-	-	-	X	-	-	-	-
Planet Ranch and Middle Bill Williams River National Wildlife Refuge	-	X	X	X	-	-	-	-
Pretty Water Conservation Area	-	-	-	X	-	-	X	-
Yuma East Wetlands	X	X	X	X	X[4]	X	-	-

X = surveyed; - = not surveyed.

[1] = The Beal Lake backwater was surveyed prior to dredging for compliance purposes.
[2] = Surveys conducted and funded by the USFWS detected northern Mexican gartersnakes at the BLCA in FY19.
[3] = Surveyed by another organization and not funded by LCR MSCP, as the land cover type is not creditable for marsh birds (these backwaters, cottonwood-willow, and/or honey mesquite include some marsh vegetation in their mosaic).
[4] = Surveyed but reported under system-wide monitoring Work Task D9, as Hunters Hole and Yuma East Wetlands are outside the creditable reaches for the western red and western yellow bat.

three yellow warblers resighted, which were all captured and banded in FY19. New captures at Cibola NWR Unit #1 included one yellow warbler and two summer tanagers. One vermilion flycatcher was detected in CW North, but it evaded capture during a target netting attempt. The covered species detected here are also being documented under post-development riparian bird surveys (F2).

Under Work Task F2, a multi-species protocol and sample plan were used to document the presence of riparian bird species on conservation areas. In FY19, 81 plots were surveyed, and 78 bird species were confirmed breeding.

- BLCA – There were 73 pairs of territorial birds confirmed breeding comprising 14 species. Nine pairs of Arizona Bell's vireos, 11 pairs of Sonoran yellow warblers, and 1 summer tanager pair were confirmed breeding.

- Cibola NWR Unit #1 – There were 149 pairs of territorial birds confirmed breeding comprising 16 species. One Gila woodpecker pair, one summer tanager pair, two pairs of vermilion flycatchers, and three pairs of Sonoran yellow warblers were confirmed breeding.

- CVCA – There were 247 pairs of territorial birds confirmed breeding comprising 15 species. One Gila woodpecker pair, one summer tanager pair, and two pairs of Sonoran yellow warblers were confirmed breeding.

- Hunters Hole – There were 10 pairs of territorial birds confirmed breeding comprising 5 species. No LCR MSCP covered species were confirmed breeding.

- LDCA – There were 238 pairs of territorial birds confirmed breeding comprising 15 species. Twelve pairs of Arizona Bell's vireos, two pairs of Gila woodpeckers, and one Sonoran yellow warbler pair were confirmed breeding.

- Middle Bill Williams River NWR – There were 1,298 pairs of territorial birds confirmed breeding comprising 22 species. Sixty pairs of Arizona Bell's vireos, 23 pairs of Gila woodpeckers, 130 pairs of Sonoran yellow warblers, and 12 pairs of summer tanagers were confirmed breeding.

- Parker Dam Camp – There were 93 pairs of territorial birds confirmed breeding comprising 16 species. One Gila woodpecker pair was confirmed breeding.

- PVER – There were 262 pairs of territorial birds confirmed breeding comprising 16 species. Two pairs of Arizona Bell's vireo and eight pairs of summer tanagers were confirmed breeding.

- Pretty Water Conservation Area – There were 87 pairs of territorial birds confirmed comprising 12 species. There were no LCR MSCP covered species confirmed breeding.

- YEW – There were 77 pairs of territorial birds confirmed breeding comprising 10 species. Four pairs of Gila woodpeckers were confirmed breeding.

Marsh bird surveys (F7) were conducted at creditable marsh at HMM, Field 18 in the Imperial Ponds Conservation Area (IPCA), and YEW. Surveys at the BLCA backwater were conducted prior to dredging to document Yuma clapper rail locations in case they were needed for compliance purposes. Survey data were also received from outside organizations for the BBCA, the ponds at the IPCA, and the LDCA, which were not surveyed by LCR MSCP in FY19, as they are not classified as marsh land cover type. The BBCA and the ponds at the IPCA are backwaters, and the LDCA contains the cottonwood-willow and honey mesquite land cover types. Yuma clapper rails were detected at the BLCA, HMM, Field 18 at the IPCA, and YEW, and they were also detected in areas with marsh vegetation at the ponds at the IPCA, and the LDCA. Western least bitterns were detected at the BLCA, and HMM, and they were also detected in areas with marsh vegetation at the BBCA, the ponds at the IPCA, and the LDCA. California black rails were detected at Field 18 at the IPCA.

Live trapping surveys to detect Colorado River and Yuma hispid cotton rats (F3) were conducted in fall 2018 and spring 2019. Surveys were conducted at the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, HMM, YEW, the LDCA, and Hunters Hole. Colorado River cotton rats were captured at the PVER, Cibola NWR Unit #1, the CVCA, and HMM. None were captured at the BLCA. Yuma hispid cotton rats were captured at the LDCA and Hunters Hole; none were captured at YEW.

Bat presence was monitored at conservation areas (F4). Acoustic monitoring was conducted at the BLCA, the PVER, the CVCA, and Cibola NWR Unit #1. The results will be reported when analyses are completed.

Sootywings were monitored (F6) at the PVER, CVCA, and the Pretty Water Conservation Area. They were detected at all three conservation areas.

FY20 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), riparian birds (F2), marsh birds (F7), rodents (F3), bats (F4), and insects (F6). MAPS banding stations (D5) will continue to operate at Cibola NWR Unit #1 and the BLCA during the FY20 breeding season. Pre-development surveys will be conducted for any new conservation areas.

Long-term vegetation monitoring will continue in FY20 using lidar technology (F1). Data will be processed and analyzed to provide metrics for vegetation structure analyses.

Surveys for northern Mexican gartersnakes, lowland leopard frogs, and Colorado River toads (F8) are not anticipated at this time, but funding has been allocated in case pre-development clearance surveys or construction monitoring are required.

FY21 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), riparian birds (F2), marsh birds (F7), rodents (F3), bats (F4), and insects (F6). MAPS banding stations (D5) will continue to operate at Cibola NWR Unit #1 and the BLCA during the FY20 breeding season. Pre-development surveys will be conducted for any new conservation areas.

Long-term vegetation monitoring will continue in FY21 using lidar technology (F1). Data will be processed and analyzed to provide metrics for vegetation structure analyses.

A monitoring plan for northern Mexican gartersnakes, lowland leopard frogs, and Colorado River toads (F8) will be prepared. Funding has also been allocated in case pre-development clearance surveys or construction monitoring are required.

Adaptive Management Program (Section G)

Under the AMP, 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. Monitoring and research priorities are assessed every 5 years and will include an analysis of new information and explain resulting changes to design or direction that will be made.

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 decision-making process. Funding allocated under Work Task G3 to begin research studies identified as priorities, when applicable, will continue.

FY19 Accomplishments

Field data collection forms were maintained for all projects already transitioned to the new platform. Proofing and reporting tools were developed for projects using the new platform.

Scientific peer reviews were conducted for 15 wildlife reports that were subsequently posted on the LCR MSCP website. These reviews ensured that all research and monitoring complies with program, bureau, and departmental scientific integrity policies. This process also ensured that research and monitoring meet 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. When appropriate, this information was shared with external partners to assist in their research, monitoring, and report writing activities.

The development of adaptive management plans for each research and monitoring effort continued. 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.

The LCR MSCP *Five-Year Monitoring and Research Priorities Report 2018–22* was completed in FY18 and was posted on the LCR MSCP website in early FY19.

Updates to all CEMs continued. CEMs for the five LCR MSCP evaluation species (California leaf-nosed bat, Colorado River toad, desert pocket mouse, lowland leopard frog, and pale Townsend's big-eared bat) have been developed. The CEM for sootywings was finalized and posted on the LCR MSCP website.

FY20 Activities

The field data collection processes continue to be updated and/or maintained. Additional projects will be transitioned to the second-generation mobile electronic field form (MEFF) platform.

Research and monitoring activities continue to be reviewed and evaluated internally as well as through independent, external reviewers.

Development of adaptive management plans for each research and monitoring effort continue.

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

FY21 Proposed Activities

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

Where appropriate, any wildlife field data collection project not using current MEFFs will be updated to second-generation MEFFs.

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 to refine existing plans.

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 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 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 floodplain. The selection process is described in the *Draft Guidelines for the Screening and Evaluation of Potential Conservation Areas*, which is available on the LCR MSCP website (www.lcrmscp.gov). These conservation areas are discrete areas of conserved habitats managed 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 the 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 land covers consisting of native riparian species.

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 mainstem 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 present 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 the 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 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 influenced 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.

FY19 Accomplishments

The Dennis Underwood Conservation Area was established as a conservation area after the signing of an easement for conservation purposes between Reclamation and the Metropolitan. Reclamation and the CDFW amended the PVER Agreement to expand this conservation area to include the PVER-South property.

Hydraulic Dredge Support Equipment: A telehandler, used for movement of dredge pipe and materials, was acquired from Government excess and used to support dredging operations. A D-6 high track dozer was also acquired, which will result in lower overall operating costs at multiple conservation areas under or planned for construction.

Reach 3 Cadastral Surveys: Additional investigation, such as obtaining topographic data with lidar, soil sampling, and a wetlands delineation were completed at the proposed Section 26 Conservation Area.

Reach 4 Cadastral Surveys: The Bureau of Land Management completed record searches for an area within Reach 4 that may be suitable for either a backwater or marsh complex. The task was to identify land status within Township 9S, Range 22E, Sections 5, 7, and 8, San Bernardino Meridian within the State of California. The final report and map were delivered in FY19.

FY20 Activities

Coordination efforts with resource agencies will be reduced since lands needed for future conservation areas to meet the minimum of 8,132 acres have been identified. Work Task E41 was established to track the development of the Section 26 Conservation Area. It is anticipated that all cadastral surveys will be completed. Enough land has been identified to meet the minimum land cover required by the HCP; however, this work task will remain open at a reduced funding level in order to identify lands with the potential for restoration if the need arises in the future.

FY21 Proposed Activities

Coordination efforts with resource agencies will continue. Additional acreage, beyond the minimum of 8,132 acres referenced in the HCP, is expected to be restored to ensure each conservation measure has been met at the end of the program. The 8,132 acres assumes that each acre restored will meet the needs of every species that utilize that land cover type (cottonwood-willow, honey mesquite, marsh, or backwater). The additional acreage is necessary to ensure the program has fully met the habitat requirements of every species. Figure 1-1 depicts the geographical distribution of 18 established conservation areas by the end of FY19. Figures 1-2 through 1-19 depict each existing conservation area.

Development and Maintenance

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 land 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 initial 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

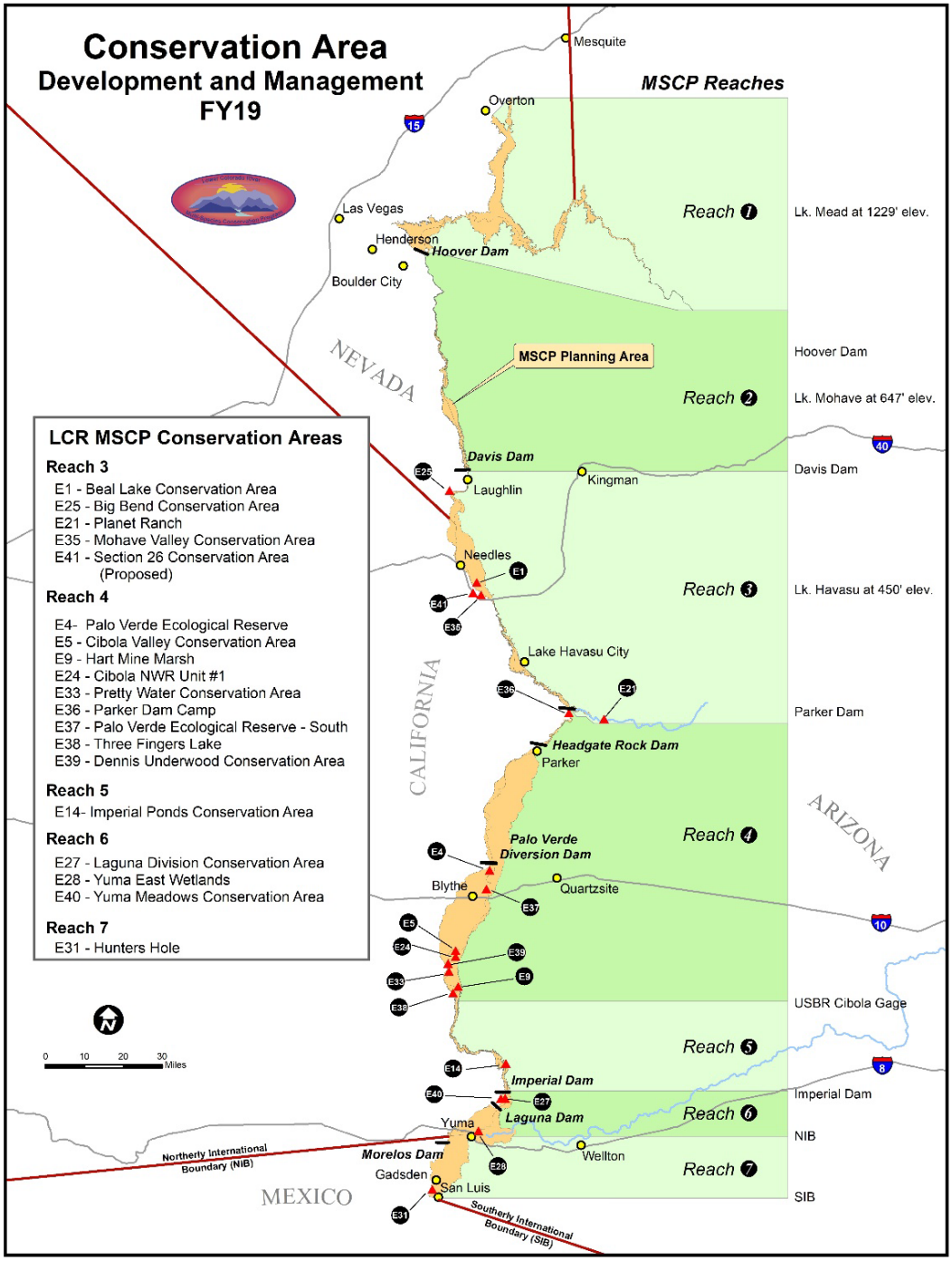


Figure 1-1.—Conservation area development and management, FY19.

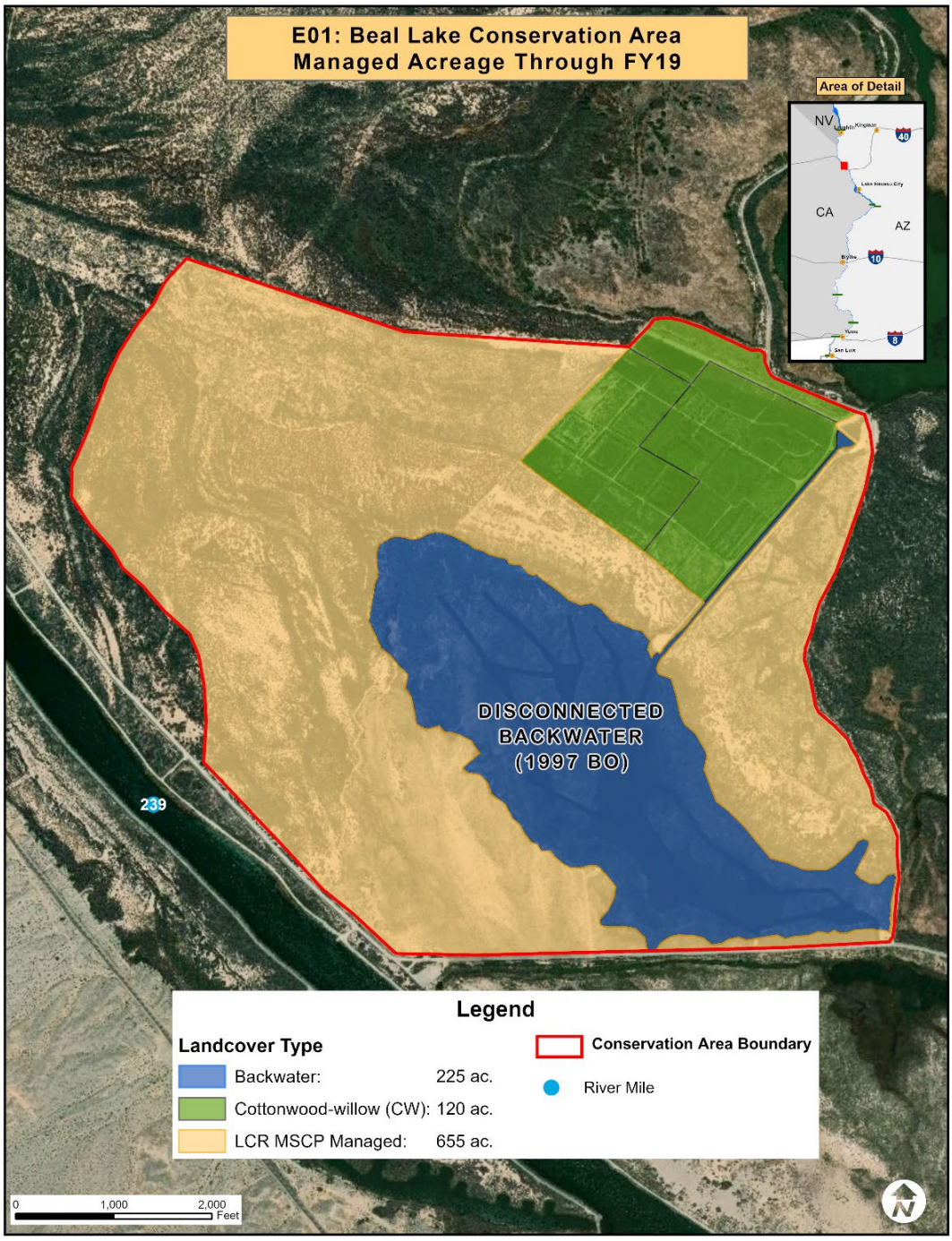


Figure 1-2.—E1 – Beal Lake Conservation Area managed acreage through FY19.

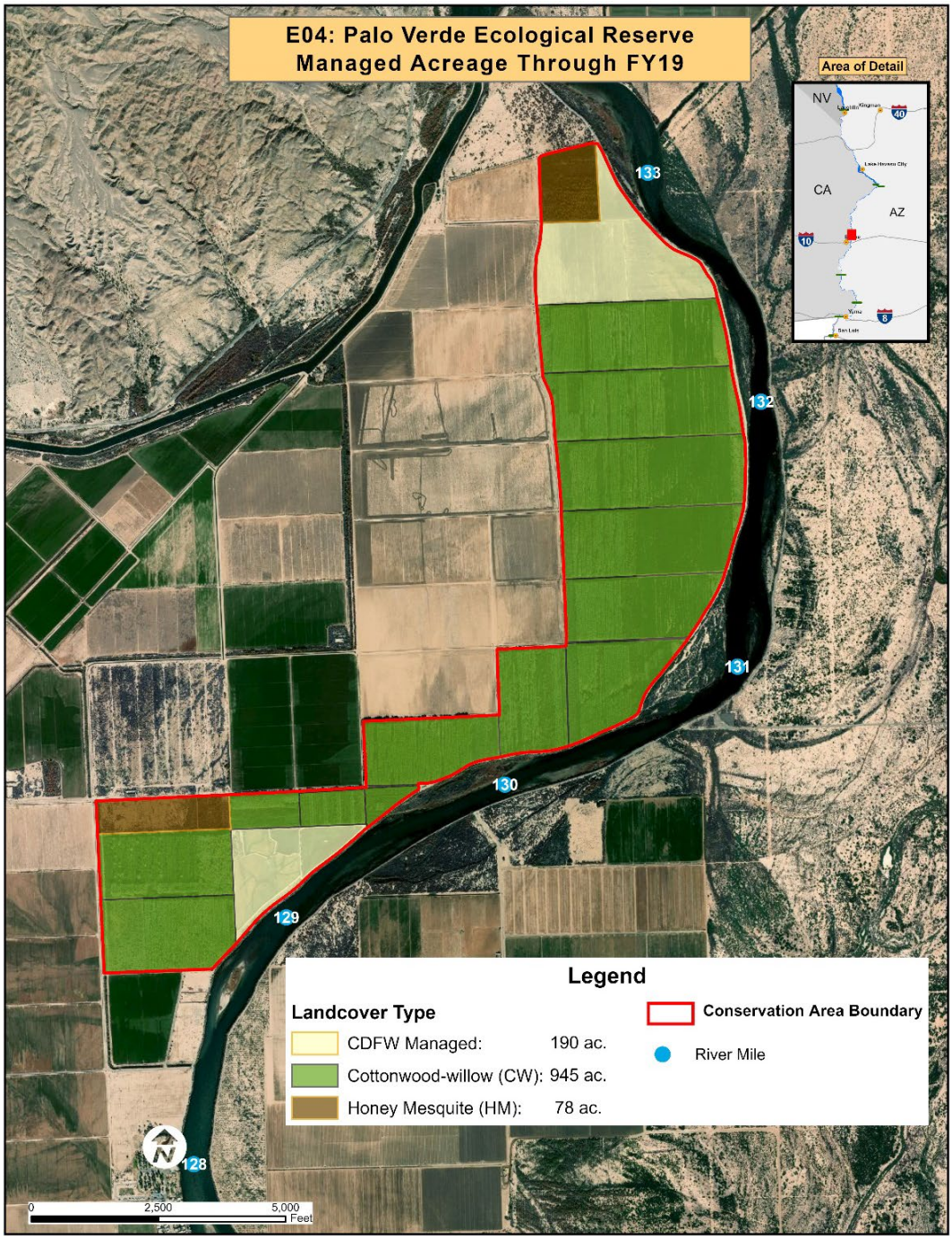
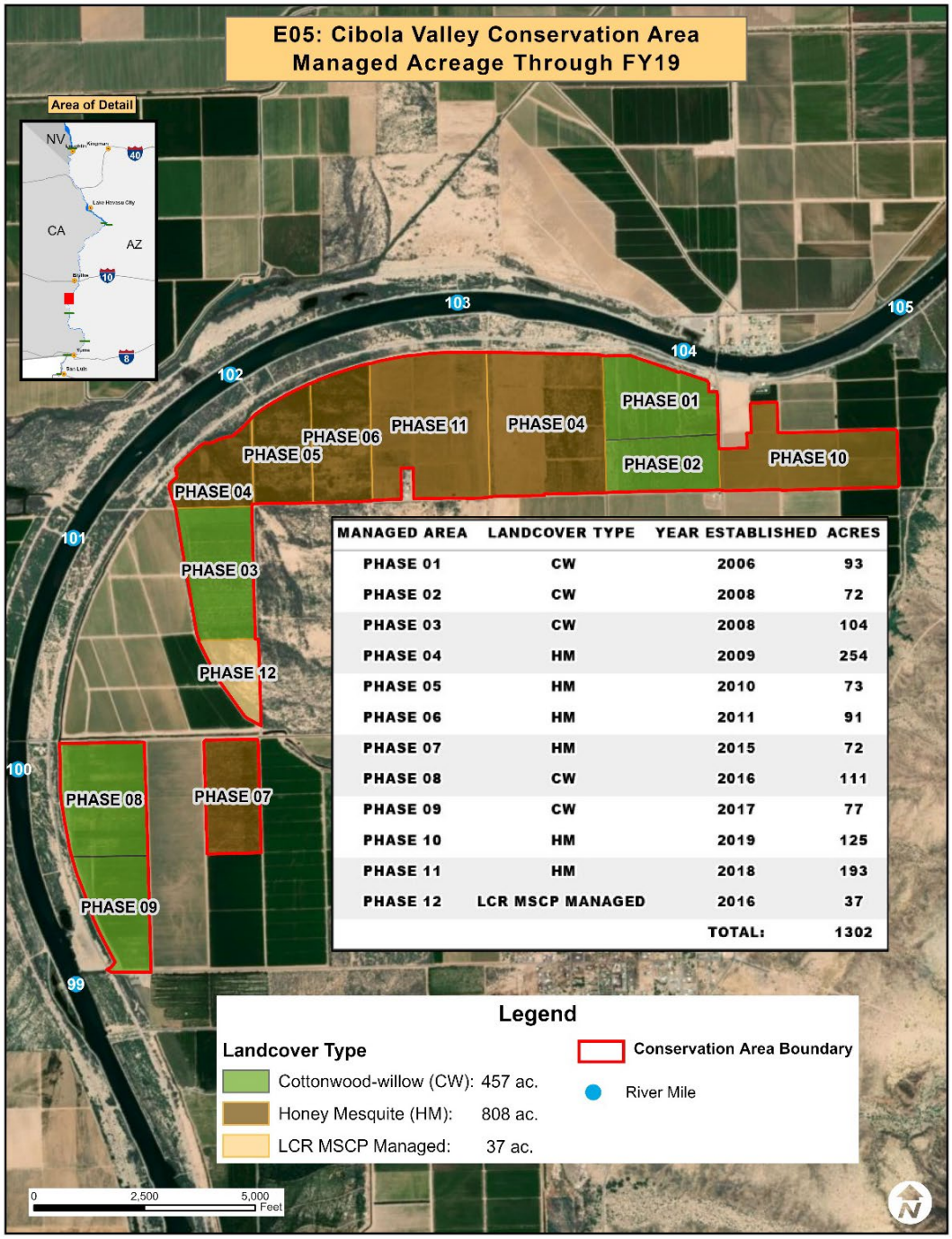


Figure 1-3.—E4 – Palo Verde Ecological Reserve managed acreage through FY19.



MANAGED AREA	LANDCOVER TYPE	YEAR ESTABLISHED	ACRES
PHASE 01	CW	2006	93
PHASE 02	CW	2008	72
PHASE 03	CW	2008	104
PHASE 04	HM	2009	254
PHASE 05	HM	2010	73
PHASE 06	HM	2011	91
PHASE 07	HM	2015	72
PHASE 08	CW	2016	111
PHASE 09	CW	2017	77
PHASE 10	HM	2019	125
PHASE 11	HM	2018	193
PHASE 12	LCR MSCP MANAGED	2016	37
		TOTAL:	1302

Figure 1-4.—E5 – Cibola Valley Conservation Area managed acreage through FY19.

Figure 1-5.—E9 – Hart Mine Marsh managed acreage through FY19.

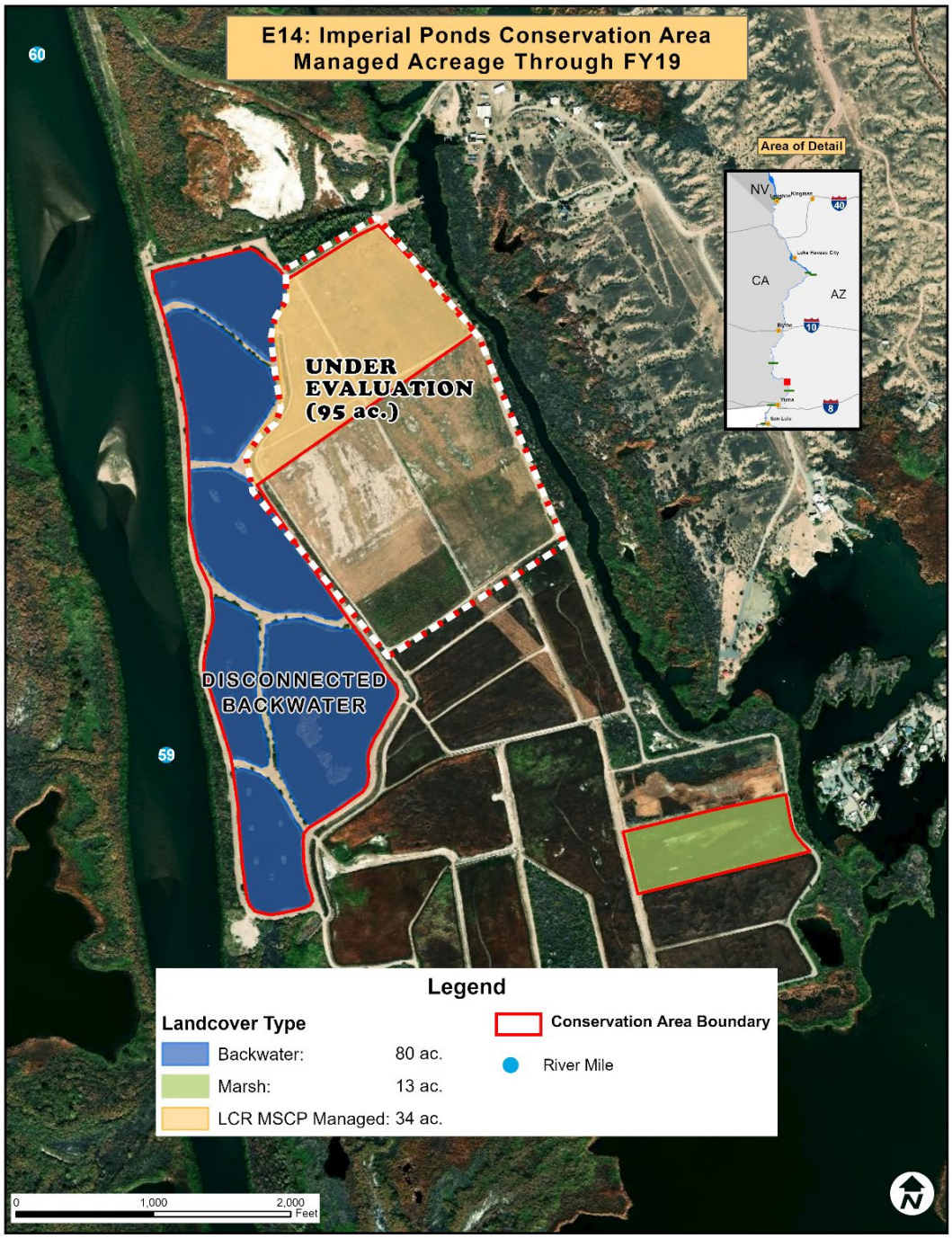


Figure 1-6.—E14 – Imperial Ponds Conservation Area managed acreage through FY19.

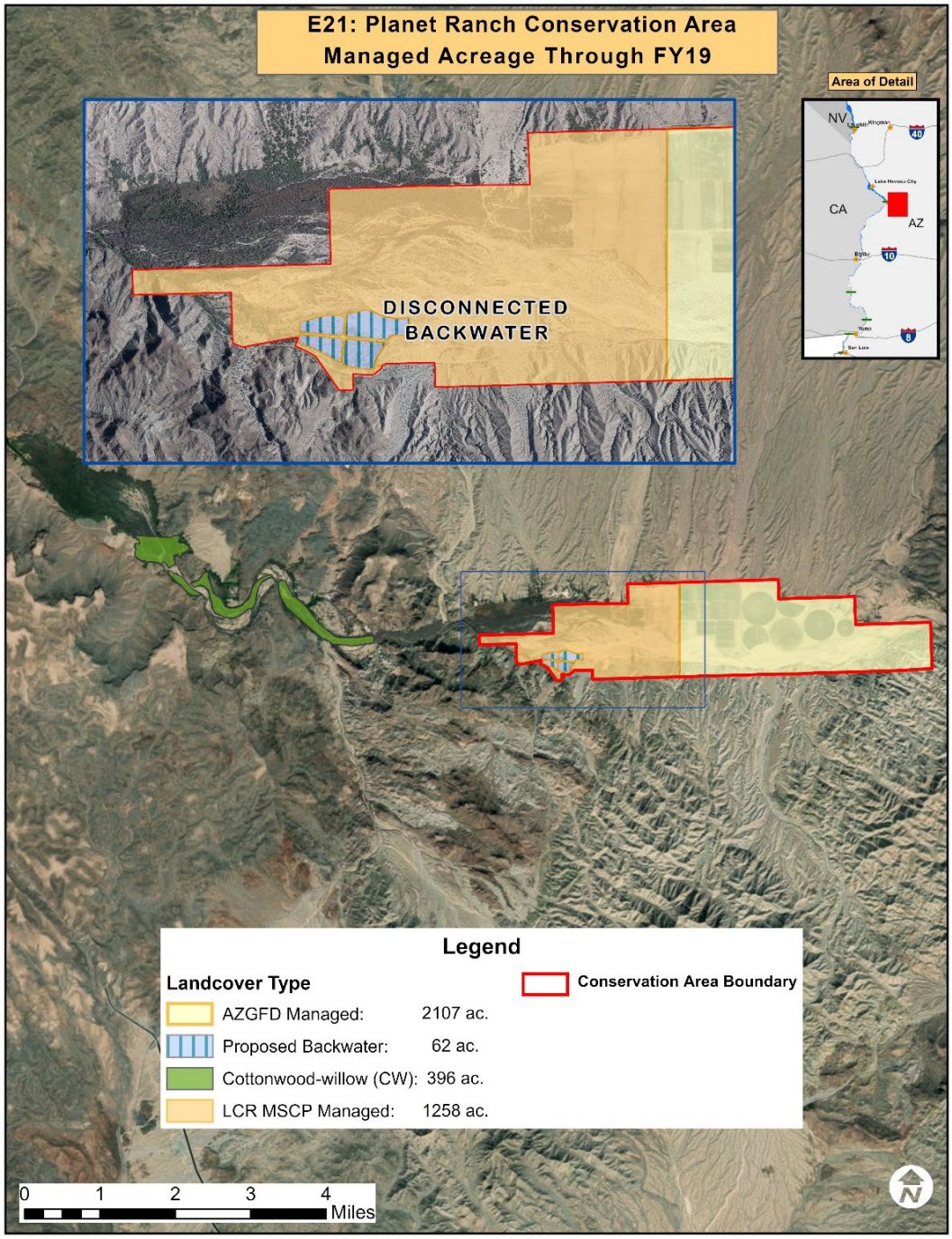


Figure 1-7.—E21 – Planet Ranch managed acreage through FY19.

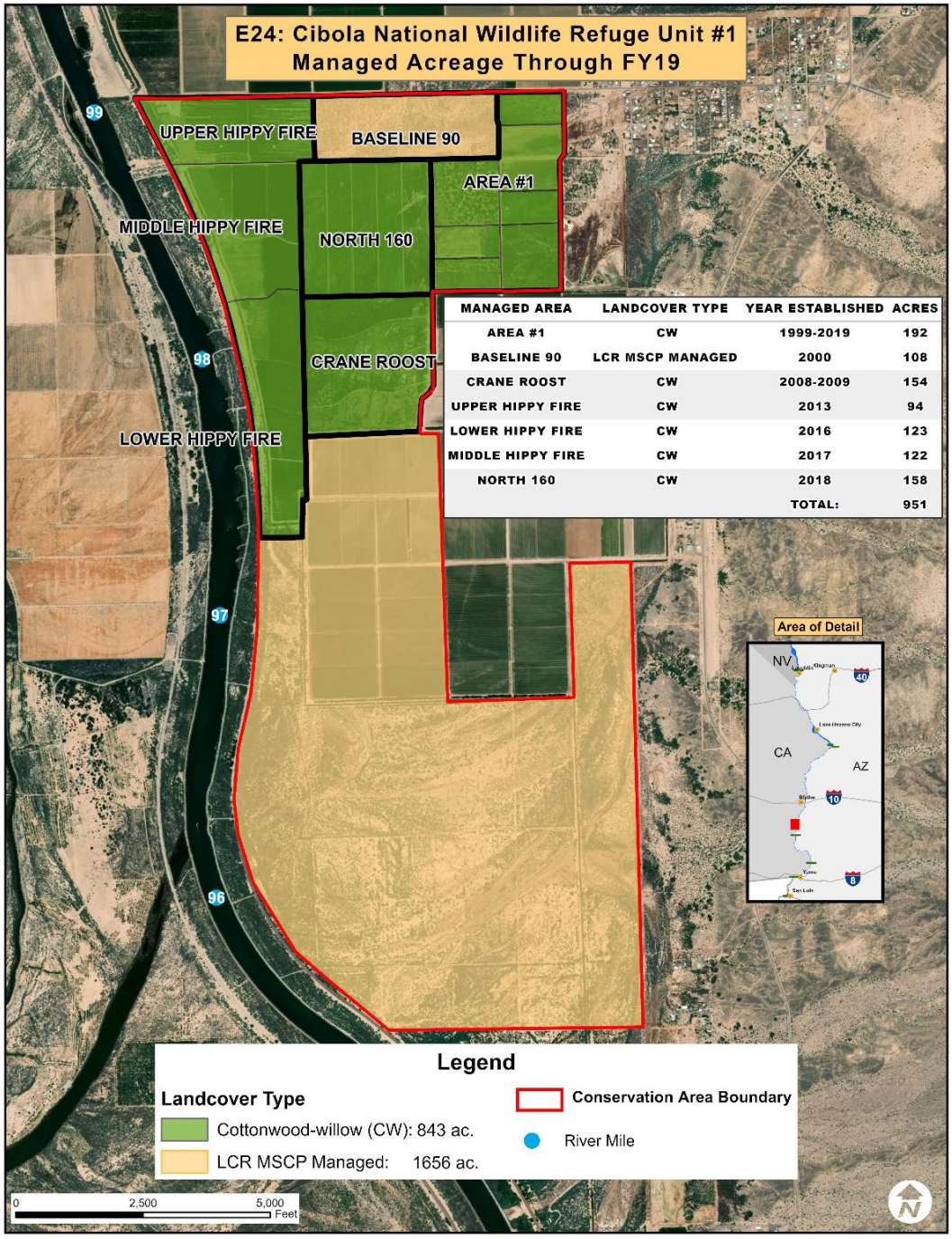


Figure 1-8.—E24 – Cibola National Wildlife Refuge Unit #1 Conservation Area managed acreage through FY19.

Figure 1-9.—E25 – Big Bend Conservation Area managed acreage through FY19.

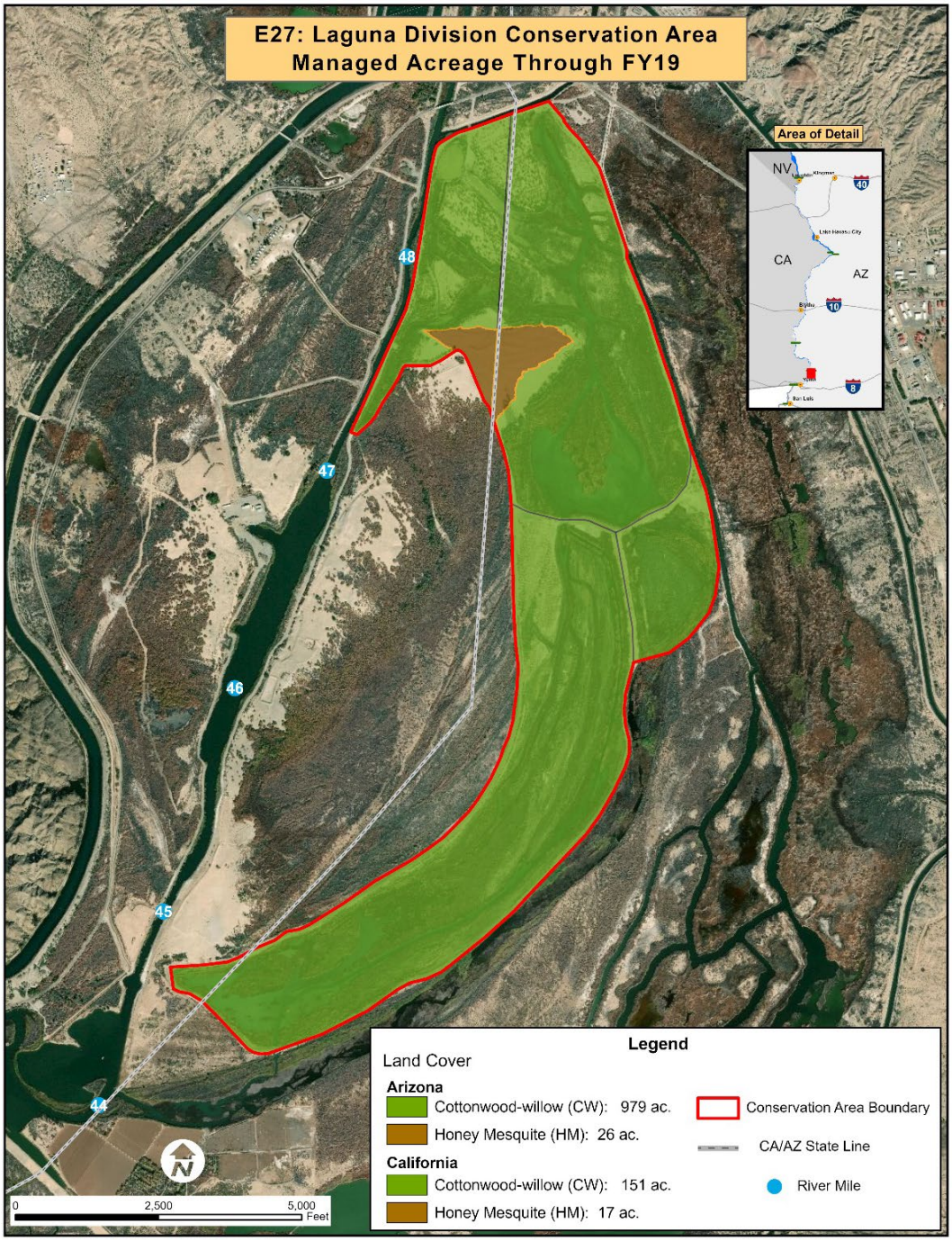


Figure 1-10.—E27 – Laguna Division Conservation Area managed acreage through FY19.

Figure 1-11.—E28 – Yuma East Wetlands managed acreage through FY19.

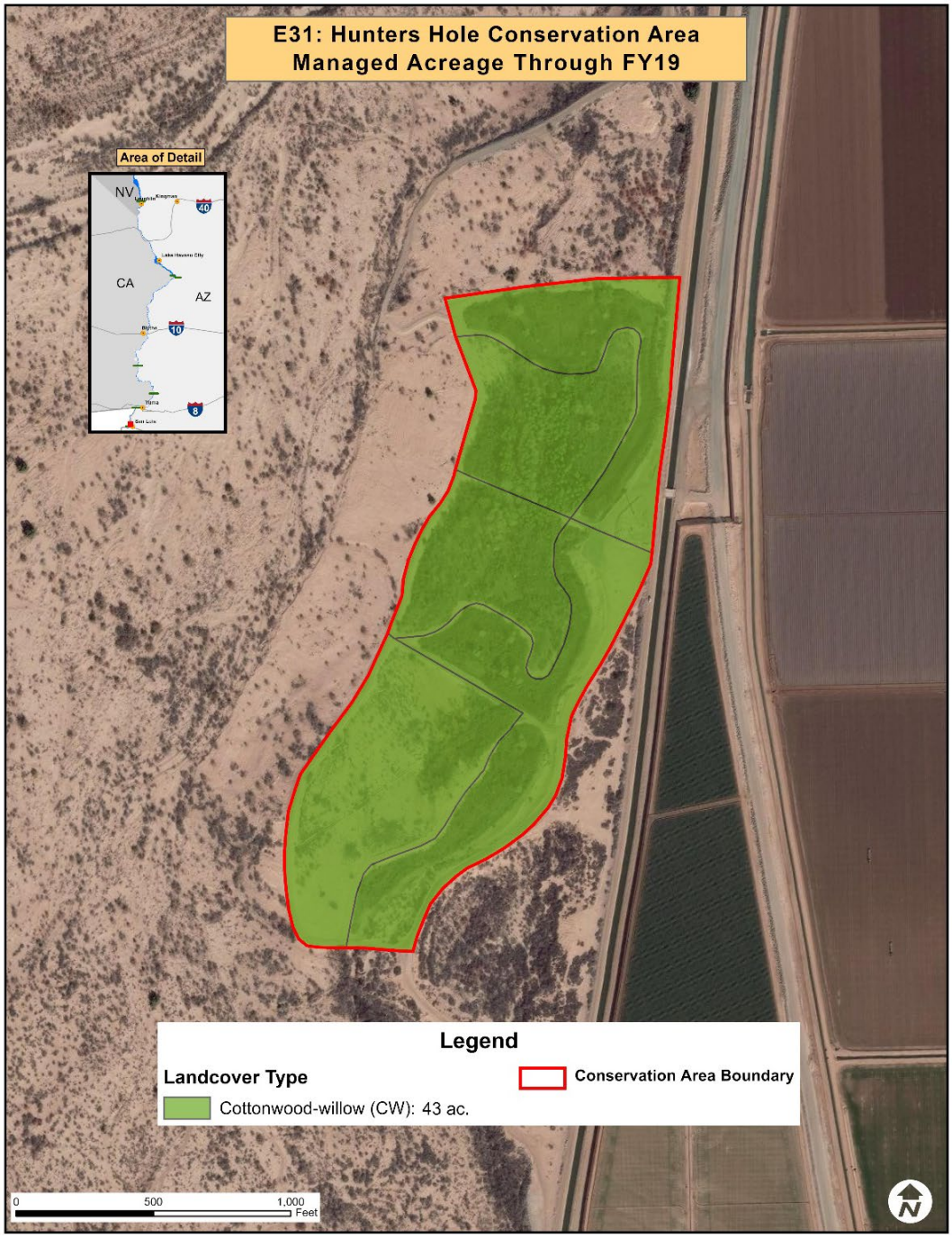


Figure 1-12.—E31 – Hunters Hole managed acreage through FY19.

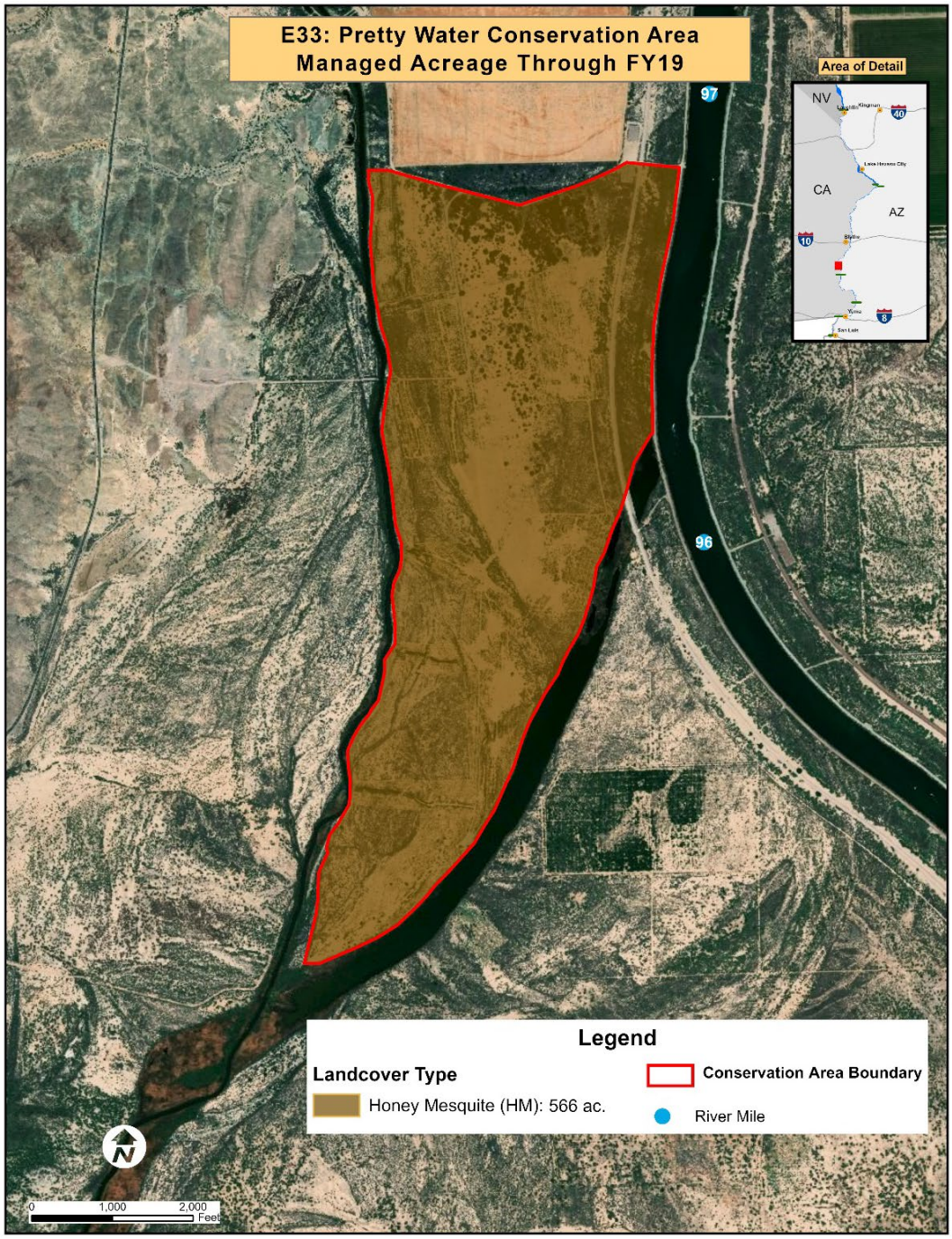


Figure 1-13.—E33 – Pretty Water Conservation Area managed acreage through FY19.

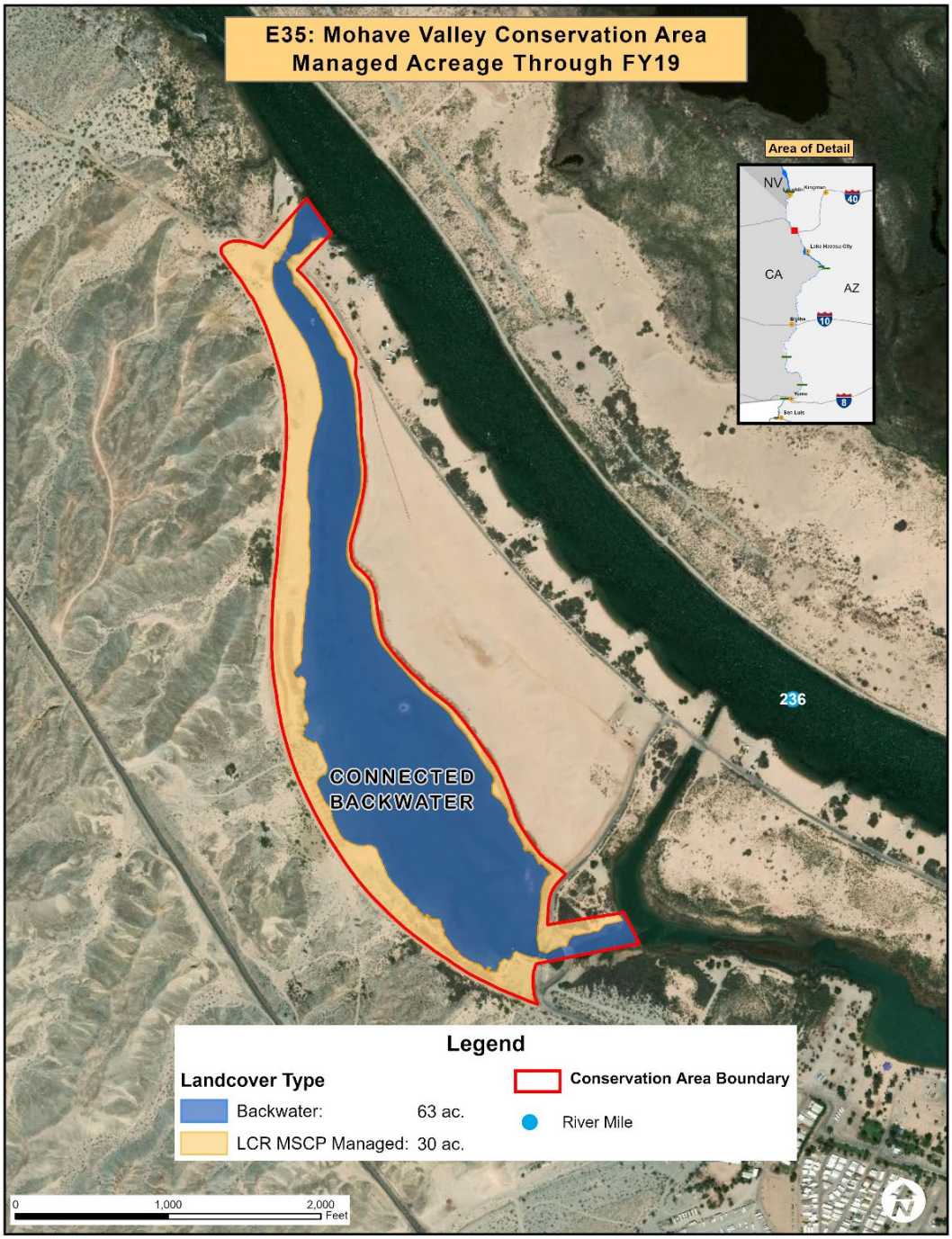


Figure 1-14.—E35 – Mohave Valley Conservation Area managed acreage through FY19.

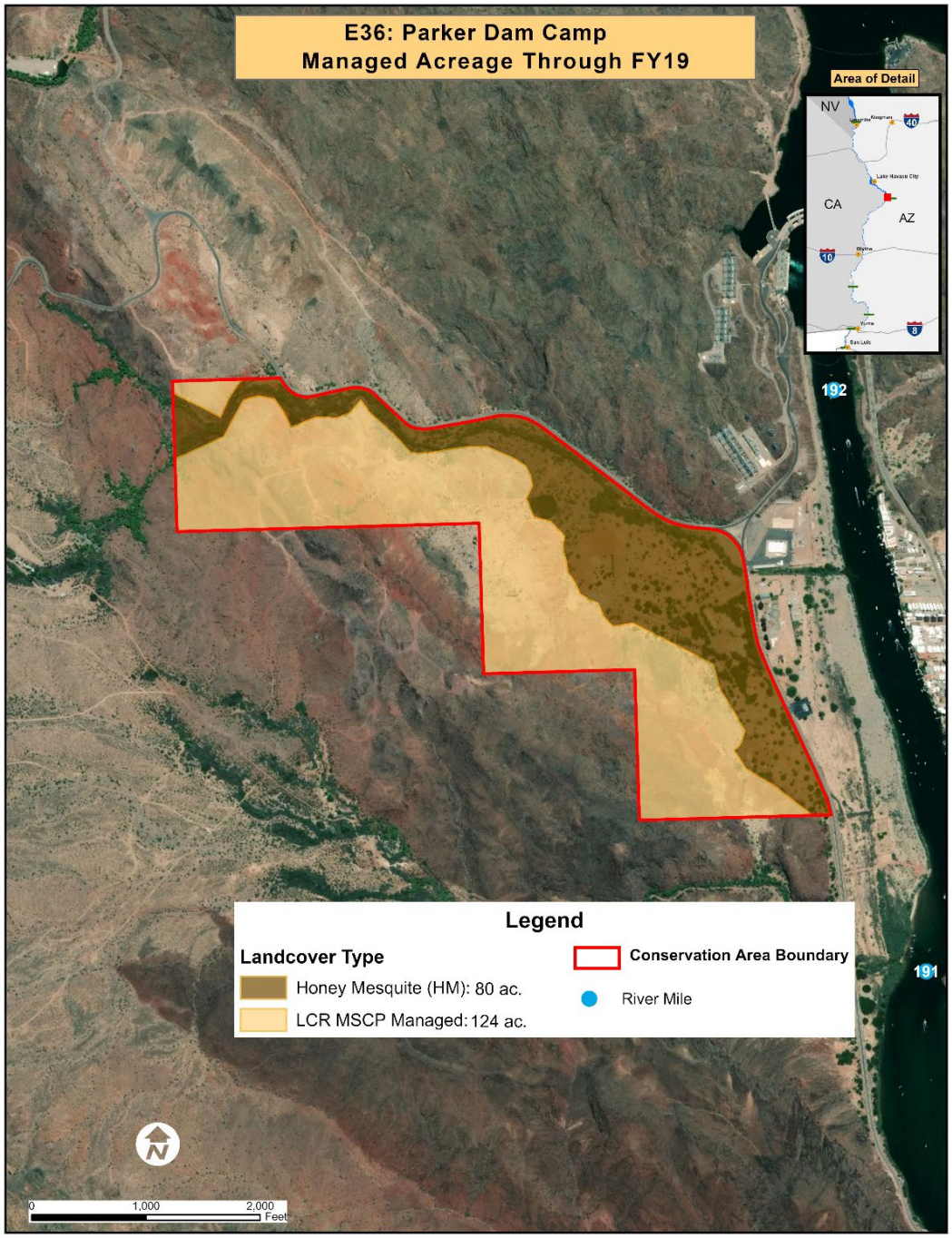


Figure 1-15.—E36 – Parker Dam Camp managed acreage through FY19.

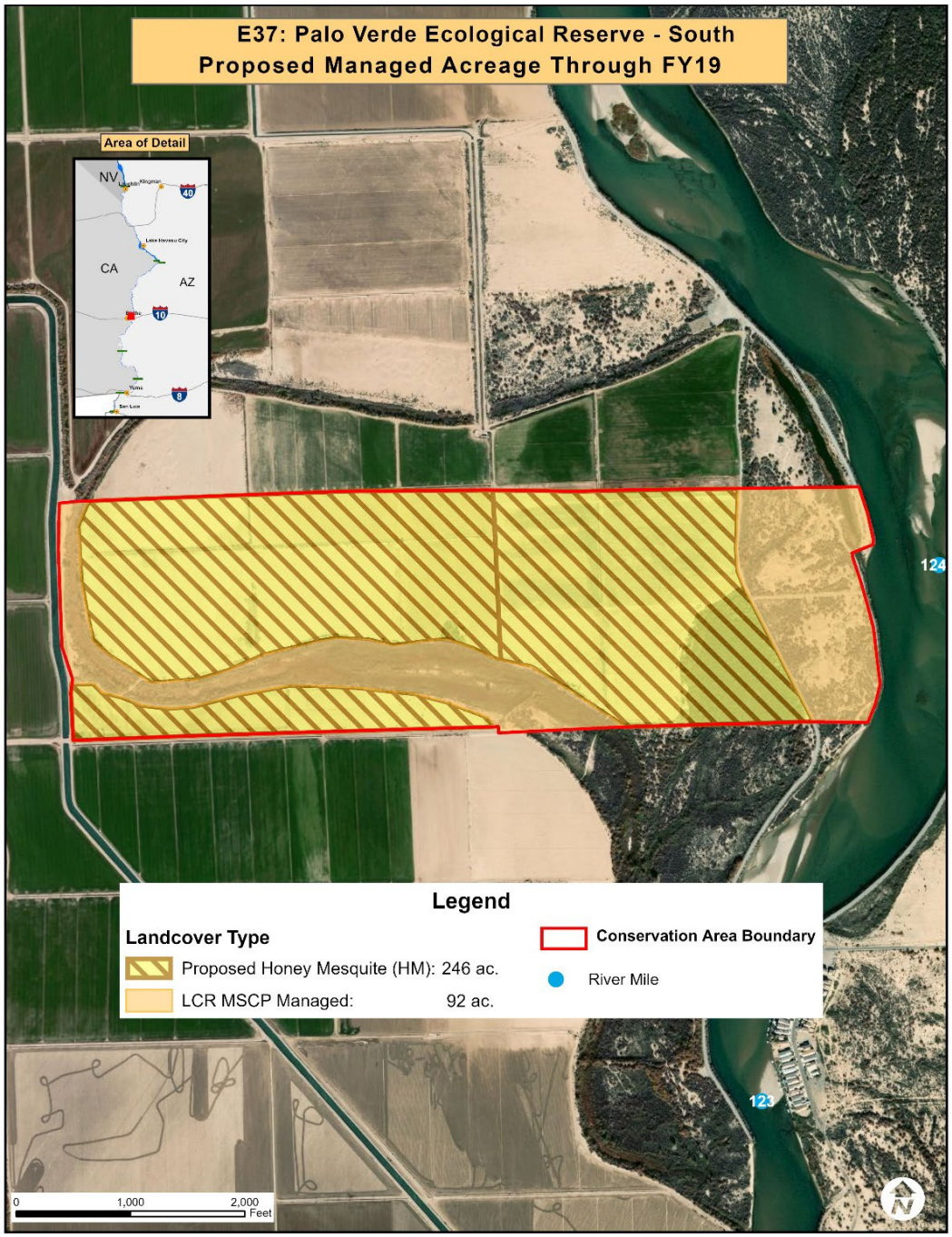


Figure 1-16.—E37 – Palo Verde Ecological Reserve-South managed acreage through FY19.

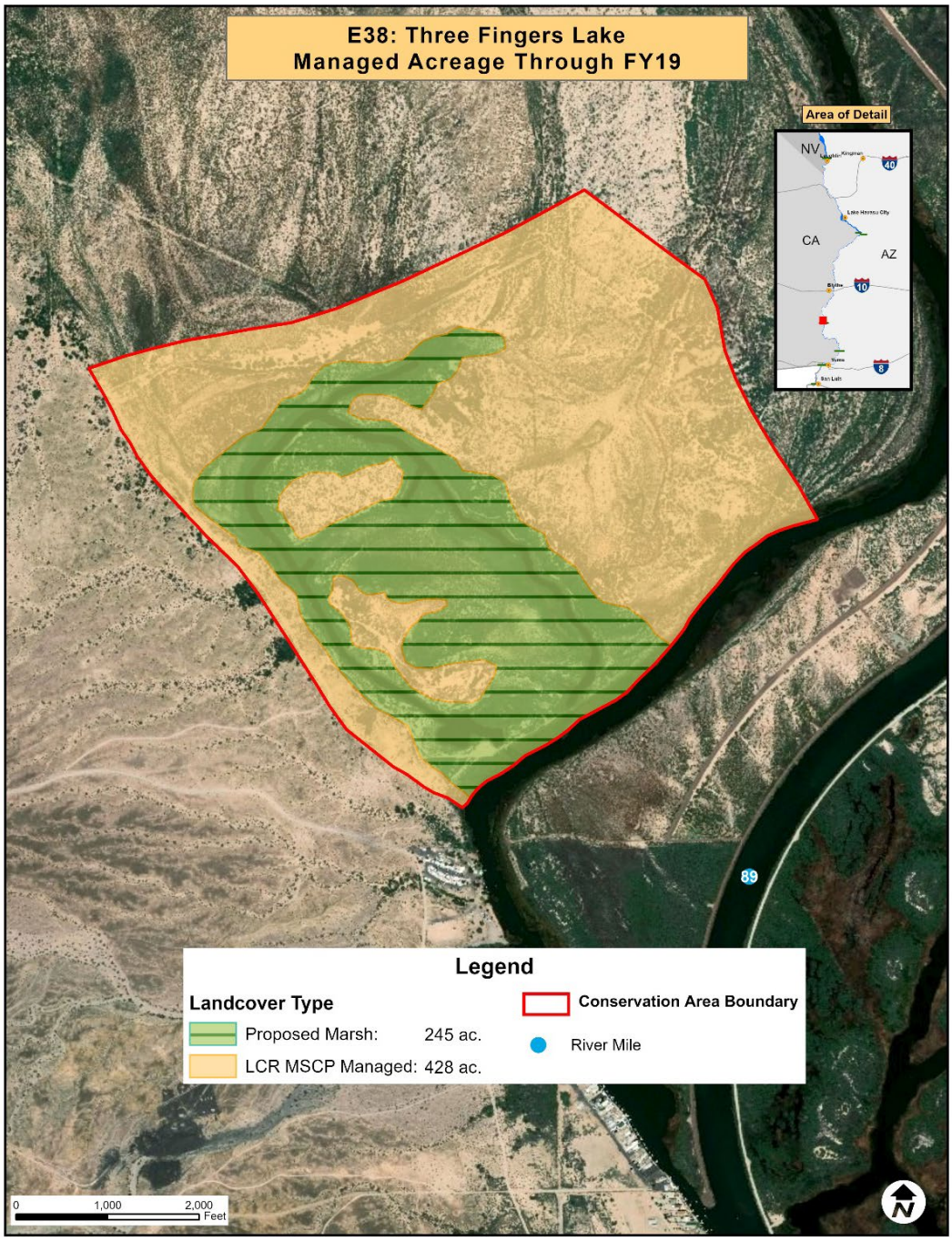


Figure 1-17.—E38 – Three Fingers Lake managed acreage through FY19.

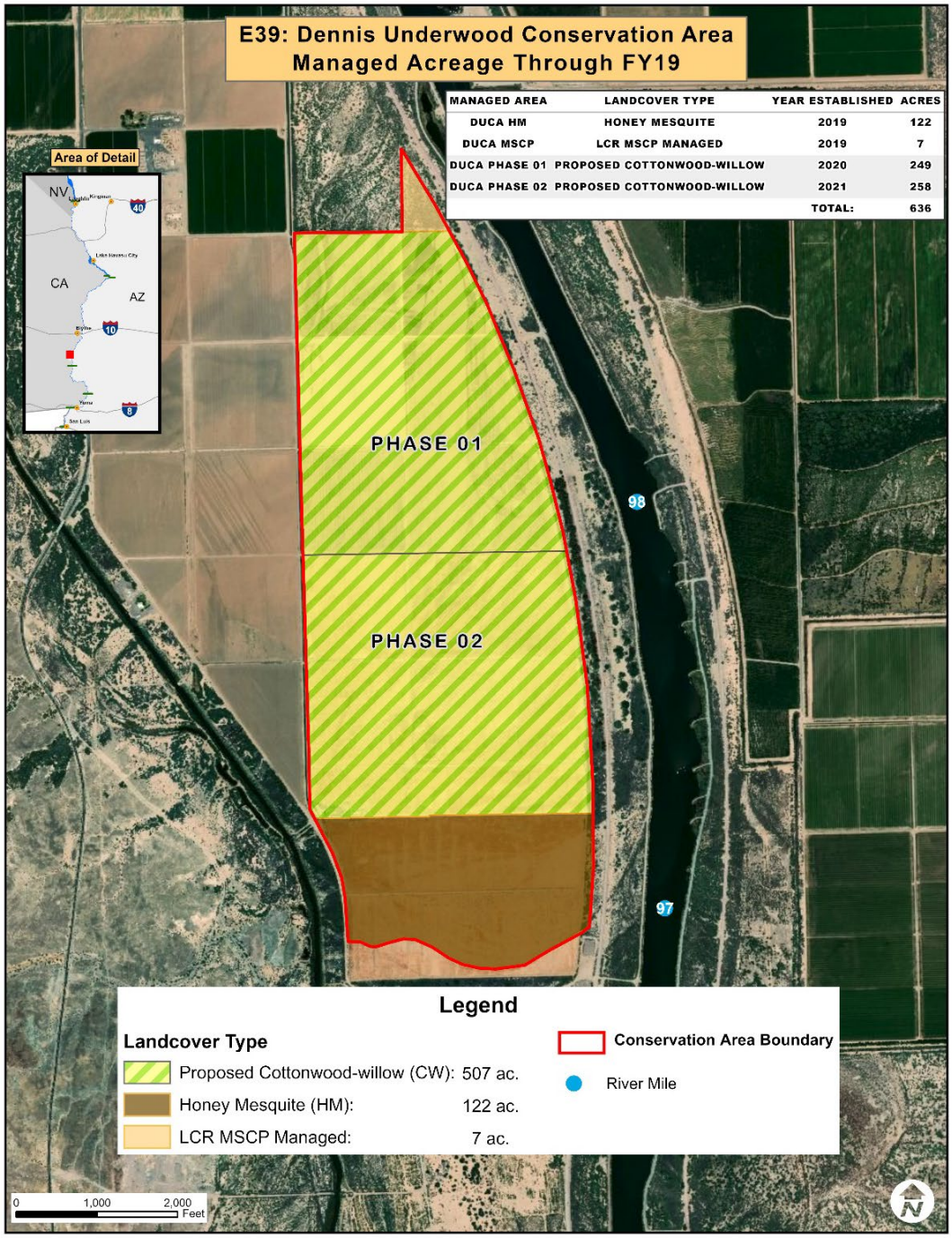


Figure 1-18.—E39 – Dennis Underwood Conservation Area managed acreage through FY19.

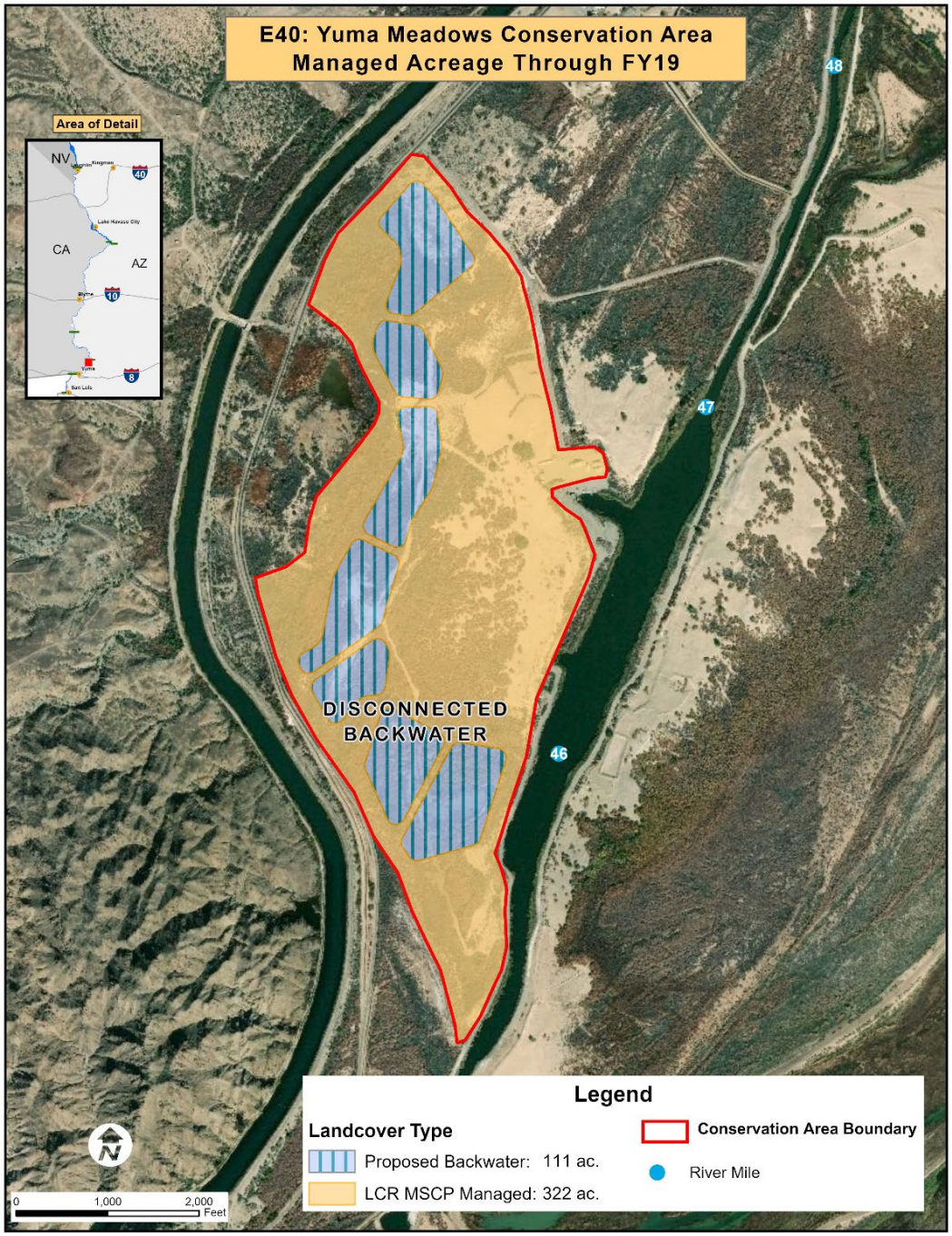


Figure 1-19.—E40 – Yuma Meadows Conservation Area managed acreage through FY19.

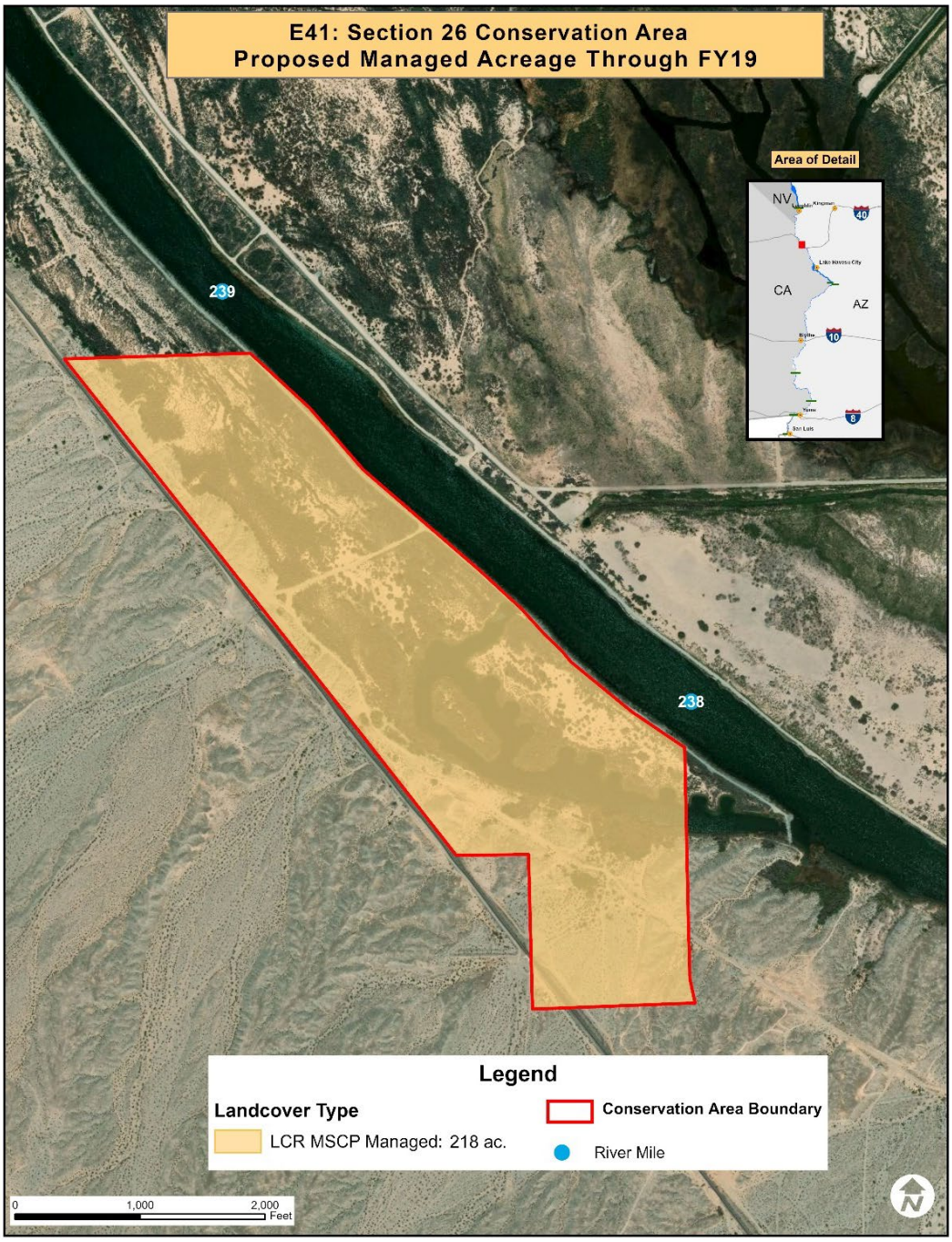


Figure 1-20.—Section 26 Conservation Area conservation area boundary.

accessible supply of riparian species also reduces 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 schedules for development of all four land cover types through FY36. However, funding allocated toward conservation area development is reduced after FY25 because it was assumed efficient habitat creation techniques would be implemented and the majority of the habitat creation would be completed. To accomplish this task, long-term planning will be conducted and a schedule created. Also, projects will be selected for implementation within the next 5 years to allow time for planning, site evaluation, coordination with partners, design, permitting, and sequencing into the program.

FY19 Accomplishments

The focus of development in FY19 was planting of honey mesquite at the CVCA, planting of cottonwood-willow at Cibola NWR Unit #1, planting of honey mesquite at the Dennis Underwood Conservation Area, dredging at the MVCA, dredging at Beal Lake, and excavation of disconnected backwaters at Planet Ranch.

Cibola Valley Conservation Area

Phase 10, approximately 125 acres, was planted with the honey mesquite land cover type. This was the final planting scheduled at the CVCA.

Cibola National Wildlife Refuge Unit #1 Conservation Area

Fifty-seven acres were planted with the cottonwood-willow land cover type.

Dennis Underwood Conservation Area

Planting of 122 acres of honey mesquite was completed in March 2019.

Mohave Valley Conservation Area

In May 2019 construction was completed, and the MVCA was open to the public. A total of 1.475 million cubic yards of material was moved, including 1.15 million cubic yards using land-based equipment and 325,000 cubic yards by dredging. An as-built survey of the new backwater documents 63 acres of new connected backwater had been created in California.

Planet Ranch

A Value Engineering Study on the 30% design was completed, and the final engineering plan sets were finalized. The study provided several options to minimize seepage from the ponds after construction if necessary.

Construction of the project began in April 2019. Work included mobilization of heavy equipment; clearing of vegetation from the footprint of the ponds; procurement, transportation, delivery, and installation of 4,000 linear feet of sheet pile for a flood control structure; drilling of a new domestic well; drilling of two pilot holes to inform the screen material for the production wells for the ponds; and excavation of approximately 300,000 cubic yards of material.

Acreage by Conservation Area Through FY19

The total number of acres managed by land cover type and by reach and State on established conservation areas is shown in tables 1-15 and 1-16. Through FY19, the LCR MSCP actively manages 11,764 acres, with 8,733 acres available for habitat creation (table 1-15). 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.

Of the 11,764 acres being actively managed by the LCR MSCP, the four land cover types have been established on approximately 6,437 acres. All conservation areas that have a signed agreement are included in tables 1-15 and 1-16.

FY20 Activities

Dennis Underwood Conservation Area

Approximately 249 acres of the cottonwood-willow land cover type were planted.

Palo Verde Ecological Reserve-South

Approximately 101 acres of the honey mesquite land cover type were planted in accordance with the approved development plan.

Mohave Valley Conservation Area

Planting occurred on a small portion (2 acres) of the spoil material to reduce wind erosion.

Beal Lake Conservation Area

Dredging of the backwater is on schedule and anticipated to be completed later this fiscal year.

Table 1-15.—Acreage by Conservation Area Through FY19

Conservation Area	Established Land Cover Through FY19[1] (acres)	Total Planned Land Cover[2] (acres)	LCR MSCP Managed[3] (acres)	Total Conservation Area[4] (acres)
Beal Lake Conservation Area (Arizona)	120	500	1,000	1,000
Big Bend Conservation Area (Nevada)	15	15	15	30
Cibola National Wildlife Refuge Unit #1 Conservation Area (Arizona)	843	1800	2,499	2,499
Cibola Valley Conservation Area (Arizona)	1,265	1,265	1,302	1,302
Dennis Underwood Conservation Area (California)	122	629	636	636
Hart Mine Marsh (Arizona)	255	255	266	266
Hunters Hole (Arizona)	43	43	43	43
Imperial Ponds Conservation Area (Arizona)	93	127	135	135
Laguna Division Conservation Area (Arizona and California)	1,173	1,173	1,173	1,173
Mohave Valley Conservation Area (California)	63	63	93	93
Palo Verde Ecological Reserve (California)	1,023	1,023	1,026	1,216
Parker Dam Camp (California)	80	80	204	204
Planet Ranch Conservation Area (Arizona)	396[5]	458[5]	1,320	3,418
Pretty Water Conservation Area (California)	566	566	566	566
Three Fingers Lake (California)	0	245	673	673
Yuma East Wetlands (Arizona)	380	380	380	380
Yuma Meadows Conservation Area (California)	0	111	433	433
Total	**6,437**	**8,733**	**11,764**	**14,067**

[1] Acreage restored/protected as either the cottonwood-willow, honey mesquite, marsh, or backwater land cover type.
[2] Acreage already restored/protected or anticipated to be restored as a land cover type.
[3] Land within a conservation area managed by the LCR MSCP.
[4] Total acreage of the conservation area.
[5] Includes protection of 396 acres of cottonwood-willow at the Middle Bill Williams River NWR.

Table 1-16.—Land Cover Type by Reach and State Through FY19

	Cottonwood-Willow	Honey Mesquite	Marsh	Backwaters	TOTAL
Arizona					
Reaches 1 and 2	0	0	0	0	0
Reach 3	516	0	0	0	516
Reach 4	1,300	808	255	0	2,363
Reach 5	0	0	13	80	93
Reach 6	1,162	129	94	0	1,385
Reach 7	43	0	0	0	43
Total	**3,021**	**937**	**362**	**80**	**4,400**
California					
Reaches 1 and 2	0	0	0	0	0
Reach 3	0	0	0	63	63
Reach 4	945	846	0	0	1,791
Reach 5	0	0	0	0	0
Reach 6	151	17	0	0	168
Reach 7	N/A	N/A	N/A	N/A	N/A
Total	**1,096**	**863**	**0**	**63**	**2,022**
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	**4,117**	**1,800**	**362**	**158**	**6,437**

Planet Ranch

Construction activities, including excavation of the ponds, installation of production wells, and associated pond piping is scheduled to be completed this fiscal year. Completion of the ponds is anticipated to create 62 acres of disconnected backwater for the program.

FY21 Proposed Activities

Dennis Underwood Conservation Area

Approximately 258 acres of the cottonwood-willow land cover type will be planted. This is the final planting scheduled for the conservation area.

Palo Verde Ecological Reserve

Approximately 145 acres of the honey mesquite land cover type will be planted on Phase 9 (formally PVER-South) in accordance with the approved development plan.

Yuma Meadows Conservation Area

Geotechnical investigation to locate suitable building material (600,000 cubic yards) to build the pad for the grow-out ponds are planned. To identify enough material, the investigations will be on both the conservation area and at adjacent borrow areas managed by Reclamation.

The exterior of the fishery sorting facility (metal building) is also planned to be procured and installed. Drilling of a replacement groundwater well for the sorting facility and office complex, along with a new well for the grow-out ponds, is also scheduled. Drilling of the well for the grow-out ponds will replace the construction of an elevated pad to match grades after pond construction.

Cibola NWR Unit #1 Conservation Area

The Restoration Development and Monitoring Plan, permitting, design, and compliance to restore the expansion area are expected to be completed. Groundwork for the 1,200-acre expansion area, such as clearing of vegetation and excavation of drainage ditches, is anticipated.

Section 26 Conservation Area

Land-based excavation will start in order to provide access for the dredge and to remove dry overburden. Dredging is scheduled to remove approximately 750,000 cubic yards of material to create 25 acres of connected backwater. Two dredge shifts, a day and swing shift, are planned to operate year round to remove approximately 250,000 cubic yards of material each year for the next 3 years.

Planned Conservation Area Development

Conservation areas are scheduled to be developed and adaptively managed from FY22–36 to meet the minimum required land cover type creation as described in the HCP. The following is the anticipated work scheduled:

(1) Excavation and dredging of the Section 26 Conservation Area to create a connected backwater within Reach 3 is scheduled for FY21–23.

(2) Construction of infrastructure for the development of cottonwood-willow at the Cibola Unit #1 Expansion Area is scheduled for FY22–23.

(3) Excavation of grow-out ponds at the Yuma Meadows Conservation Area is scheduled for FY24–26.

(4) Creation of a seventh disconnected backwater at the IPCA is scheduled for FY26.

(5) Construction of infrastructure for the development of cottonwood-willow at the Beal Lake Expansion Area is scheduled for FY27–28.

(6) Excavation and dredging of disconnected backwaters at the Yuma Meadows Conservation Area is scheduled for FY29–34.

(7) Development of Three Fingers Lake as a marsh complex is scheduled for FY32–33.

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 whether a technique might be feasible and effective. 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. 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.

FY19 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 to maintain soil and groundwater salinity levels within established thresholds.

The salinity and soil moisture monitoring network was operated at seven conservation areas. Soil moisture data were also collected at one occupied southwestern willow flycatcher site outside of the LCR MSCP planning area.

The soil moisture data collected during FY19 will be used with lidar vegetation monitoring data to evaluate the habitat conditions at sites with and without observed southwestern willow flycatcher breeding.

Habitat Manipulation

Several covered avian species require habitat with early- to mid-successional stages of native riparian trees. In natural systems where flooding is a component of the system, portions of the natural habitat were disturbed on a periodic basis and reset to earlier successional stages and associated structural diversity. Vegetation at LCR MSCP conservation areas is planted densely to reduce invasive species competition with native species and to provide habitat for covered species. Without the disturbance events that were once more common in the historic river system, 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 seral stages of habitat for covered species.

Work continued for the cottonwood-willow component of Work Task C60, including collection of additional vegetation structure data (lidar) and soil moisture data. These data will be used for refining the vegetation structure models, the habitat suitability models, and for updating the LCR MSCP planning area vegetation classification.

Data from various remote sensing platforms were processed and analyzed for the pilot habitat manipulation study at HMM. These data were overlaid with marsh bird dispersal data to identify specific areas of occupied habitat that were used by

marsh birds. The results of this analysis showed that areas with known presence of rails had higher values of normalized difference vegetation index (NDVI) than areas with no birds detected.

Baseline data were collected for the irrigation management study at Phase 8 of the PVER. The objective of the study was to evaluate the effects that reduced irrigation will have on volunteer cottonwoods that have established in a stand of planted honey mesquite trees.

FY20 Activities

Salinity and Soil Moisture Monitoring Network

The salinity and soil moisture monitoring network was expanded during FY20 to include monitoring at newly planted phases of existing conservation areas and continued to operate at all other existing locations.

Habitat Manipulation

Lidar data collected at LCR MSCP conservation areas and southwestern willow flycatcher-occupied sites throughout the Southwestern United States will be analyzed to evaluate vegetation structure. 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.

Pilot studies will be planned for habitat manipulation at HMM (and other occupied marsh bird habitat sites if possible). Areas with low NDVI values will be identified, and pre- and post-manipulation vegetation data will be collected following an established protocol. Additional marsh habitat manipulation techniques are being considered, and if appropriate, field tests will be planned and designed to evaluate their inclusion in the long-term marsh habitat manipulation toolbox.

A tool to monitor vegetation health at established conservation areas will be established. The tool will use satellite imagery to automatically generate rasters of NDVI on a pre-programmed time step and to generate change rasters between time steps. The change rasters will be used to identify areas that have experienced negative changes in NDVI indicative of a decline in vegetation health and warrant additional monitoring.

Vegetation data will be collected in Phase 8 of the PVER as part of the irrigation management study.

FY21 Proposed Activities

Salinity and Soil Moisture Monitoring Network

The salinity and soil moisture monitoring network will continue to operate at established locations 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 be acquired in FY21. Soil moisture data collected at southwestern willow flycatcher-occupied sites will continue to be analyzed, and data at LCR MSCP conservation areas will continue to be collected. Long-term monitoring will help inform the LCR MSCP about the level of active habitat manipulation that is necessary. Initial planning and design will be conducted to implement pilot 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 HMM. This monitoring will assist in evaluating whether the monitoring techniques are appropriate. Additional marsh habitat manipulation techniques may be evaluated, and if appropriate, field tests will be planned and designed to evaluate their inclusion in the long-term marsh habitat manipulation toolbox.

The vegetation health monitoring tool will continue to be used to identify areas of concern where declines in vegetation health may have occurred.

The irrigation management study at the PVER will continue. Irrigation volumes will begin to be decreased, and soil, groundwater, and vegetation monitoring will continue.

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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$1,467,956	$1,133,593.18	$15,723,254.31	$1,528,018	$1,545,324	$1,545,324	$1,545,324

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.

FY19 Accomplishments: Under Work Task A1 for FY19, 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 24, 2018, and April 24, 2019, and had a conference call on June 26, 2019. At the October 24, 2018, meeting, the Steering Committee passed Program Decision Document 19-001 *Land and Water Approval for Dennis Underwood Conservation* Area. At the April 24, 2019, meeting, the Steering Committee approved Resolution 19-002, *Increase FY2019 Work Plan and Budget, FY2017 Accomplishment Report Approved Amount.* This funding increase was needed to provide funding for securing the land and water for the

Dennis Underwood Conservation Area. During the June 26, 2019, Steering Committee conference call, the Steering Committee approved Resolution 19-003 to approve the *Final Implementation Report, Fiscal Year 2020 Work Plan and Budget, Fiscal Year 2018 Accomplishment Report*. Financial tracking of the program continued, and the annual financial work group meeting was held as a conference call on February 21, 2019.

FY20 Activities: 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 a conference call held on October 23, 2019, and a conference call on April 22, 2020. The *Draft Implementation Report, Fiscal Year 2021 Work Plan and Budget, Fiscal Year 2019 Accomplishment Report* was prepared. Financial tracking for the program will continue, and the annual financial work group meeting was held.

Proposed FY21 Activities: 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 2022 Work Plan and Budget, Fiscal Year 2020 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 report titled *Final Implementation Report, Fiscal Year 2020 Work Plan and Budget, Fiscal Year 2018 Accomplishment Report* is posted on the LCR MSCP website. The *Final Implementation Report, Fiscal Year 2021 Work Plan and Budget, Fiscal Year 2019 Accomplishment Report* will also be posted upon completion.

WORK TASKS – SECTION B

Fish Augmentation

Work Task B1: Lake Mohave Razorback Sucker Larvae Collections

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$215,000	$216,528.83	$2,961,855.03	$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, B6, and B7 are related to this work task, as razorback suckers to be reared under these work tasks originate from Lake Mohave. Work Tasks B4 and B5 were previously associated with this work task, and related research evaluating native fish transport and genetics was completed under Work Tasks C30 (closed), C31 (closed), and C40 (closed).

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 are captured from Lake Mohave each year and delivered to the Willow Beach National Fish Hatchery (Willow Beach NFH) and Lake Mead Fish Hatchery to be reared for future release in support of maintaining the Lake Mohave broodstock and accomplishing program augmentation goals. Annual field work includes surveys to locate spawning groups, nighttime larvae collection, delivery of larvae to partner hatchery facilities, and maintaining the boat fleet and field station at Cottonwood Cove.

Work coincides with the razorback sucker spawning season and 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 throughout the spawning season, and locations of razorback sucker spawning aggregations are recorded. Spawning aggregations are used to identify general sampling locations, and larvae, attracted to submerged lights suspended from boats, are captured by net and counted. Larvae are captured one at a time, making this a labor-intensive program. This work occurs for up to 4 nights per week during the spawning season. Captured larvae are delivered to the Willow Beach NFH and Lake Mead Fish Hatchery, where they are logged in by date received, number collected, and location of capture. In order to maximize the genetic diversity of razorback sucker larvae captured and used for future augmentation, collection efforts will be distributed both temporally throughout the spawning season and spatially among identified Lake Mohave spawning areas.

Previous Activities: Wild-born razorback sucker larvae have been collected from Lake Mohave each year since program implementation began in 2005. Larvae have been reared to subadult/adult size at partner hatchery facilities and (1) repatriated to Lake Mohave to maintain the existing broodstock and its genetic diversity and (2) released into Reaches 3–5 to accomplish program augmentation goals. Beginning in FY17, a check-in/check-out protocol was developed and implemented in conjunction with the National Park Service radio dispatch at the Lake Mead National Recreation Area to ensure nighttime crews were off the water safely. Funding to support this additional measure has been provided through this work task.

FY19 Accomplishments: A collection goal of 43,000 larvae was established in coordination with LCR MSCP partner agencies. This goal was higher than previous years in order to provide additional larvae to replace hatchery stocks lost at the Willow Beach NFH in early FY17, provide additional fish as a contingency for other unforeseen events, and to prepare for future increases in razorback sucker annual augmentation goals. Of these larvae, 27,000 were targeted for rearing at the Willow Beach NFH, and 16,000 were targeted for rearing at the Lake Mead Fish Hatchery.

A total of 44,806 wild larvae were collected from four areas of Lake Mohave. The Willow Beach NFH received 28,857 larvae, and the remaining 15,949 larvae 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, 2019*

Location	January	February	March	April	May	Total
Nine Mile	74	1,583	8,046	1,189	0	10,892
Tequila	42	8,905	2,180	0	0	11,127
Yuma	775	1,950	2,096	1,314	0	6,135
Above Owl Point	887	1,683	2,015	12,067	0	16,652
Total	**1,778**	**14,121**	**14,337**	**14,570**	**0**	**44,806**

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

FY20 Activities: A collection goal of 33,000 larvae has been established in coordination with LCR MSCP partner agencies. Approximately 6,000 larvae will be delivered to the Lake Mead Fish Hatchery, and 27,000 larvae will be delivered to the Willow Beach NFH. Of these 27,000 larvae, 10,000 will remain on station for rearing, 10,000 will be delivered to the Achii Hanyo Native Fish Rearing Facility, and 7,000 will be transferred to the Lake Mead Fish Hatchery following initial rearing. To better represent the Lake Mohave riverine subpopulation in hatchery stocks, additional larvae will be collected from this area in FY20. Increasing the collection effort in this area may provide a better representation of the total genetic composition of razorback suckers within Lake Mohave.

Proposed FY21 Activities: Razorback sucker larvae collections will continue. The collection goal is expected to be approximately 30,000 larvae.

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

Work Task B2: Willow Beach National Fish Hatchery

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$325,000	$326,397.91	$4,653,204.60	$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) and the Lake Mead Fish Hatchery (B6) 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 fishes 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 in Dexter, New Mexico (Center) (B4).

2. **Provide fishes to other hatcheries.** The Willow Beach NFH will annually provide approximately 10,000 fingerling bonytail to the Achii Hanyo Native Fish Rearing Facility and will distribute approximately 15,000 fingerling razorback suckers between 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 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 fishes back into Lake Mohave.

FY19 Accomplishments:

On Station: Approximately 25,000 razorback suckers were on station at the beginning of FY19 (table 1).

Table 1.—Year Class and Approximate Number of Razorback Suckers on Station in Early FY19

Year Class	Approximate Number
2016	7,000
2017	8,250
2018	9,750
Total	**25,000**

Received: The Willow Beach NFH received 28,857 razorback sucker larvae from Lake Mohave.

Stocked: Lakeside rearing ponds were stocked with 528 razorback sucker juveniles (B7), and 2,448 razorback suckers were repatriated into Lake Mohave (Reach 2).

Transferred: Approximately 7,000 fingerling razorback suckers were lost in transit between the Willow Beach NFH and Lake Mead Fish Hatchery when the transport truck caught on fire. The loss of these fish is not expected to impact future year augmentation goals.

Improvements: Four fiberglass tanks were installed outdoors for rearing of razorback suckers in recirculating aquaculture systems. A new hot water pressure washer was purchased to clean raceways and equipment.

FY20 Activities:

On Station: At the start of FY20, the Willow Beach NFH had approximately 44,000 razorback suckers on station (4,000 year-class 2016, 8,250 year-class 2017, 9,750 year-class 2018, and 22,000 year-class 2019).

Received: The Willow Beach NFH will receive approximately 27,000 razorback sucker larvae from Lake Mohave and rear and distribute them for the LCR MSCP Fish Augmentation Program.

Stocked: The Lake Mohave backwaters will be stocked with approximately 525 subadult razorback suckers from the Willow Beach NFH, and approximately 6,000 razorback suckers will be stocked into Lake Mohave to augment the existing population.

Transferred: Approximately 17,000 razorback sucker fingerlings will be distributed between the Achii Hanyo Native Fish Rearing Facility and the Lake Mead Fish Hatchery. Bonytail received from the Center may be temporarily housed at the Willow Beach NFH before transfer to other facilities.

Improvements: Minor hatchery improvements will be implemented and will include repurposing solar panels to heat well water for four large recirculating aquaculture systems. These recirculating aquaculture systems will be used to rear razorback suckers to target size.

Proposed FY21 Activities: The Willow Beach NFH will continue to receive razorback sucker larvae from Lake Mohave and to 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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$170,000	$170,190.62	$1,818,848.60	$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

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. This project is also related to Work Task B6, as fish may be transferred to the Lake Mead Fish Hatchery for additional grow-out. Native fish research may also be accomplished at this facility.

Project Description: This project supports development and maintenance of the Achii Hanyo Native Fish Rearing Facility (a satellite facility managed by the Willow Beach NFH). Razorback suckers (Lake Mohave origin larvae transferred from the Willow Beach NFH) and bonytail (supplied from the Center) are reared at this facility in support of the LCR MSCP Fish Augmentation Program. The numbers of razorback suckers and bonytail reared at this facility are adjusted annually 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. 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 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 total length) 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, an office, a feed storage room, restrooms, and fiberglass fish tanks; electrical upgrades; aeration system upgrades for fish tanks; and the purchase of a backup generator. Work completed to date has supported rearing of both razorback suckers and bonytail, and this facility and has contributed both species to the LCR MSCP Fish Augmentation Program on a near annual basis.

FY19 Accomplishments:

On Station: Approximately 9,000 native fishes were on station at the beginning of FY19 (table 1).

Table 1.—Year Class and Approximate Number of Native Fishes on Station in Early FY19

Year Class	Species	Approximate Number
2017	Razorback suckers	2,000
2018	Bonytail	7,000
	Total	**9,000**

Received: The Achii Hanyo Native Fish Rearing Facility received approximately 15,000 bonytail from the Center.

Stocked: Fishes were harvested from hatchery ponds in December and marked with passive integrated transponder tags prior to being released into the lower Colorado River. A total of 876 razorback suckers were stocked into Reach 2, and a total of 999 razorback suckers were stocked into Reach 3. A total of 866 bonytail were stocked into Reach 4. Harvested fish that were under target size were returned to ponds for continued rearing.

Transferred: A total of 2,491 bonytail were transferred to the Lake Mead Fish Hatchery (B6) for further grow-out.

Improvements: Facility maintenance activities and improvements to rearing ponds were completed throughout the year. Protective netting was replaced over several ponds, and other minor pond repairs were completed. Cottonwood trees were removed from the perimeter of Pond 1 to prevent the roots from compromising the pond. Electrical outlets and aerators were installed in Ponds 1, 2, 3, 4, and 5 to improve oxygen levels for fish production.

FY20 Activities:

On Station: At the start of FY20, approximately 22,000 bonytail were on station (7,000 year-class 2018 and 15,000 year-class 2019).

Received: The Achii Hanyo Native Fish Rearing Facility will receive approximately 10,000 razorback suckers from the Willow Beach NFH to support production goals.

Stocked: Fishes that meet target size will be stocked into Reaches 3–5.

Transferred: No fishes will be transferred off station in FY20.

Improvements: Netting will be placed over all large ponds prior to stocking in an effort to reduce predation. Three circular fiberglass tanks will be repurposed for grow-out of razorback suckers. Gravel will be distributed to improve and maintain road surfaces around the ponds.

Proposed FY21 Activities: Razorback suckers and bonytail on station from previous years will continue to be reared to target size. Additional fishes of both species will be delivered from the Willow Beach NFH and the Center as needed.

Pertinent Reports: Annual administrative reports are available upon request.

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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$260,000	$256,244.89	3,246,432.59	$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 operations at the Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico (Center), support maintenance of the bonytail broodstock, and to annually contribute razorback suckers and bonytail to the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): This work task is related to Work Tasks B2, B3, B5, and B6, as fishes from the Center will be delivered to the Willow Beach National Fish Hatchery, Achii Hanyo Native Fish Rearing Facility, Bubbling Ponds Fish Hatchery, and the Lake Mead 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 population 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 razorback sucker broodstock. Funds provided will be used to maintain the extant broodstocks, produce bonytail and razorback suckers for distribution to other hatcheries, and to annually rear bonytail for distribution within Reaches 2–5. The Center targets a 305-millimeter (mm) total length (TL) for all bonytail stocked; however, fishes with TLs of 300 mm or larger may be stocked into Reaches 2 and 3. Fishes stocked into Reaches 4 and 5 will be 305 mm TL or larger.

Previous Activities: Prior to FY14, the Center raised and stocked subadult razorback suckers and bonytail into the lower Colorado River to support LCR MSCP fish augmentation. In FY14, a decision was made to use the available grow-out space at the Center to raise subadult bonytail exclusively. Razorback sucker production continued but was transitioned to short-term grow-out geared toward producing larval and fingerling fish for distribution to other hatchery facilities. Work completed to date has supported rearing of both bonytail and razorback suckers, and this facility and has contributed both species to the LCR MSCP Fish Augmentation Program on an annual basis.

FY19 Accomplishments:

On Station:

Bonytail – The Center maintained approximately 1,850 adult bonytail as broodstock that comprised six year classes of Lake Mohave origin fish. Adult broodfish were hormonally induced to spawn, and bonytail females collectively produced over 300,000 eggs. Approximately 44,500 bonytail were maintained on station for future stocking (table 1).

Table 1.—Year Class and Approximate Number of Bonytail on Station in Early FY19

Year Class	Approximate Number
2015	3,500
2016	6,000
2017	10,000
2018	25,000
Total	**44,500**

Razorback Suckers – The Center maintained a broodstock of 1,050 adult razorback suckers that comprised nine year classes of Lake Mohave origin fish. Adult broodfish were hormonally induced to spawn, and razorback sucker females collectively produced approximately 300,000 eggs.

Received: The Center produced approximately 31,000 year-class 2019 bonytail for grow-out and future stocking into the lower Colorado River.

Stocked: The Center harvested, tagged (with passive integrated transponders), transported, and stocked 1,026 subadult bonytail (300+ mm TL) into Reach 3 and 2,853 subadult bonytail (305+ mm TL) into Reach 4.

Transferred: The Center transferred approximately 55,000 razorback sucker larvae to the Bubbling Ponds Fish Hatchery (B5), approximately 15,000 bonytail fry to the Achii Hanyo Native Fish Rearing Facility (B3), and 12,371 juvenile bonytail to the Lake Mead Fish Hatchery (B6).

FY20 Activities:

On Station: Razorback sucker and bonytail broodstocks will be maintained. At the start of FY20, the Center had approximately 37,000 bonytail on station from multiple year classes.

Received: The Center will produce up to 50,000 year-class 2020 bonytail for on station grow-out and future stocking into the lower Colorado River.

Stocked: The Center will rear 12,000–13,000 bonytail to 305 mm TL in FY20 for distribution within the lower Colorado River. From October to December 2019, 1,513 bonytail were stocked into Reach 4.

Transferred: The hatchery will produce approximately 20,000 larval or fingerling bonytail for distribution to other hatchery facilities.

Proposed FY21 Activities: Razorback sucker and bonytail broodstocks will be maintained. Razorback sucker larvae will be produced and delivered to the Bubbling Ponds Fish Hatchery for grow-out and future stockings. Up to 100,000 larvae or fingerling bonytail will be produced for distribution to various rearing/research facilities, and 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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$475,000	$500,850.04	$4,451,404.72	$475,000	$150,000	$0	$0

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 support operation of the Bubbling Ponds Fish Hatchery in order to 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 Tasks B4 and B6. The hatchery receives razorback suckers from the Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico (Center) (B4) and will occasionally transfer surplus razorback suckers to the Lake Mead Fish Hatchery (B6) for additional grow-out. 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 (AZGFD). 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. The annual production goal is 12,000 razorback suckers with a minimum size of 305 millimeters (mm) total length (TL) for release into Reaches 3–5.

Previous Activities: The work completed to date has supported rearing of razorback suckers at this facility. The Bubbling Ponds Fish Hatchery has successfully produced and stocked razorback suckers for the LCR MSCP each year since FY05.

FY19 Accomplishments:

On Station: The Bubbling Ponds Fish Hatchery began FY19 with approximately 106,200 razorback suckers on station (table 1). All razorback suckers were previously supplied by the Center as fry or fingerlings.

Table 1.—Year Class and Approximate Number of Razorback Suckers on Station in Early FY19

Year Class	Approximate Number
2014	1,900
2015	1,900
2016	18,400
2017	34,000
2018	50,000
Total	**106,200**

Received: The Bubbling Ponds Fish Hatchery received approximately 55,000 year-class 2019 razorback suckers from the Center in April.

Stocked: A total of 18,122 razorback suckers were harvested, tagged (with passive integrated transponders), and stocked into the lower Colorado River; 5,061 razorback suckers were stocked into Lake Havasu (Reach 3), and 13,061 were stocked below Parker Dam (Reach 4).

Transferred: A total of 4,284 razorback suckers were transferred to the Lake Mead Fish Hatchery (B6) on February 13, 2019, for continued grow-out and future stocking into the lower Colorado River.

Maintenance: Facility maintenance and repair activities were completed throughout the year. Repairs were made on stairways, catwalks, and pond liners in Ponds 1–8 to improve safety. Two raceways were sanded and recoated with epoxy sealer, and an enclosure was built over the raceways to prevent predation and escapement of fish. Minor equipment purchases were also completed to support operations.

Obligations for FY19 exceeded the estimate; these additional funds were used to support pond harvests, tagging, and transport of an additional 10,406 razorback suckers. These efforts resulted in exceeding the annual production goal of

12,000 razorback suckers with the stocking of an additional 6,122 razorback suckers into the lower Colorado River. The remaining surplus fish were transferred to the Lake Mead Fish Hatchery for additional grow-out (described above).

In FY16, partial funding was provided under this work task for replacement of the spring source pipeline that supplies water to the Bubbling Ponds Fish Hatchery. In a letter dated April 15, 2019, the AZGFD requested that the LCR MSCP deobligate its remaining funds for the project, and a total of $261,609.47 was returned to the program. The AZGFD plans to complete the pipeline replacement project in future years using other funding sources. LCR MSCP funds will no longer be used for hatchery improvements and maintenance after FY20.

FY20 Activities:

On Station: At the start of FY20, approximately 64,100 razorback suckers were on station (3,100 year-class 2016, 12,000 year-class 2017, 27,000 year-class 2018, and 22,000 year-class 2019).

Received: No razorback sucker fry will be received from the Center in FY20.

Stocked: As of January 2020, 7,439 razorback suckers with a TL of ≥ 305 mm had been stocked into Reach 4. The Bubbling Ponds Fish Hatchery is expected to stock an additional 4,500 fish by the end of FY20.

Transferred: It is anticipated that all razorback suckers on station will be transferred to other partner hatcheries by the end of FY20. This will be completed in preparation of planned renovations at the Bubbling Ponds Fish Hatchery.

Maintenance: Facility maintenance and repair activities will be completed as needed throughout the year.

Proposed FY21 Activities: The AZGFD is scheduled to begin major renovations of the Bubbling Ponds Fish Hatchery using State funding sources. The AZGFD does not anticipate producing any razorback suckers for the LCR MSCP for at least the next 3 years.

Any remaining razorback suckers will be transferred to other partner hatcheries prior to scheduled renovations.

Pertinent Reports: Annual administrative reports are available upon request.

Work Task B6: Lake Mead Fish Hatchery

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$350,000	$536,445.62	$1,808,314.56	$525,000	$585,000	$585,000	$585,000

Contact: Jeff Lantow, (702) 293-8557, jlantow@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 annually contribute bonytail and razorback suckers to the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): The Lake Mead Fish Hatchery receives larval razorback suckers under Work Task B1, fingerling razorback suckers from the Willow Beach National Fish Hatchery (Willow Beach NFH) under Work Task B2, bonytail from the Achii Hanyo Native Fish Rearing Facility under Work Task B3 and the Southwestern Native Aquatic Resources and Recovery Center (Center) under Work Task B4, and razorback suckers from the Bubbling Ponds Fish Hatchery under Work Task B5. Activities at the Lake Mead Fish Hatchery also contribute to other LCR MSCP work tasks, including closed work tasks B11, C13, C25, C32, C39, C41, C49, C57, and ongoing work tasks C53, C61, C63, C64, D8, and F5.

Project Description: The Lake Mead Fish Hatchery is managed and operated by the Nevada Department of Wildlife. The LCR MSCP and Nevada Department of Wildlife are cooperatively rearing razorback suckers and bonytail at this hatchery in support of the LCR MSCP Fish Augmentation Program. Razorback suckers are wild-caught individuals from Lake Mead and Lake Mohave, and bonytail for this work task are produced and supplied by the Center. 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: Several infrastructure and facilities improvements were made to the Lake Mead Fish Hatchery prior to FY07 to accommodate native fish production for the LCR MSCP. Additional rearing space was made available at the hatchery in FY12 in continued support of the LCR MSCP Fish Augmentation Program. This additional space has been used to rear native fishes for research and augmentation efforts and will continue to be necessary in future years when the number of fishes stocked annually into Reaches 3–5 is expected to increase.

The Nevada Department of Wildlife and LCR MSCP finalized a Memorandum of Understanding in FY18 that established the commitment of both parties to rear native fish species at the Lake Mead Fish Hatchery. This memorandum provided the framework for coordination and cooperation between the parties, identified general partner responsibilities, and will secure native fish rearing and production for LCR MSCP fish augmentation through 2055.

FY19 Accomplishments:

On Station: The Lake Mead Fish Hatchery continued rearing the approximately 12,000 razorback suckers and 20,000 bonytail that were on station from previous years (table 1).

Table 1.—Year Class and Approximate Number of Native Fishes on Station in Early FY19

Year Class	Species	Approximate Number
2013	Bonytail	6,042
2014	Bonytail	435
2015	Bonytail	949
2017	Bonytail	2,901
2018	Bonytail	10,340
2015	Razorback sucker	2,362
2016	Razorback sucker	1,856
2017	Razorback sucker	3,226
2018	Razorback sucker	4,205
	Total	**32,316**

Received: The Lake Mead Fish Hatchery received 15,949 razorback sucker larvae from Lake Mohave, 4,284 juvenile razorback suckers from the Bubbling Ponds Fish Hatchery, 12,371 fingerling bonytail from the Center, and 2,491 fingerling bonytail from the Achii Hanyo Native Fish Rearing Facility.

Stocked: A total of 2,362 razorback suckers and 3,514 bonytail were stocked into the lower Colorado River; 2,333 razorback suckers and 220 bonytail were stocked into Lake Mohave (Reach 2), and 29 razorback suckers and 3,294 bonytail were stocked below Parker Dam (Reach 4).

Obligations for FY19 exceeded the estimate. These additional funds were used to cover increased utility costs associated with rearing additional fishes, an unanticipated rate increase by the utility provider, and to initiate expansion of larval rearing capacity at the facility. It is anticipated that an additional 40,000 bonytail and 50,000 razorback suckers will be brought on station through FY23, and out-year budget estimates reflect the new utility costs and the level of effort associated with rearing these additional fishes.

FY20 Activities:

On Station: At the start of FY20, approximately 23,100 razorback suckers and 14,400 bonytail were on station (2,000 year-class 2016, 8,600 year-class 2017, 3,300 year-class 2018, and 9,200 year-class 2019 razorback suckers, and approximately 3,600 year-class 2013, 200 year-class 2014, 1,000 year-class 2015, 2,900 year-class 2017, and 6,700 year-class 2018 bonytail).

Received: The Lake Mead Fish Hatchery received 2,767 juvenile razorback suckers harvested from Yuma Cove backwater in November. The hatchery will receive an additional 7,000 razorback suckers from the Willow Beach National Fish Hatchery, up to 6,000 razorback sucker larvae from Lake Mohave, and approximately 10,000 fingerling bonytail from the Center.

Stocked: The Lake Mead Fish Hatchery is expected to stock 6,000 razorback suckers and 4,000 bonytail.

Improvements: Electrical upgrades will be completed in the larval fish room, which will allow for increased annual rearing of Lake Mohave razorback sucker larvae. These upgrades will support additional pumps, aerators, tanks, and in-tank heaters, and they will increase the annual rearing capacity from 6,000 to 12–16,000 larvae.

Proposed FY21 Activities: Rearing and stocking of native fishes from previous year classes will continue. The Lake Mead Fish Hatchery will receive and rear up to 20,000 additional razorback suckers from Lake Mohave and 10,000 additional fingerling bonytail from the Center. It is anticipated that the Lake Mead Fish Hatchery will annually rear over 80,000 native fishes of multiple year classes in preparation of LCR MSCP experimental augmentation.

Pertinent Reports: Annual activities reports are available upon request.

Work Task B7: Lakeside Rearing Ponds

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$200,000	$187,448.44	$2,740,823.05	$150,000	$150,000	$150,000	$150,000

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

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: Maintain fish rearing capability, provide razorback suckers and bonytail for 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, as fish for lakeside rearing ponds come from the Willow Beach National Fish Hatchery. In addition, some of the fish rearing research activities outlined in Work Tasks C34 (closed), C40 (closed), C44 (closed), and C63 (closed) have been conducted in 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 action redistributes sediment deposits from desert washes and shapes 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. 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 through the middle of March). 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: Over 33,500 razorback suckers have been reared in these ponds since 1992. Beginning in 2007, management of these ponds shifted toward rearing larger-sized fish for the LCR MSCP. Typically, razorback suckers > 300 millimeters (mm) total length (TL) were stocked into the ponds and then harvested later that year. Since 2012, surplus in-situ spawned fish have been harvested, fin clipped, and/or marked with a passive integrated transponder (PIT) tag and transferred to Reach 3 below Davis Dam.

FY19 Accomplishments: Five ponds were stocked at the beginning of the calendar year with 528 subadult razorback suckers (table 1). These fish were originally collected from Lake Mohave as larvae and then reared at the Willow Beach National Fish Hatchery. All fish were stocked at a size of at least 300 mm TL to be consistent with the minimum release target length. The Arizona Juvenile backwater had a shallow surface connection to the lake at the time of stocking, and it is possible that an unknown number of fish escaped into the lake prior to harvest efforts. The Yuma Cove and Davis Cove backwaters contain fish from multiple stocking years, therefore the population size in these ponds is unknown. All stockings of the lakeside rearing ponds were supported under this work task.

Table 1.—2019 Stocked Adult Razorback Suckers Repatriated into Lake Mohave from Lakeside Rearing Ponds

Lakeside Pond		Number Stocked		Mean TL at Stocking (mm)		Number Harvested		Mean TL at Harvest (mm)		Percent Harvested
Willow		50		367		39		450		78.0
Dandy		100		367		28		414		28.0
Arizona Juvenile		100		371		3		406		3.0
North Chemehueve		128		368		15		435		11.7
Davis Cove		150		367		1		480		0.7
Total or Overall Mean Value	**Total**	**528**	**Mean**	**368**	**Total**	**86**	**Mean**	**434**	**Mean**	**16.3**

A total of 86 razorback suckers were harvested from the ponds and repatriated into Lake Mohave. All fish were PIT tagged prior to initial stocking into the ponds; however, harvested fish were rescanned at the time of harvest, and a new tag was inserted if the original PIT tag was not detected. All fish had a fin clip

taken for genetic analysis prior to being repatriated into the lake. The mean TL for fish during this harvest was 434 mm (see table 1), with a range of 340–525 mm.

While harvest efforts can be variable from year to year depending on fish survival and other contributing factors, lake-wide monitoring has consistently shown higher long-term contact rates for pond-reared versus hatchery-reared fish in Lake Mohave. Pond 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, increasing the likelihood that these fish will contribute to the adult broodstock.

FY20 Activities: A total of 2,767 juvenile razorback suckers were harvested from the Yuma Cove backwater in November. This harvest was completed to reduce fish density in the pond in preparation of additional stockings. These fish were transported to the Lake Mead fish hatchery for additional grow-out and future stocking into Reaches 3–5.

Lakeside rearing ponds will again be used for Lake Mohave razorback sucker broodstock maintenance and development. Approximately 525 fish will be stocked into lakeside ponds. The Yuma Cove, North Chemehueve, and Davis Cove backwaters will each be stocked with approximately 100 razorback suckers. The Arizona Juvenile, Dandy, and Willow backwaters will be stocked with 75 razorback suckers each. Despite the flash flooding that compromised the Arizona Juvenile pond in FY18, lakeside wave action has rebuilt the natural barrier to the pond, and fish will continue to be reared at this location.

Pond maintenance, including the removal of surface algal mats and dense submerged vegetation, will be completed as needed to promote water quality suitable for native fishes.

Remote sensing technology will be expanded to all rearing ponds in the form of continuous PIT tag scanning from the time of initial stocking until the final harvest. Data collected from this continuous monitoring will be used to address spatial and temporal variability in survival rates and to suggest improvements in pond management.

Proposed FY21 Activities: Lakeside ponds along the shoreline of Lake Mohave will be operated and maintained for rearing native fishes. All ponds will be monitored regularly to ensure survivorship is maximized throughout the year. Continuous proactive measures will need to be implemented to ensure ponds are free of surface algal mats and dense submerged vegetation that has likely impacted the water quality of various ponds in past years. Fish spawned in situ will continue to be transported and stocked downstream from Davis Dam.

Pertinent Reports: N/A

Work Task B8: Fish Tagging Equipment

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$135,000	$147,859.37	$1,460,307.76	$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 decision making. 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 (Lake Mead and Lake Mohave, Reaches 1 and 2), 125-kHz PIT tags (Davis Dam to Parker Dam, Reach 3), and wire tags (Davis Dam to Imperial Dam, Reaches 3, 4, and 5). Recaptured fishes 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 Lake Mead, Lake Mohave, and Lake 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 fishes) and allow for testing and deployment of remote monitoring stations within spawning areas and other locations along the LCR.

FY19 Accomplishments: PIT tags, tagging equipment, and tag readers were purchased as needed to mark fishes for monitoring and research. A total of 25,335 razorback suckers and 8,259 bonytail were PIT tagged and released into the LCR during FY19. These numbers represent the total number of fishes implanted with tags and repatriated, not the number of fishes 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, fishes that have been retagged due to tag loss or to replace older frequency tags, and razorback suckers released into Reach 2 (Lake Mohave).

FY20 Activities: PIT tags, tagging equipment, and tag readers will be purchased as needed to mark fishes for monitoring and research. The budget estimates reflect current stocking goals and the need for supplies and equipment to support ongoing tagging and remote sensing research and monitoring efforts.

Proposed FY21 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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$70,000	$65,734.38	$244,906.04	$70,000	$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): This work task is connected to Work Task B4, as bonytail for this broodstock were acquired from the Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico (Center).

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 Center maintained the only bonytail broodstock in the world. This broodstock has been the source of all bonytail for the LCR MSCP Fish Augmentation Program. 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 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.

The relocation and maintenance of the second broodstock was completed through a cost-share agreement with the U.S. Fish and Wildlife Service. Budget estimates for this work task will reflect LCR MSCP contributions toward continuing broodstock maintenance activities.

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.

FY19 Accomplishments: Survival of the second bonytail broodstock was 97.9% through the end of FY19. Bonytail continue to be maintained in six 6-foot-diameter circular tanks. Bonytail diets were monitored throughout the year, and feed rates were adjusted to meet the objective of maintenance rather than fish growth. Bonytail grew approximately 12 millimeters in 2019 on a daily maintenance diet of 0.5% of total body weight at an average water temperature of 11 degrees Celsius. The average total length of the bonytail broodstock was 301 millimeters by the end of FY19.

FY20 Activities: Funds will be supplied to help cover the costs of maintaining the second bonytail broodstock at the Mora NFH. This cost may vary depending on contributions made through other recovery and conservation programs.

Proposed FY21 Activities: Funding will be provided to help support maintenance of the second bonytail broodstock at the Mora NFH. 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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$11,000	$15,564.32	$163,656.39	$11,000	$11,000	$11,000	$11,000

Contact: Jenny Smith, (702) 293-8518, jenealsmith@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 2018, 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 2018 and invasive weed removal in 2013 to 2018 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."

FY19 Accomplishments: Conservation activities for these two plant species were 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, and 219 of the 470 plots surveyed contained plants, with 21,089 plants recorded overall. Sticky buckwheat populations located at Lime Cove were monitored in a 0.01-acre survey area, and 71 sticky buckwheat plants were documented. In addition, 34 acres of dunes and sandy areas at Sandy Cove were surveyed for invasive Sahara mustard, and 1.71 acres were treated to remove the weed.

Obligations in FY19 exceeded the approved estimate in order to establish a new 5-year agreement.

FY20 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. The NPS will focus activities in FY20 on attempts to remove Sahara mustard, native sixweeks fescue, and non-native Mediterranean grass that are stabilizing the dunes at Sandy Cove and degrading threecorner milkvetch habitat. They will treat plots with mechanical and herbicide methods, and then monitor each treatment's effectiveness in controlling Sahara mustard and native and non-native grasses and to document any threecorner milkvetch that colonize the plots. This should promote more habitat over time for the threecorner milkvetch and provide tools to maintain and improve habitat at sticky buckwheat areas in the future. An annual report will be provided to the LCR MSCP that summarizes the achievements made toward the conservation goals for these two plant species.

Proposed FY21 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 LCR MSCP 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 2019 – Lake Mead National Recreation Area* is posted on the LCR MSCP website.

Work Task C14: Humpback Chub Program Support

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$1,000	$7,500	$288,216.61	$60,000	$60,000	$60,000	$60,000

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): N/A

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 U.S. Fish and Wildlife Service (USFWS), to support implementation of planned, but unfunded, humpback chub conservation measures.

Previous Activities: Approximately 60% of the overall $500,000 commitment has been spent funding broodstock development and supporting humpback chub initiatives of the Glen Canyon Dam AMP. A captive broodstock/refugium population of Grand Canyon humpback chubs was established at the Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico (Center) from FY09–12. Since FY12, the Center has successfully maintained this refuge population of approximately 1,000 humpback chubs.

FY19 Accomplishments: Funding was provided for the development and validation of environmental DNA (eDNA) markers for the humpback chub at the request of the USFWS. Sampling protocols using eDNA allow for cost-effective collection of data by providing an alternative to more labor-intensive monitoring efforts. Applications of eDNA sampling include providing evidence of aquatic

species presence, absence, and distribution, and they could potentially be used to estimate relative abundance of species that are difficult to detect or capture using traditional methods.

FY20 Activities: Development and validation of eDNA markers is expected to be completed. Advanced funding will be provided for initiating humpback chub field research in the western Grand Canyon. Recent capture and recruitment data suggest there is a new, self-sustaining population in the area downstream from Diamond Creek, but no quantitative evaluation has been conducted to date. The USFWS will be seeking cost-sharing opportunities for this project as part of the planning phase, and field activities are expected to begin in early FY21.

Proposed FY21 Activities: Humpback chub field research in the western Grand Canyon is expected to begin. Advanced funding for the second year of this project (FY22) will be obligated. Support will continue for humpback chub conservation in coordination with the USFWS and Glen Canyon AMP. Remaining funds will be obligated according to research needs as agreed to among cooperating agencies.

Pertinent Reports: Progress reports are available upon request.

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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$160,000	$160,260.22	$468,712.35	$160,000	$60,000	$0	$0

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

Start Date: FY13

Expected Duration: FY21

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 (HMM), Imperial Ponds Conservation Area (IPCA), and McAllister Lake

Purpose: To evaluate the baseline selenium levels within created backwater and marsh habitats to help 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 to determine baseline levels and 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. If initial levels of selenium are well below thresholds of concern, a long-term selenium monitoring plan may include less frequent sampling over time. If monitoring results indicate that management of conservation areas increases levels of selenium, the LCR MSCP will undertake research to develop feasible methods to manage conservation areas in a manner that will eliminate or compensate for the effects. A multi-year sampling design may be needed to provide a larger dataset on which management decisions can be based through the adaptive management process. Sampling in subsequent years may be reduced as appropriate, and the frequency and levels of sampling intensity are expected to vary from site to site. As new conservation areas are developed, this exploratory sampling phase will be accomplished under this work task. Accordingly, annual expenditures are also expected to vary based on these levels of effort.

Previous Activities: Sampling sites were identified in FY14 and included the BBCA, HMM, the IPCA, and McAllister Lake. Selenium monitoring was conducted in FY15–18 with the collection of water, substrate, plankton, and whole-body fish samples from these sites. Analyses from the IPCA determined that the current level of selenium was well below threshold water quality standards for fishes and wildlife. Similar results were observed at HMM and McAllister Lake, with dissolved selenium concentrations below 4 parts per million (ppm) and selenite and selenate concentrations below 1 ppm. The BBCA had the highest reported concentration of dissolved selenium (12 ppm), but selenite and selenate concentrations were similar to those found at HMM (1 ppm). Analyses of sediment samples from the BBCA and McAllister Lake were above 4 ppm, the dry weight threshold for high-hazard toxicity in sediment. All other sediment samples were below the moderate toxicity threshold. Selenium concentrations in FY17 were highest in invertebrate and fish tissue samples from the BBCA. Mysid shrimp collected at the BBCA were above the high-hazard threshold for macroinvertebrates, and a bluegill whole-body sample had a selenium concentration of 13.6 ppm dry weight, which is above the 8.5 ppm selenium concentration Environmental Protection Agency criterion and above the high-hazard threshold for fishes. All other invertebrate and fish samples had selenium concentrations lower than the criterion and the moderate threat level threshold.

FY19 Accomplishments: Analyses of FY18 samples were completed and summary data reported in FY19. Selenium concentrations in water samples stayed consistently low across all sampling sites in FY18, with the exception of samples from the BBCA during the second quarter when they were above 1 ppm, placing them in the minimal hazard category. Average selenium concentrations in sediment, periphyton, invertebrates, and whole-body fish samples from HMM, the IPCA, and McAllister Lake remained below their respective U.S. Fish and Wildlife Service (USFWS) thresholds for protecting fish and wildlife in FY18, and hazard assessments for these components ranged from moderate to no hazard. Similar results were reported for the majority of these components from the BBCA; however, average selenium concentrations in whole-body fish samples

exceeded the USFWS threshold for protecting fish and wildlife during each quarter of FY18. Average selenium concentrations in periphyton, invertebrates, and whole-body fish samples from the BBCA were consistently higher than those of other sites, and hazard assessments for these components ranged from moderate to high.

Sampling was again conducted at all project sites in FY19. Whole-body fish, invertebrate, periphyton, sediment, and water samples were collected, and sample analyses will be completed and reported in FY20.

FY20 Activities: Selenium monitoring will continue with quarterly sampling events at the BBCA, HMM, the IPCA, and McAllister Lake. Laboratory analyses of the full sample suite will be compared to selenium thresholds suggested by the USFWS for aquatic species, and quarterly activity reports will summarize data as they become available.

Proposed FY21 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. A final project report will be completed and will provide long-term monitoring recommendations for current and future conservation areas.

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

Work Task C60: Habitat Manipulation

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$175,000	$161,453.42	$549,826.62	$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 LCR MSCP conservation areas

Purpose: The purposes of this work task are to develop monitoring protocols to evaluate species-specific habitat requirements of created habitat; develop protocols to manage LCR MSCP conservation areas, ensuring that these habitat requirements are being maintained; identify sections of conservation areas in need of habitat manipulation; and carry out pilot studies in these areas. The intent is to use the results of this research to appropriately manage habitat characteristics that are required by covered 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: In natural riparian systems where periodic flooding is a component of the system, habitat is periodically disturbed and "reset" to earlier seral stages with increased structural diversity. Several covered species require habitat that is in the early to mid-seral stages of riparian habitat succession. Without the disturbance events that were once more common in the historic

Colorado River system, 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 ensure that species-specific habitat requirements are present.

Studies will initially be carried out for created habitats with the cottonwood-willow and marsh land cover types. Future studies conducted may address the honey mesquite and backwater land cover types.

The objectives of these initial studies for the cottonwood-willow and marsh land cover types are to:

1. Develop a protocol for evaluating the structural diversity and habitat characteristics at conservation areas and identify areas that may require enhancement to meet management objectives for pilot studies.

2. Develop a protocol to guide cost-effective and appropriate manipulations of identified riparian habitats in order to reset portions of these areas to earlier seral stages.

3. Evaluate the timing and extent of manipulation necessary for maintaining riparian habitat that provides the species-specific habitat characteristics.

Previous Activities: Literature reviews were completed in 2015 on cottonwood-willow and marsh habitat manipulations to determine the best approaches for achieving the desired habitat structure and to determine the measured parameters needed to indicate success.

Following the literature review, two strategies using lidar technology were investigated to assess structural diversity: (1) field-based methods (terrestrial laser scanning [TLS]) and (2) airborne-based methods (aerial laser scanning [ALS]). In FY17, models and 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 the cottonwood-willow analysis, ALS provided the necessary detail to evaluate structural diversity of the vegetation and topography. However, ALS does not provide adequate spatial resolution for evaluation of marsh habitat analysis.

Vegetation structure (lidar) data collection began at several southwestern willow flycatcher-occupied locations (within and outside the Lower Colorado River Basin) in 2015. Soil moisture data collection began at the Palo Verde Ecological Reserve (PVER) and two southwestern willow flycatcher-occupied locations outside of the Lower Colorado River Basin in 2015. The soil moisture data will be used to (1) identify the range of soil moisture levels present at areas occupied

by breeding southwestern willow flycatchers and (2) assess whether adequate soil moisture is being maintained during the nesting season at conservation areas being managed for southwestern willow flycatchers.

A pilot habitat manipulation study was conducted at Hart Mine Marsh (HMM), testing one of the marsh habitat manipulation techniques (mechanical disturbance) identified in the literature review. This was done in cooperation with the U.S. Fish and Wildlife Service. Mechanical disturbance (mowing and roller-chopper) was performed, 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.

FY19 Accomplishments: Work continued for the cottonwood-willow component of this work task, including collection of additional vegetation structure data (lidar) and soil moisture data. Lidar data were scheduled to be collected for the entire LCR MSCP planning area under this work task and Work Task F1 during FY18. Lidar data for some areas were not collected as scheduled during FY18, so collection took place during FY19. The delays were caused by difficulties in attaining landowner approval in a timely manner. These data will be used for refining the vegetation structure models and for updating the vegetation classification. Soil moisture data were collected at one southwestern willow flycatcher-occupied location outside of the Lower Colorado River Basin at three survey sites on the Middle Rio Grande River in New Mexico. The methods previously developed to process and analyze ALS data to describe vegetation structure were used to process recently collected lidar data.

Data (UAS-based lidar, UAS-based photogrammetric, UAS-based multispectral, and multispectral satellite) were processed and analyzed for the pilot habitat manipulation study at HMM. These data were overlaid with marsh bird dispersal data to identify specific areas of occupied habitat that were used by marsh birds. The results of this analysis showed that areas with known presence of rails had higher values of normalized difference vegetation index (NDVI) than areas with no birds detected. NDVI rasters from multispectral remote sensing platforms will be used when determining habitat manipulation actions for managed marsh habitat. A report and protocol detailing the results of this analysis is forthcoming. The report will also present different habitat manipulation techniques for resetting marshes to ensure that habitat conditions are present that will provide these NDVI values and other marsh bird habitat characteristics.

Baseline data (soil moisture, soil salinity, groundwater level, groundwater salinity) were collected for an irrigation reduction study in Phase 8 of the PVER. The objective of the study is to evaluate the effects that reduced irrigation will have on volunteer cottonwoods that have established in a stand of planted honey

mesquite trees. This study will help evaluate what the effect of reduced irrigation on cottonwood health and productivity is in areas where moist soils are not necessarily required for species habitat requirements.

FY20 Activities: The processed lidar data collected at southwestern willow flycatcher-occupied locations throughout the Southwestern United States will be analyzed to develop ranges for 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 locations. 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.

Using the information from the marsh habitat manipulation report, pilot studies will be planned for habitat manipulation at HMM (and other occupied marsh bird habitat sites if possible). Areas with low NDVI values will be identified and pre- and post-manipulation vegetation data will be collected following the established protocol. Additional marsh habitat manipulation techniques are being considered, and if appropriate, field tests will be planned and designed to evaluate their inclusion in the long-term marsh habitat manipulation toolbox.

Vegetation data will be collected in Phase 8 of the PVER as part of the irrigation management study.

Proposed FY21 Activities: Lidar data will continue to be acquired in FY21 under Work Task F1 and will be processed and analyzed using techniques developed under Work Task C60. Soil moisture data collected at southwestern willow flycatcher-occupied locations will continue to be analyzed under Work Task C60, and soil moisture data at LCR MSCP conservation areas will continue to be collected under Work Task F1 and analyzed under Work Task C60. 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 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 HMM using data acquired with UASs and other platforms. 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.

The irrigation management study at Phase 8 of the PVER will continue. Irrigation volumes will begin to be decreased, and soil, groundwater, vegetation, and wildlife monitoring will continue.

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 website upon completion.

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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$10,000	($2,391.06)[1]	$638,512.21	$10,000	$10,000	$0	$0

[1] Funding was obligated in prior years, and there were no additional obligations in FY19.

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 (closed), C33 (closed), C39 (closed), C46 (closed), C63 (closed), C64, D8, and G3. In FY16, documentation of soft release experiments was moved from Work Task C65 (closed) to Work Task C61, as soft release research is essentially a type of stocking treatment and aims to assess long-term survival through recontact probabilities.

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 juvenile 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 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. Less than 3% of these releases had been captured or contacted through monitoring efforts by the end of FY18, and little overall difference in survival has been observed between day and night releases.

Trials to condition razorback suckers and bonytail to avoid predation were conducted at the Valle Vista Golf Course in Kingman, Arizona, from FY13 through FY16. 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. Predator avoidance trials were ended in FY17 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's Aquatic Research Conservation Center (ARCC) to provide a secure site for research to continue. Experiments to condition razorback suckers and bonytail for predator recognition and avoidance were completed in FY18. Results indicated no difference in survival between predator recognition treatments for either species. Additional trials were completed to evaluate if

artificial vegetation or habitat alone would improve survival for these species in the presence of a predator; however, improved survival was only observed for bonytail in the presence of artificial vegetation and one of the habitat structures.

Soft release treatments for razorback suckers were conducted in three backwaters within Topock Gorge in FY16–18. These treatments consisted of fishes being released in paired cohorts of approximately 200 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.

A study to compare survival of razorback suckers stocked into Lake Mohave in cohorts of different quantities was initiated in FY16. 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 FY18, < 1% of these cohorts had been captured or contacted. Due to the loss of hatchery fish in FY17, no additional stockings to evaluate this potential relationship took place in FY17–18. Capture and contact data will continue to be analyzed for the FY16 cohorts as they become available through monitoring efforts.

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

FY19 Accomplishments: Data collected through ongoing monitoring efforts were analyzed to evaluate the results from previous year day/night paired releases in Lake Mohave. Through FY19, less than 3% of FY13, FY14, and 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 several 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 FY19, 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.

Limited contacts have been made with razorback sucker cohorts that were stocked as part of the soft release treatments in Topock Gorge. Future monitoring of these cohorts may provide comparisons on survivorship of the individual treatments as fish mature and arrive on the spawning grounds. Data will be collected through detections derived from PIT scanning recontacts.

Predator avoidance trials continued at the ARCC. Experimental trials evaluating survival of conditioned native fishes in the presence of predators and artificial habitat were completed. Razorback sucker and bonytail survival were higher relative to previous trials evaluating only conditioning or artificial habitat. Results from this and additional related research will be reported under this work task through FY21.

FY20 Activities: The potential benefits of alternative stocking methods will continue to be analyzed using data from fishes stocked during previous years.

Predator avoidance trials will continue at the ARCC. Pilot trials evaluating avian predator conditioning are expected to be completed in spring 2020, when razorback sucker and bonytail fry become available from the Southwestern Native Aquatic Resources and Recovery Center, Dexter, New Mexico.

Proposed FY21 Activities: Longer-term evaluation of various stocking treatments will be conducted using data derived from PIT scanning recontacts. This recontact information will be acquired through research and monitoring efforts conducted under Work Tasks C64 and D8. Relative recontact rates of treatment versus control fishes will be queried and used to evaluate the effectiveness of each treatment.

Predator avoidance research is expected to be completed in FY21. Results will continue to be reported under this work task.

Pertinent Reports: Summary reports for predator avoidance experiments will be completed and available upon request. A final project report for predator avoidance research will be posted on the LCR MSCP website upon completion.

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

FY19 Estimate	FY19 Actual Obligations	Cumulative Accomplishment Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$450,000	$442,497.69	$2,366,684.41	$450,000	$450,000	$450,000	$450,000

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

Start Date: FY15

Expected Duration: FY27

Long-Term Goal: 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 develop 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 Work Task 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 was covered by this work task in FY15.

Project Description: Information on post-stocking distribution, habitat selection and use, and survival will be collected 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 throughout Reaches 2–5, 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 Reaches 2–5. 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 completed under closed Work Tasks C39, C45, and C49 are available 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: Sonic telemetry has been used to evaluate movements and habitat use of adult razorback suckers in Lake Mohave since FY15. Passive and active tracking allowed for continuous surveillance of sonic-tagged fish and the identification of both large-scale movements and the use of specific spawning locations. Razorback suckers were observed moving between lake zones during each year, and seasonal habitat use indicated a preference for deeper, mid-channel habitat in late spring and summer and shallow inshore habitat in late fall and through the spawning season. Sonic telemetry has also been used to evaluate post-stocking survival of bonytail in Lake Mohave since FY16. Active tracking was conducted intensively for 3–6 weeks after releases each year in an effort to maintain contact with these fish. Despite these intensive efforts, and the use of continuous passive tracking, recontact rates remained low across all years, and estimates of survival could not be generated.

Reach 3: Habitat use by razorback suckers was studied in the lower Colorado River from Park Moabi downstream to the Lake Havasu Delta. During 5 years of trammel netting and 3 years of remote passive integrated transponder (PIT) scanning, it was observed that both methods predominantly contacted recently released fish (i.e., fish released < 3 years ago). 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.

Habitat use and post-stocking survival of bonytail was evaluated 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. This reduction in detections may indicate that fish left the study area, remained in cover, or had poor survival.

In FY17, native fish work in Topock Marsh was initiated to track survival and distribution of new and existing cohorts of stocked razorback suckers and bonytail. Mark recapture data were used to evaluate razorback sucker abundance and generated a population estimate of 798 individuals (95% confidence interval [CI] from 652 to 987) in Topock Marsh. Sonic telemetry indicates that the fish use the entire marsh, but during the summer months, they congregate around the fire break canal (the main inflow into the marsh).

Reaches 4 and 5: In FY16, routine PIT tag scanning surveys were initiated below Palo Verde Dam, and this has continued through FY18. The majority of razorback suckers contacted originated from recent stocking events, and more specifically from fish released into the A10 backwater complex.

In FY18, remote PIT scanners scanned for 12,597.1 hours and resulted in 1,234 unique razorback sucker contacts and 535 unique bonytail contacts. The majority of fishes originated from recent stockings, with the exception of 206 razorback suckers and 1 bonytail, which were contacted more than a year post-release. The razorback sucker population was estimated at 169 individuals (95% CI from 157 to 180). Acoustic telemetry of adult and subadult razorback suckers and adult bonytail is ongoing.

FY19 Accomplishments: Accomplishments for this work task have been summarized by river reach.

Reach 2: Active and passive tracking of razorback suckers resulted in the detection of six individuals. Data collected to date have met the goals of this project and successfully documented movements and habitat use of adult razorback suckers in Lake Mohave. No additional razorback suckers were sonic tagged during the study year, and this work is expected to conclude in FY20.

Post-stocking survival of bonytail was evaluated with the release of an additional 20 sonic-tagged and 200 PIT-tagged bonytail in April. Bonytail were intensively monitored using remote PIT scanning and active and passive telemetry for 1 month following stocking. Only 2 of 20 sonic-tagged bonytail were

contacted via active tracking 3 weeks after stockings. At the conclusion of the 9-month study period, there were 2 confirmed mortalities, and 18 bonytail had an unknown fate. Subsequent telemetry surveys for bonytail were conducted monthly; however, active telemetry efforts were reduced due to low contact rates.

Reach 3: Remote PIT scanning surveys continued in Topock Marsh. Remote PIT scanners scanned for 1,974 hours, which resulted in 1,013 contacts from 189 unique razorback suckers. No bonytail were contacted through these efforts.

Reaches 4 and 5: In Reach 4, remote PIT scanning surveys were conducted throughout the fiscal year but occurred with greater frequency in winter and spring. In addition, a single electrofishing survey was conducted during the razorback sucker spawning period. In total, scanning and electrofishing contacted 1,861 razorback suckers and 347 bonytail. A total of 344 razorback suckers and 0 bonytail were contacted more than 1 year after release. Main channel contacts were considerably higher this year, with 337 razorback suckers and 106 bonytail being contacted in the main channel. In previous years, the largest numbers of main channel contacts were 15 razorback suckers and 9 bonytail. The increase in river contacts is largely due to the discovery of a razorback sucker aggregation site in January, where 307 razorback suckers and 3 bonytail were contacted. No bonytail contacted during the marking period (January 1 to February 28, 2018) were contacted again in the capture period (October 1, 2018, to April 30, 2019), so no population estimate was possible. The current razorback sucker population estimate is 147 (95% CI 123 to 171).

Sonic telemetry of previously implanted fishes continued, and an additional 20 subadult razorback suckers and 20 subadult bonytail were implanted with short-term (3-month) acoustic telemetry tags to examine dispersal patterns immediately following release. Ten adult razorback suckers were implanted with longer-term (36-month) tags to examine dispersal over a longer period.

FY20 Activities: Activities for this work task have been summarized by river reach.

Reach 2: Sonic-tagged razorback suckers released in FY17 will continue to be tracked. This work can be performed concurrently with bonytail tracking and will help to maximize resources and the use of acquired equipment. Razorback sucker sonic tags are expected to reach the end of their battery life this fiscal year, and no additional sonic-tagged razorback suckers are scheduled to be released at this time. Data collected to date have met the goals of this project and successfully documented movements and habitat use of adult razorback suckers in Lake Mohave. Sonic-tagged razorback suckers may be released in Lake Mohave in the future if additional research or monitoring needs are identified.

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 200–500 fish. Intensive active tracking will be conducted immediately following stocking. Less intensive active tracking and continuous passive tracking will continue throughout the year. Continuous PIT tag scanning in the vicinity of the stocking location will also be used to monitor bonytail movement as was done in the previous year.

Reach 3: Razorback suckers and bonytail will continue to be monitored in Topock Marsh, and subsequent stocking events will be scheduled as needed.

Reaches 4 and 5: Monthly scanning surveys and sonic telemetry will continue in Reach 4 in an effort to increase recontact rates with stocked fishes and to locate additional riverine spawning aggregates. 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 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 number of stocked fishes are dispersing into this reach.

Proposed FY21 Activities: Proposed activities for this work task have been summarized by river reach.

Reach 2: Additional releases of sonic-tagged bonytail may occur.

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

Reach 4: Surveys and monitoring efforts will continue. 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 stocked fishes are dispersing into this reach and forming spawning aggregates.

Pertinent Reports: The report titled *Population Status and Distribution of Razorback Suckers and Bonytail Downstream from Palo Verde Diversion Dam, 2019 Interim Report* will be posted on the LCR MSCP website upon completion.

WORK TASKS – SECTION D

System Monitoring

Work Task D1: Marsh Bird Surveys

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$40,000	$32,614.21	$437,495.48	$40,000	$40,000	$40,000	$40,000

Contact: Joe Kahl, Jr. (702) 293-8568, jkahl@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: System monitoring for marsh birds

Conservation Measures: MRM1 (BLRA, CLRA, and LEBI)

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.

FY19 Accomplishments: Marsh bird surveys were conducted between the I-40 Bridge, near Needles, California, and Lake Havasu during March, April, and May 2019 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. All three covered species were encountered: 63 Yuma clapper rails were detected in March, 51 in April, and 47 in May; 14 western least bitterns were detected in March, 25 in April, and 44 in May; and 1 California black rail was detected in March, 0 in April, and 2 in May. Data were compiled and entered into the Avian Knowledge Network (AKN) database.

FY20 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 and then entered into the AKN database.

Proposed FY21 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 and entered into the AKN database.

Pertinent Reports: The reports titled *Marsh Bird Surveys in Topock Gorge, 2018 Annual Report* and *Marsh Bird Surveys in Topock Gorge, 2019 Annual Report* are posted on the LCR MSCP website.

Work Task D2: Southwestern Willow Flycatcher Presence/Absence Surveys

FY19 Estimates	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$200,000	$321,685.83	$10,412,379.99	$340,000	$420,000	$340,000	$340,000

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

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: System monitoring of southwestern willow flycatchers

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

Location: Reaches 1–7 along the lower Colorado River (LCR), southern Nevada, the Bill Williams River, and the lower Gila River. Life history study sites are located along (1) Topock Marsh on the Havasu National Wildlife Refuge, Arizona, (2) the Bill Williams River watershed, Arizona, and (3) Alamo Lake State Park near Wenden, Arizona.

Purpose: To monitor southwestern willow flycatcher populations along the LCR, 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. Post-development monitoring conducted in FY16–17 is now captured under Work Task F9.

Project Description: Presence surveys are conducted along the LCR and its tributaries from the Southerly International Boundary with Mexico to southern Nevada, the Bill Williams River, and the lower Gila River. Life history studies are conducted at known breeding areas when needed.

Previous Activities: Presence surveys and life history studies for southwestern willow flycatchers have been conducted along the LCR and its tributaries since 1996 and include approximately 100 sites. The sites south of Parker Dam were only surveyed triennially; sites on the triennial schedule were last surveyed in FY18. Through FY17, searches were conducted for nests in all areas occupied by territorial flycatchers, and flycatcher nests were monitored to document nest fate,

brood parasitism, and causes of nest failure. As many flycatchers as possible were captured and color banded, and attempts were made to resight as many flycatchers as possible to determine the breeding status of territorial flycatchers and to document movement and recruitment. At the end of FY17, the LCR MSCP determined that sufficient data had been collected to understand general recruitment trends and threats affecting nest fate, brood parasitism, and nest failure. Data collected also indicated that adult birds are most likely to return to their prior breeding areas, and many juvenile birds will also return to their natal area. Some juvenile flycatchers will disperse to new areas, and that age class appears to be more likely than adults to do so. The study plan was subsequently refined to focus on searching for and monitoring flycatchers in occupied and potential habitat, which would most likely be the source of birds that would colonize LCR MSCP conservation areas, and occupied sites that could help inform habitat management, such as wet conditions. All surveys in southern Nevada were discontinued at the end of FY17. System-wide surveys continued at Topock Marsh; Alamo Lake State Park, Arizona; the portions of the Bill Williams River not creditable by the LCR MSCP; and areas south of Parker Dam (only every third year). Activities such as color banding and nest monitoring of conservation areas will only be conducted as needed.

FY19 Accomplishments: System-wide presence surveys for southwestern willow flycatchers were conducted at Alamo Lake, the Bill Williams River (areas outside of areas creditable by the LCR MSCP), and Topock Marsh.

A total of 158 southwestern willow flycatchers (table 1) were detected at 12 of the 76 sites during presence surveys, and 95 territories were documented. Surveyors confirmed that southwestern willow flycatchers were resident or breeding at 12 of the sites (within 3 study areas): Alamo Lake, the Bill Williams River National Wildlife Refuge, and Topock Marsh. Please note that due to the changes in methodology and survey effort, these numbers are not comparable to previous years.

Table 1.—Study Areas Where Resident Adult Southwestern Willow Flycatchers were Observed

Study Area	Number of Residents
Alamo Lake	145
Bill Williams River National Wildlife Refuge	1
Topock Marsh	12
Total	**158**

Nest success was calculated for seven southwestern willow flycatcher nests at Topock Marsh that contained flycatcher eggs. Five of the seven nests fledged flycatcher young, for a success rate of 71%. This represents the highest number of nests and successful nests at Topock Marsh since 2008, and the number of young produced in 2019 equals the total number produced over the previous decade combined. Nest monitoring was only conducted at Topock Marsh.

The FY19 obligations exceeded estimates. When Work Task D2 was split into Work Tasks D2 and F9, more funding was estimated under Work Task F9 than was needed. It was shifted back to Work Task D2 in FY20 to reflect the actual cost of conducting the system-wide surveys and associated logistics.

FY20 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.

Proposed FY21 Activities: Presence surveys for southwestern willow flycatchers will be conducted at Topock Marsh, the Bill Williams River, Alamo Lake, and the sites south of Parker Dam. Nest monitoring will be conducted at Topock Marsh. The budget increases in FY21 to cover the cost of surveying the system-wide sites south of Parker Dam that are only surveyed every 3 years.

Pertinent Reports: The report titled *Southwestern Willow Flycatcher Presence/Absence Surveys, 2018 Annual Report* is posted on the LCR MSCP website. The 2019 annual report will also be posted upon completion.

Work Task D5: Monitoring Avian Productivity and Survivorship

FY19 Estimates	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$250,000	$299,283.00	$3,888,963.22	$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 of avian species by conducting intensive monitoring of conservation areas 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 conservation areas may also be used for post-development monitoring (F2, F9, and F10).

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 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.

Previous Activities: Bird 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 warblers, and summer tanagers was initiated in August 2008 at the banding sites to monitor site persistence during the breeding and winter banding seasons.

FY19 Accomplishments: Banding was conducted at the BLCA and Cibola NWR Unit #1 during summer using the MAPS protocol. Banding is normally conducted once during every 10-day banding period for 5 hours a day, beginning 1/2 hour before sunrise. All 10 sessions were completed in FY19. During the breeding season, there were 220 captures at the BLCA and 153 captures at Cibola NWR Unit #1.

Three LCR MSCP species were captured and banded during the MAPS season. At the BLCA, there were six Bell's vireos, six yellow warblers, and two summer tanagers captured and color banded. Two summer tanagers and one yellow warbler were captured and color banded at Cibola NWR Unit #1.

Three color-banded yellow warblers were recaptured at the BLCA; their initial captures were in 2019. One color-banded summer tanager, which was initially banded in 2011, was recaptured at the BLCA,. One Townsend's x hermit warbler hybrid was captured and banded at the Cibola NWR Unit #1 in May.

Obligations in FY19 exceeded the estimate due to the cost of training five additional staff in MAPS bird handling methods in order to increase future staffing flexibility.

FY20 Activities: MAPS banding stations will continue to operate at the BLCA and Cibola NWR Unit #1 during the FY20 breeding season. Color banding of LCR MSCP covered species will continue to be implemented in order 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 FY21 Activities: Breeding season monitoring may continue in FY21 based on the recommendations from the project evaluation (D5, D6, and F2).

Pertinent Reports: The *2018 MAPS Summary Banding Report* and the *2019 MAPS Summary Banding Report* will be posted on the LCR MSCP website upon completion.

Work Task D6: System Monitoring of Riparian Obligate Avian Species

FY19 Estimates	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$500,000	$258,540.61	$2,972,830.12	$500,000	$530,000	$530,000	$530,000

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

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: System monitoring of avian covered species

Conservation Measures: MRM1 (BEVI, ELOW, GIFL, GIWO, SUTA, VEFL, 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 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 Work Tasks C24 (closed), C36 (closed), and C52 (closed) will be used to help define habitat requirements for riparian obligate bird species and 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 multi-species survey protocols. 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 trends 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, Gila woodpeckers and summer tanagers were present within the study area in lesser numbers, and gilded flickers and vermilion flycatchers were rarely detected. Gilded flickers were only detected breeding along the Bill Williams River east of Planet Ranch. 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. Reconnaissance surveys for gilded flickers were conducted in FY18 along the Bill Williams River near Planet Ranch to identify future gilded flicker survey locations.

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. An evaluation of the multi-species survey protocol and monitoring plan was initiated in FY16 to update the monitoring questions, update the vegetation layer used to define survey plots, and to ensure that the size, number of plots, and number of visits are sufficient to address the monitoring questions.

FY19 Accomplishments: Gilded flicker surveys using methods developed under Work Task C52 (closed) were conducted within 10 kilometers of LCR MSCP conservation areas at the Bill Williams National Wildlife Refuge, Parker Dam Camp, and along Laguna Dam Road between the Yuma Proving Grounds and the Mittry Lake Wildlife Area just east of the Laguna Division Conservation Area. Surveys occurred from January to early March. Suitable habitat was found in all these locations; however, no gilded flickers were detected. Gilded flicker observations by biologists from other agencies were made at the north side of Lincoln Ranch on June 25, at Palo Verde Ecological Reserve on June 12 and July 28, and at Mittry Lake on February 5.

The multi-species survey protocol and monitoring evaluation continued. The monitoring goals and objectives were finalized, and the vegetation map was prepared using remote sensing tools. Potential analysis and survey methods continued to be analyzed for suitability and cost efficiency. A power analysis of

multiple survey methods was conducted. This evaluation will ensure that monitoring methods and statistical analyses are meeting the LCR MSCP long-term objectives.

Data and record management activities were conducted. The mobile electronic field forms and associated web application for the multi-species survey were refined so that all data were collected and summarized in ArcGIS Online.

Obligations were less than anticipated, as the monitoring protocol evaluation was funded through Work Task G4.

FY20 Activities: System-wide surveys for gilded flickers will continue to be conducted in high potential habitat within 10 kilometers of the Cibola National Wildlife Refuge Unit #1 Conservation Area, the Laguna Division Conservation Area, Parker Dam Camp, and Planet Ranch to identify if there are populations nearby that may colonize created habitat at LCR MSCP conservation areas.

System-wide monitoring to detect the presence and trends of Arizona Bell's vireos, Gila woodpeckers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers will be conducted. Data and record management activities will continue.

The multi-species survey protocol and monitoring evaluation will continue. The vegetation map and associated remote sensing tools will be refined. A decision on the suite of analysis and survey methods that may be used for multi-species monitoring will be made.

Proposed FY21 Activities: System-wide monitoring to detect the presence and trends of Arizona Bell's vireos, Gila woodpeckers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers will be conducted. Data and records management activities will continue. A long-term monitoring plan will be prepared as well as updated survey protocols and training materials.

A report documenting gilded flicker populations and high potential habitat within 10 kilometers of LCR MSCP conservation areas will be finalized. It will include recommendations for future gilded flicker monitoring activities.

Pertinent Reports: Reports will be posted on the LCR MSCP website upon completion.

Work Task D7: Yellow-billed Cuckoo System-Wide Monitoring

FY19 Estimates	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	F22 Proposed Estimate	FY23 Proposed Estimate
$50,000	$54,267.18	$7,039,053.52	$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 monitoring of yellow-billed cuckoos

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 monitoring of 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 was 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 F10.

Project Description: Yellow-billed cuckoos use cottonwood-willow habitat and may act as an umbrella species for other covered avian species that use these habitats. A standardized survey protocol (issued by the U.S. Fish and Wildlife Service on April 22, 2015) is used to monitor yellow-billed cuckoos in 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 2014–18), 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.

Monitoring of yellow-billed cuckoos affixed with geolocator devices confirmed the migration route and wintering grounds of cuckoos nesting on the LCR. These birds traveled south in fall, along the west coast of mainland Mexico to wintering grounds in the Gran Chaco Forest of southeastern Bolivia and northern Argentina. In spring, they took a more easterly route back through mainland Mexico to the Palo Verde Ecological Reserve. To date, there are seven cuckoos that have not been recaptured in order to remove the geolocator devices; searches for these birds will continue to be part of system-wide monitoring for the next few years.

FY19 Accomplishments: Followup surveys were conducted to search for cuckoos banded and tagged with geolocator devices. Eight cuckoos banded in previous years were positively resighted in 2019, but none of the seven cuckoos with geolocator devices were resighted. Of note was a sixth-year female originally banded as a chick from Phase 6 of the Palo Verde Ecological Reserve that was resighted at the Crane Roost North site. It was the first resight of this bird since it was banded.

The quality of system-wide habitat and occupancy potential was reviewed to assess the benefit of conducting system-wide surveys from FY20 to FY29. Cottonwood-willow habitat quality along the Bill Williams River has not fully recovered from impacts due to drought, although cuckoos have returned to the area (see Work Task F10). Yellow-billed cuckoos continue to utilize created habitat at the LCR MSCP conservation areas and will occupy new habitat within 1–3 years after planting. The LCR MSCP decided to focus monitoring efforts on documenting cuckoo presence at conservation areas under Work Task F10.

Proposed FY20 Activities: Yellow-billed cuckoo (D7) presence surveys will be conducted on the Bill Williams River. Followup surveys at conservation areas to search for cuckoos with geolocator devices will continue. System-wide habitat is checked annually to see if habitat conditions improve and whether conducting

yellow-billed cuckoo surveys at those areas could benefit the LCR MSCP. A sampling design or rotating schedule will be considered in the future to reduce annual costs.

Proposed FY21 Activities: Yellow-billed cuckoo (D7) presence surveys will be conducted on the Bill Williams River. System-wide cottonwood-willow habitat will be checked to see if conditions improve and whether conducting yellow-billed cuckoo surveys at those areas could benefit the LCR MSCP.

Pertinent Reports: The *Yellow-billed Cuckoo Surveys on the Lower Colorado River and Tributaries, 2014–2018 Summary Report* is posted on the LCR MSCP website. The *Yellow-billed Cuckoo Surveys on the Lower Colorado River, 2019 Annual Report* will also be posted upon completion.

Work Task D8: Razorback Sucker and Bonytail Stock Assessment

FY19 Estimate	F19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$1,125,000	$1,292,410.96	$9,594,742.03	$1,125,000	$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), C64, 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 under this work task.

Work routinely includes remote passive integrated transponder (PIT) scanning, trammel netting, and electrofishing, but visual surveys and surveys using

specialized equipment and techniques (e.g., scuba divers, underwater photography, and video recordings) are also conducted periodically. 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; transferring data into record archives; and organizing data into cohesive reports is also provided under this work task.

Previous Activities: Fall fish surveys on Lake Mead have been conducted since 1999 in cooperation with the Arizona Game and Fish Department and Nevada Department of Wildlife. 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.

FY19 Accomplishments: Accomplishments for this work task have been summarized by river reach.

Reach 1: Wild-born razorback sucker larvae were collected at all major spawning sites (Las Vegas Bay, Echo Bay, and the Muddy River/Virgin River inflow). A total of 304 larvae were captured, with 156 larvae from Las Vegas Bay, 127 larvae from Echo Bay, and 21 larvae from the Muddy River/Virgin River inflow area. The majority of larvae were returned to the lake following each sampling period.

The Lake Mead adult razorback sucker population was monitored throughout the year. Nineteen sonic-tagged fish were contacted 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, and lake-wide and seasonal movement patterns within and among spawning areas. Trammel netting conducted during the spawning season resulted in the capture of 46 razorback suckers: 3 from Las Vegas Bay, 9 from Echo Bay, 22 from the Muddy River/Virgin River inflow, and 12 from the Colorado River inflow area. Of the 46 razorback suckers captured, 15 were recaptured fish. The remaining razorback suckers captured were untagged, presumed to be wild-spawned, and included three juvenile fish. Based on capture data, the razorback sucker population in Lake Mead was estimated at 248 individuals (95% confidence interval [CI] from 160 to 385). Aging information was also obtained from 37 razorback suckers during the study year, bringing the total number of razorback suckers aged lake-wide to 633. The ages of wild razorback suckers captured from all monitoring areas in 2019 ranged from 3 to 10 years old.

Reach 2: A total of 6,185 razorback suckers were repatriated into Lake Mohave. A total of 513 bonytail were also released into 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 November and March. During these efforts, 225 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 October and December and again in July through September. A total of 82 razorback suckers were captured.

Remote PIT scanning recorded 96,575 contacts throughout Lake Mohave. In the river section of the lake above the Willow Beach National Fish Hatchery, 9,480 hours of scan time resulted in 23,330 total contacts representing 2,237 unique PIT tags. In the basin section of Lake Mohave, an effort of 18,814 hours of scan time resulted in 72,943 contacts representing 2,462 unique PIT tags. Supplemental scanning was also conducted in the Liberty Cove to Chalk Cliffs section of the lake, with 8,964 hours of scan time resulting in 302 total contacts representing 101 unique PIT tags. Duplicate PIT tags contacted in multiple lake sections were removed from analyses, resulting in 4,408 unique fish being contacted in 37,258 hours of scan time. This is a 13% increase over the 3,835 unique PIT tags contacted in 37,903 hours of scan time in FY18.

The razorback sucker population in Lake Mohave was estimated from two data sources: (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 capture data, the repatriate population estimate for the basin section of Lake Mohave was 994 (95% CI from 602 to 1,639). Based on 2018–19 remote PIT scanning, the lake-wide Lake Mohave repatriate population was estimated at 3,649 individuals (95% CI from 3,552 to 3,745). Subpopulation estimates using zone-specific scanning were also calculated and estimated the basin (River Miles 13–29) population at 1,963 (95% CI from 1,904 to 2,021) and the river (River Mile 43–63) population at 2,120 (95% CI from 2,012 to 2,227).

Reach 3: A total of 6,060 razorback suckers and 1,026 bonytail were released into Reach 3; all fishes were released with a PIT tag.

Capture/contact data were acquired through Work Tasks C64, F5, ongoing multi-agency native fish roundups, and from other annual surveys conducted by LCR MSCP partners. Fall and spring netting surveys were conducted throughout Topock Gorge and upper Lake Havasu.

All survey methods resulted in either capture or contact of 5,552 unique razorback suckers, 51 bonytail, and 25 flannelmouth suckers. Reach 3 had a razorback sucker population estimate of 4,791 (95% CI from 4,328 to 5,254). Bonytail contacts remain rare in this reach and typically only occur for the first several months post-release.

Reaches 4 and 5: A total of 13,090 razorback suckers and 7,010 bonytail were stocked into Reaches 4 and 5; all fishes were released with a PIT tag.

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

In FY19, 1,861 unique razorback suckers and 347 unique bonytail were contacted. Electrofishing was conducted from the I-10 bridge to the wash fans downstream of the C-10 backwater, resulting in the detection of a potential spawning aggregation in the river near the C-7 backwater. Monitoring at this location resulted in the contact of 307 razorback suckers and 3 bonytail. Data from FY18 and FY19 were used to generate a razorback sucker population estimate of 147 individuals (95% CI from 123 to 171). Due to the limited number of bonytail recontacts, no population estimate could be generated.

FY20 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 FY21 Activities: Monitoring efforts will continue in all river reaches as previously outlined. As research-based work tasks are completed in Reaches 1–5, gaps in native fish community sampling data are expected. Efforts under this work task 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.

Pertinent Reports: The *Razorback Sucker Studies on Lake Mead, Nevada and Arizona 2018–2019 Final Annual Report* and the *Demographics and Monitoring of Repatriated Razorback Sucker in Lake Mohave 2015–2019 Final Project Report* will be posted on the LCR MSCP website following review.

Work Task D9: System Monitoring of Covered Bat Species

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$100,000	$96,950.99	$2,526,012.61	$100,000	$100,000	$100,000	$100,000

Contact: Jenny Smith, (702) 293-8518, jenealsmith@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 LCR from FY02 to FY19. 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 river.

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 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. California leaf-nosed bat males observed during the study flew at least 10.3 miles between roost and foraging areas, while females flew 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.

FY19 Accomplishments: Eight 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, the 'Ahakhav Tribal Preserve, the Cibola National Wildlife Refuge-Island Unit, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, Yuma East Wetlands, and Hunters Hole. Stations where each bat species were detected are listed in table 1.

Table 1.—System-Wide Acoustic Bat Monitoring Conducted in FY19

System-wide Stations	Western Red Bat	Western Yellow Bat	California Leaf-nosed Bat	Pale Townsend's Big-eared Bat
Havasu National Wildlife Refuge-Pintail Slough	X	-	-	-
Bill Williams River National Wildlife Refuge	X	-	X	X
'Ahakhav Tribal Preserve	X	-	-	-
Cibola National Wildlife Refuge-Island Unit	X	-	X	-
Picacho State Recreation Area	X	-	X	-
Mittry Lake Wildlife Area	X	X	X	-
Yuma East Wetlands	X	X	X	-
Hunters Hole	-	X	X	-

X = detected; - = not detected.

FY20 Activities: Eight permanent acoustic monitoring stations will be operated along the LCR. Data will be collected and analyzed for covered and evaluation species presence during the summer peak activity periods.

Proposed FY21 Activities: Eight 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 *2018 System-Wide Acoustic Monitoring of LCR MSCP Bat Species* is posted on the LCR MSCP website. The 2019 report will also be posted upon completion.

Work Task D10: System Monitoring of Rodent Populations

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY20 Proposed Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate
$40,000	$25,446.36	$345,749.33	$0	$0	$0	$0

Contact: Jeff Hill, (702) 293-8163, jhill@usbr.gov

Start Date: FY11

Expected Duration: FY19

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: CRCR1, MRM1 (DPMO), MRM2 (CRCR, DPMO, and YHCR), 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. Surveys may be conducted in the extreme edges of each species' range 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 FY18 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.

FY19 Accomplishments: System-wide surveys were conducted for Yuma hispid cotton rats to determine if the species utilizes marsh habitat, similar to Colorado River cotton rats. Traps were set in marsh habitat within Yuma East Wetlands to see if they use marsh habitat like the Colorado River cotton rat. No Yuma hispid cotton rats were detected. Future monitoring at Yuma East Wetlands and the Laguna Division Conservation Area (F3) may shed light on Yuma hispid cotton rat use of marsh habitat.

FY19 obligations were less than estimated as only the marsh at Yuma East Wetlands was sampled.

FY20 Activities: This work task closed in FY19.

Proposed FY21 Activities: This work task closed in FY19.

Pertinent Reports: The report titled *Post-Development and System-Wide Monitoring of Rodent Populations, Fiscal Year 2018* is posted on the LCR MSCP website. The FY19 annual report will also be posted upon completion.

Work Task D14: System-Wide Monitoring of MacNeill's Sootywing Skippers

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$20,000	$14,109.52	$14,109.52	$20,000	$20,000	$0	$0

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

Start Date: FY19

Expected Duration: FY21

Long-Term Goal: System-wide monitoring of MacNeill's sootywing skippers (sootywings)

Conservation Measures: MNSW1

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 the presence of sootywing, vegetation, and plant quality in cottonwood-willow habitat along the lower Colorado River to inform management of creditable habitat

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: Sootywings can be found in many land cover types along the lower Colorado River if quailbush are present. Under this work task, the LCR MSCP will monitor for presence and habitat use of sootywings to document their presence in association with varying irrigation amounts in order to identify the range of irrigation that maintains quailbush occupied by this species.

Previous Activities: This is a new start in FY19.

FY19 Accomplishments: Cottonwood-willow land cover at the Palo Verde Ecological Reserve and the Cibola Valley Conservation Area containing quailbush shrubs were surveyed for the presence of sootywings during April.

They were detected in Phases 4 and 5 at the Palo Verde Ecological Reserve in dense stands of quailbush and Phases 3 and 9 at the Cibola Valley Conservation Area in quailbush that is dispersed throughout much of the phases.

FY20 Activities: Riparian areas with a quailbush component will be surveyed for the presence of sootywings during March, April, May, and June. If sootywings are detected before the June survey, surveys in the remaining months will not be conducted.

Proposed FY21 Activities: The association of sootywing presence and land cover will be analyzed to inform habitat management guidelines.

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

Work Task D15: Genetic Monitoring and Management of Native Fish Populations

FY19 Estimate	FY19 Actual Obligations	Cumulative Accomplishment Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$0	$0	$0	$600,000	$600,000	$400,000	$400,000

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

Start Date: FY20

Expected Duration: FY55

Long-Term Goal: Maintain the genetic quality of razorback suckers used by the LCR MSCP for fish augmentation and guide genetic management of native fish populations in backwater habitats developed by the LCR MSCP

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

Location: Reaches 1–6 of the LCR MSCP planning area

Purpose: To monitor the genetic composition and implement a long-term genetic management program for native fishes

Connections with Other Work Tasks (Past and Future): This work task is related to Fish Augmentation (Section B), previously completed genetic research under Work Tasks C31 (closed), C40 (closed), and G3, and ongoing research and monitoring work that includes the collection of larval fish and tissue samples from adult native fishes (Work Tasks C64, D8, and F5).

Project Description: The genetic structure of native fish communities in hatcheries, reservoirs, river reaches, and off-channel habitats will be monitored, and the various stocks will be characterized, compared to source or founder populations, and managed through augmentation. The annual production and stocking of large numbers of native fishes under the LCR MSCP Fish Augmentation Program has the potential to change the genetic diversity of resident populations in a short period of time, so it will be necessary to monitor the genetic structure of the various native fish communities over many years in order to detect changes in genetic diversity and guide genetic management as these populations mature.

Under this work task, the use of new genotyping methods will be expanded, a central repository for tissue samples will be established and maintained, and a widely accessible genetic database will be developed. Larval fish and tissue samples from adults will be collected and preserved from each stock during numerous annual surveys and Lake Mohave larvae collections. These samples will be delivered to a genetics research laboratory for analyses using newly developed genetic markers – single nucleotide polymorphisms (SNPs; "snips"). The development of SNPs as genetic markers for native fishes began in FY17 (Work Task G3), and initial analyses were completed the following year under Work Task C40 (closed). This genotyping method provides considerably more power over the use of microsatellites in estimating genetic similarity and evaluating demographic aspects of populations. The results of genetic analyses will be used to determine the genetic health of native fish 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 populations developing in newly constructed floodplain habitats within the LCR MSCP planning area. Information gleaned from these analyses will be used to model population structures within isolated habitats over subsequent generations and to predict at what frequency genetic material will need to be exchanged between isolated populations to maintain the overall genetic diversity within the LCR MSCP planning area.

Previous Activities: This is a new start in FY20.

FY19 Accomplishments: This is a new start in FY20.

FY20 Activities: The genetic structure of native fish communities in the lower Colorado River is being monitored, including main-channel and isolated backwater populations. The development of SNP markers is scheduled to be completed for razorback suckers and initiated for bonytail. These new markers will be used to genotype historic and new tissue samples collected from individual fish, and genetic variation will be assessed for existing native fish populations. Methods for long-term archiving of tissue samples will be established, and development of an accompanying database will be initiated for all samples and associated genetic information.

Proposed FY21 Activities: The genetic structure of native fish communities will continue to be monitored.

Pertinent Reports: N/A

WORK TASKS – SECTION E

Conservation Area Development and Management

Work Task E1: Beal Lake Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$900,000	$1,314,564.68	$5,942,122.03	$900,000	$500,000	$450,000	$450,000

Contact: Laken Anderson, (702) 293-8153, landerson@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): This work task and Work Task E2 (closed) have been combined into a single work task: Work Task E1: Beal Lake Conservation Area. Vegetation and species monitoring are being addressed under Section F work tasks. Portions of restoration research at the Beal Lake Conservation Area (BLCA) have been funded under Work Task G3.

Project Description: The BLCA was established on lands made available by the U.S. Fish and Wildlife Service on the Havasu National Wildlife Refuge. The 225-acre disconnected backwater is managed for native fishes, and the adjacent 120 acres of cottonwood-willow habitat areas are managed for LCR MSCP covered species. In December 2010, a Land Use Agreement was signed by the U.S. Fish and Wildlife Service and the Bureau of Reclamation to manage 433 acres as the BLCA. The conservation area included the 225-acre backwater and the 120 acres of cottonwood willow habitat planted by the LCR MSCP. In February 2018, the Land Use Agreement was modified to expand the conservation area to 1,000 acres. The intent is to create an additional

300–400 acres of the cottonwood-willow land cover, which includes a mosaic of honey mesquite, and mash that would be managed along with the existing backwater and established cottonwood-willow.

Annual Maintenance and Management:

Cottonwood-Willow: 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 valves. The northern end of the cottonwood-willow habitat receives surface water from Topock Marsh through a gravity flow connection but can also be managed with the diesel-powered pump. The surface water provides moist soils and helps manage salinity. 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.

Previous Activities: Beal Lake was a 225-acre 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. Adjacent riparian habitat was restored as a habitat demonstration area in 2001 and resulted in 120 acres of the cottonwood-willow land 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 120 acres of cottonwood-willow habitat, including a mosaic of cottonwood-willow, honey mesquite, and marsh. In 2017, the downstream wedge-wire screen was replaced with a small mammal screen during the annual removal and cleaning process. This new maintenance strategy has resulted in a 1-foot increase in water surface elevation of Beal Lake.

Cottonwood-Willow: 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 has been monitored monthly, and no golden algae have been detected since May 2013.

FY19 Accomplishments:

Maintenance and Management: Routine maintenance and management of the cottonwood-willow and Beal Lake were completed.

Cottonwood-Willow: A total of 1,186 acre-feet of water was delivered to the BLCA (120 acres) and included an annual flush for salinity control in January.

Beal Lake: A drawdown of Beal Lake was conducted in January 2019 using the existing pump stand, which eliminated the need to bring in a large portable pump, reducing obligations for this task. 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.

Restoration:

Cottonwood-Willow: National Environmental Policy Act compliance, a Cultural Class III Pedestrian Survey, and a preliminary wetlands delineation were conducted on the 400-acre expansion area. Transects were cleared by a high-track D-6 bull dozer to allow access for soil sampling of 14 test pits and installation of groundwater monitoring wells within the expansion area.

The habitat creation concept includes establishing approximately 300–400 acres of additional cottonwood-willow land cover, which includes a mosaic of honey mesquite, and marsh to be managed for LCR MSCP covered species. This includes areas that can be flood irrigated as well as areas that would take advantage of the high-water table. Honey mesquite, in addition to

cottonwood-willow areas planted in low densities, will only be irrigated until their roots can reach the water table. Cottonwood-willow areas planted in high density will be flood irrigated to create moist soil conditions.

Beal Lake: Dredging of Beal Lake began in April 2019 in order to increase the backwater depth to 12 feet. To facilitate access to the lake, a launch site and staging area were constructed in April 2019, and the inlet canal was widened by 50 feet using land-based equipment. All material was placed within the designated dredge spoil area adjacent to Beal Lake.

The sandy material encountered created a sloughing effect that impacted the target depth for the dredge launch site. Upon delivery of the dredge, the launch area, which was designed to be 8 feet deep, had filled in to 4 feet, making it impossible to launch the dredge in such shallow water. The launch area measuring 100 by 100 feet required additional shift work to deepen the area, resulting in added costs to the project and obligations being more than planned. Dredging of Beal Lake began in May. Portions of the backwater were dredged by side casting the material 150-feet to the spoil site. Once the side casting was completed, the dredge pipe was attached in 500-foot sections to continue deepening the backwater. Excluding material removed with land-based equipment, approximately 92,200 cubic yards were dredged from Beal Lake in FY19.

Monitoring:

Cottonwood-Willow: Vegetation data were collected using lidar technology. Monitoring stations as part of the salinity and soil moisture monitoring network were operated 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.

Riparian bird surveys were conducted from mid-April to mid-June 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. Six Arizona Bell's vireos, six Sonoran yellow warblers, and two summer tanagers were captured and color banded. In addition, one summer tanager that was banded in 2011 was recaptured. Southwestern willow flycatcher surveys were conducted from mid-May to mid-July, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted from mid-June to mid-August. Yellow-billed cuckoos were detected, and there was one possible breeding territory at the site.

A long-term acoustic bat station was used to detect the presence of LCR MSCP bat species from June to August. The results will be reported when the analysis is completed.

Rodent trapping was conducted in fall. No Colorado River cotton rats or desert pocket mice were captured.

Beal Lake: Water quality and native fish monitoring were not conducted in FY19 and have been postponed until dredging activities are completed.

Marsh bird surveys were conducted on three occasions in March and April. Western least bitterns and Yuma clapper rails were detected and are presumed to be breeding at the site.

FY20 Activities: Routine maintenance and management of the cottonwood-willow and Beal Lake is ongoing.

Maintenance and Management:

Cottonwood-Willow: Riparian fields will be irrigated from March through September and in January to manage salinity.

Beal Lake: The annual removal, cleaning, and replacement of the wedge-wire screens along the rock structure was conducted in Beal Lake's unlined ditch in December 2019.

Restoration:

Cottonwood-Willow: Development of a conceptual design for restoration of the expansion area in coordination with the U.S. Fish and Wildlife Service is anticipated.

Beal Lake: Renovations of Beal Lake will continue in order to increase the lake depth to 12 feet in over 40 acres of habitat. Dredging is anticipated to be completed by September 2020. An additional 125,000 cubic yards of dredging was added to the original Beal Lake dredge plan in the fall of 2019 to include two northern fingers in the lake that are an ideal location for a pump platform to irrigate the future expansion area. Dredging of the two fingers is expected to result in an increase in obligations for FY20.

Monitoring:

Cottonwood-Willow: Vegetation data will be collected using lidar technology. Monitoring stations as part of the salinity and soil moisture monitoring network in the expansion area will continue to be operated to collect baseline data. Data from the existing monitoring stations 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. Riparian 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. Avian mist netting will be conducted from early May to early August. Bat acoustic monitoring will be conducted during summer. Rodent monitoring will be conducted in fall and/or spring.

Beal Lake: Water quality and native fish monitoring have been postponed until dredging activities are completed.

Proposed FY21 Activities:

Maintenance and Management: Routine maintenance and management of the cottonwood-willow and Beal Lake is planned.

Cottonwood-Willow: Riparian fields will be irrigated from March through September and in January to manage salinity.

Beal Lake: Maintenance, cleaning, and rotation of the wedge-wire screens within the unlined ditch are anticipated.

Restoration:

Cottonwood-Willow: Design, permitting, and compliance activities are expected to be completed in FY21. Control of saltcedar in the recently burned portions of the expansion area may occur to reduce sprouting. Fire breaks and total clearing of the expansion area is not scheduled until FY24.

Beal Lake: Dredging is anticipated to be completed in FY20. Management of the lake through the water control structures will continue. Design and installation of the pump platform for the expansion area is anticipated to occur in Beal Lake.

Monitoring:

Cottonwood-Willow: Vegetation data will be collected using lidar technology. The data collected from the 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. Riparian 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. Avian mist netting will be conducted from early May to early August. Bat acoustic monitoring will be conducted during summer. Rodent monitoring will be conducted in fall and/or spring.
Beal Lake: Water quality monitoring will resume.

Pertinent Reports: The *Beal Lake Conservation Area, 2018 and 2019 Annual Reports* will be posted on the LCR MSCP website upon completion.

Work Task E4: Palo Verde Ecological Reserve

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$500,000	$671,772.91	$11,348,421.66	$650,000	$850,000	$850,000	$850,000

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. This work task will be combined with Work Task E37 starting in FY21 as a result of the inclusion of the Palo Verde Ecological Reserve (PVER)-South property in the PVER Agreement.

Project Description: The 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 long) is adjacent to the Colorado River, and the western boundary is adjacent to active agricultural fields. The PVER has an extensive infrastructure consisting of miles of lined irrigation ditches, roads, and pumps. 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 cottonwood-willow and 78 acres of honey mesquite, which are both managed for LCR MSCP covered species in Phases 1–8.

In November 2019, an amendment was signed to incorporate PVER-South (Work Task E37) into the PVER. PVER-South is approximately 340 acres in size and consists of a mix of active agricultural fields, undeveloped ground, and portions of an old river meander. The agricultural fields are scheduled to be converted to honey mesquite starting in FY20 and will be tracked under the PVER (E4) as Phases 9 and 10.

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 fields 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. The PVID provides water order data monthly to the LCR MSCP; using these data has increased the accuracy of water usage within the conservation area. Irrigation does not occur from November through January, unless irrigation is needed for salinity management, because the trees are dormant.

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. The exception is the honey mesquite habitat in the northern portion of the property where volunteer cottonwoods have become established.

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. Restoration Development and Monitoring Plans were approved by the California Department of Fish and Wildlife. 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.

FY19 Accomplishments:

Maintenance and Management: Annual management and maintenance were conducted through the year. The annual costs associated with operating the PVER, such as contract farming, delivery of water, water taxes, water tolls, electrical power utility bills, and assessments for district operation, have increased over the last few years. The obligations in FY19 reflect these rising costs.

Volunteer cottonwoods have become established in the northern portion of the PVER, which was planted with honey mesquite in FY15. A research study has been developed to monitor and evaluate the effects of a gradual reduction and cessation of applied water on the health and productivity of these volunteer cottonwoods.

Monitoring: Vegetation data were collected using lidar technology. Data collected from the salinity and soil moisture monitoring network were assessed to evaluate whether adequate soil moisture is being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions were adequate for sustained vegetation health.

Riparian bird surveys were conducted at the PVER between mid-April and mid-June using the LCR MSCP double sampling protocol. Arizona Bell's vireos and summer tanagers were detected breeding at the site. Southwestern willow flycatcher surveys were conducted between mid-May and mid-July, and no resident or breeding individuals were detected. One female gilded flicker was incidentally observed at the PVER on both June 12 and July 28, 2019, during southwestern willow flycatcher surveys. Yellow-billed cuckoo surveys were conducted between mid-June to mid-August. Yellow-billed cuckoos were detected in all cottonwood-willow phases, and nesting was confirmed in the southwestern and eastern portions of the conservation area.

Two long-term acoustic bat stations were used to detect the presence of LCR MSCP bat species from June to August. The results will be reported when the analysis is completed.

Rodent trapping was conducted in fall. One Colorado River cotton rat was captured in Phase 8.

Surveys were conducted in spring for MacNeill's sootywing skippers, and eggs and adults were present.

FY20 Activities:

Maintenance and Management: Irrigation and management activities will continue as in previous years until data become available that indicate adjustments are needed. The exception is the northern portion of the PVER where volunteer cottonwoods have become established within the planted honey mesquites. A reduced watering schedule will be implemented, and the response of the cottonwoods will be monitored.

Monitoring: Vegetation data will be collected using lidar technology. Data from the existing monitoring stations 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. Rodent monitoring will be conducted in fall and/or spring. Surveys will also be conducted for MacNeill's sootywing skippers.

Proposed FY21 Activities:

Restoration activities for PVER-South will be tracked under Work Task E4 starting this fiscal year. PVER-South will be developed as PVER Phases 9 and 10. The annual costs will increase because of the addition of 338 acres. Planting of Phase 9, 101 acres of honey mesquite, was completed in FY20 under Work Task E37.

Planting of 145 acres of honey mesquite in Phase 10 in accordance with the approved development plan is planned.

Maintenance and Management: Irrigation and management of the PVER will continue as in previous years until data become available that indicate adjustments are needed.

Monitoring: Vegetation data will be collected using lidar technology. The data collected from the 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. Rodent monitoring will be conducted in fall and/or spring. Surveys may also be conducted for MacNeill's sootywing skippers.

Pertinent Reports: The *Palo Verde Ecological Reserve 2018 and 2019 Annual Reports* will be posted on the LCR MSCP website upon completion.

Work Task E5: Cibola Valley Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$850,000	$582,260.92	$13,692,484.08	$600,000	$350,000	$350,000	$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 (AZGFD) acquired the CVCA in September 2007 through a multi-organizational agreement involving the AZGFD, the Bureau of Reclamation, the Mohave County Water Authority, The Conservation Fund, and the Hopi Tribe. Through these agreements, the AZGFD 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 vegetation 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.

Cottonwood-Willow: Fields are divided into smaller areas to 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 to continue throughout the 50-year term of the LCR MSCP.

Honey Mesquite: For honey mesquite, water is 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 FY18, 1,140 acres of cottonwood-willow and honey mesquite have been established and are being managed for LCR MSCP covered species.

FY19 Accomplishments:

Maintenance and Management: Management, maintenance, irrigation, and monitoring of the established habitat continued. Established cottonwood-willow habitat (Phases 1, 2, 3, 8, and 9) continued to be irrigated. Phases 10 and 11 were irrigated using furrows in the honey mesquite planting. Invasive species control was completed in Phases 4, 7, 8, 9, and 11.

Restoration: Phase 10, consisting of 125 acres, was planted with honey mesquite in April 2019. Phase 10 is the last area to be developed within the conservation area. Obligations were less than budgeted because Phase 10 required less ground preparation and invasive plant control than the previous two phases.

Monitoring: Vegetation data were collected using lidar technology. Data collected from the salinity and soil moisture monitoring network were assessed to

evaluate 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.

Riparian bird surveys were conducted at the CVCA between mid-April and mid-June using the LCR MSCP double sampling protocol. Gila woodpeckers, summer tanagers, and Sonoran yellow warblers were found breeding at the site. Southwestern willow flycatcher surveys were conducted between mid-May and mid-July, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted between mid-June and mid-August. Cuckoos were present throughout the site and confirmed breeding within cottonwood, willow, and mesquite planted in 2015 and 2016.

Two long-term acoustic bat stations were used to detect the presence of LCR MSCP bat species from June to August 2019. The results will be reported when the analysis is completed.

Phase 1 of CVCA was surveyed for rodents in fall, and six Colorado River cotton rats were detected.

Surveys in spring for MacNeill's sootywing skippers (sootywings) were conducted in Phases 3, 5, and 9, with sootywing present in Phases 3 and 9 and not detected in Phase 5.

FY20 Activities:

Maintenance and 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 9 will no longer receive water. Phases 10 and 11 will be watered regularly for 2 years following planting.

Restoration: No additional planting or site development is anticipated on the conservation area. Since the conservation area plantings are completed, it is anticipated that obligations will be reduced in FY20. Invasive species control will be done on an as-needed basis in spring and fall, primarily focusing on Phases 8 and 9.

Monitoring: Vegetation data will be collected using lidar technology. Data from the existing monitoring stations 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. Rodent monitoring will be conducted in fall and/or spring. Surveys will also be conducted for sootywings.

Proposed FY21 Activities:

Maintenance and Management: Regular management, maintenance, irrigation, and monitoring will continue. No additional planting is anticipated at the CVCA. Budget estimates decreased to reflect the actual cost of managing the conservation area, as final planned planting was completed in FY19.

Monitoring: Vegetation data will be collected using lidar technology. The data collected from the 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. Rodent monitoring will be conducted in fall and/or spring. Surveys may also be conducted for sootywings.

Pertinent Reports: The *Cibola Valley Conservation Area, 2018 and 2019 Annual Reports* will be posted on the LCR MSCP website upon completion.

Work Task E9: Hart Mine Marsh

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$250,000	$181,129.19	$7,621,151.63	$250,000	$1,150,000	$150,000	$150,000

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 Colorado River cotton rats, California black rails, western least bitterns, and Yuma clapper rails

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 habitat for LCR MSCP covered species. This was accomplished by installing 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: Historically, the only source of water for Hart Mine Marsh was drainage water from fields in Farm Unit #1 on the Cibola National Wildlife Refuge, which is delivered through Arnett Ditch. However, after restoration, in addition to drain water, 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, allows for stable water level management as well as the ability to manage salinity. Water deliveries are used to maintain static water levels during the 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 uses 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: Construction activities occurred in FY09–10, resulting in the creation of a 255-acre marsh that is managed for LCR MSCP covered species.

FY19 Accomplishments:

Maintenance and Management: Management, maintenance, and monitoring of the established marsh was conducted. No construction repairs or replacements were completed in FY19, and vegetation maintenance was less than previous years; this resulted in lower-than-estimated obligations.

Pump Stand Replacement: The preliminary design, including addressing sediment intake at this site, are completed. Materials necessary for the pump replacement have been acquired, allowing for installation of the pumps and construction of the pump stand to be completed in FY21 during winter, when the river stage is low.

Monitoring: Vegetation data were collected using lidar technology.

The U.S. Fish and Wildlife Service conducted marsh bird surveys at Hart Mine Marsh in March and April as part of their annual monitoring program. They provide these data to the LCR MSCP: Western least bitterns and Yuma clapper rails were detected and are presumed to be breeding at the site. California black rails were not detected.

Rodent trapping was conducted, and Colorado River cotton rats were captured for the second consecutive year.

FY20 Activities:

Maintenance and 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 lower obligations.

Monitoring: Vegetation data will be collected using lidar technology. Marsh bird surveys will be conducted March and April. Rodent monitoring will be conducted in fall and/or spring.

Proposed FY21 Activities:

Maintenance and 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 completed.

Monitoring: Vegetation data will be collected using lidar technology. Marsh bird surveys will be conducted in March and April. Rodent monitoring will be conducted in fall and/or spring.

Pertinent Reports: The *Hart Mine Marsh Conservation Area, 2018 Annual Report* is posted on the LCR MSCP website. The *Hart Mine Marsh Conservation Area, 2019 Annual Report* will also be posted upon completion.

Work Task E13: McAllister Lake

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$400,000	$7,409.61	$188,232.31	$400,000	$100,000	$400,000	$40,000

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 (1997 BO)

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 floodplain 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 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 decision was made to install a rapid drawdown pumping station 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.

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. 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.

In FY17, the LCR MSCP and the U.S. Fish and Wildlife Service (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.

For FY18, the LCR MSCP met with the USFWS (Imperial NWR and Refuge Complex Managers as well as the USFWS Arizona Ecological Services Field Office) to discuss the viability of the low flow rate pumping system to be tested in FY18. The decision was made not to continue to evaluate this option but instead to proceed with the high flow rate pumping system. The decision was based on anticipated mobilization and demobilization as well as labor costs to install and maintain both systems. The high flow rate pumping system has been shown to be effective and a lower cost alternative. High flow rate pumping was conducted in February 2018 to manage salinity. Engineering design and shop drawings for the separation of the western lobe from the main body of McAllister Lake and the installation of the pumping system were completed.

FY19 Accomplishments: Environmental compliance and permitting to allow for the separation of the western lobe from the main body of McAllister was initiated. Obligations were less than anticipated, as no drawdowns were conducted. Construction was postponed while resources were directed to higher priority projects.

FY20 Activities: Environmental compliance and permitting and installation of a permanent pumping system will be completed. Two drawdowns of the lake were completed to manage salinity in January. Obligations will be less than approved, as construction of the berm will not occur until FY22.

Proposed FY21 Activities: Procurement of the material and the pump for the annual drawdowns scheduled for January is expected. Water quality may be monitored.

Pertinent Reports: Reports will be posted on the LCR MSCP website upon completion.

Work Task E14: Imperial Ponds Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$350,000	$407,789.63	$11,583,200.74	$350,000	$500,000	$350,000	$2,000,000

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 (closed), D9, and F1–F5.

Project Description: The Imperial Ponds Conservation Area is an integrated mosaic of native land cover types, including disconnected backwaters, cottonwood-willow, and marsh. It is situated within the Martinez Lake Management Unit (previously identified as an Intensive Management Area) of the Imperial NWR, an area of focused management for sensitive wildlife species, including native fishes, marsh birds, neotropical migratory birds, and migratory waterfowl. The marsh created within Field 18 was created as Clean Water Act mitigation for dredging of the Laguna Reservoir, which is an action covered under the LCR MSCP.

Previous Activities:

Disconnected Backwaters: Six backwaters have been constructed to provide approximately 80 surface acres of habitat for razorback suckers and bonytail. Lower Colorado River water was supplied to the backwaters by a pump fitted

with a wedge-wire screen system. The screen had a slot size of 0.05 millimeter that was designed to prevent passage of fish eggs and larvae into the backwaters. An in-situ evaluation of the screen was completed under Work Task G3. The results indicated that fish eggs and larvae of multiple species were passing through the screen. In response to the results, the pump was shut off in the summer of 2009, and water was supplied to all the backwaters using a single groundwater well. A water management study was initiated in May 2011 and was completed in 2015 to evaluate the water quality in Pond 1 (where regular water management was continued) and Ponds 2–6 (without a managed water supply). The water management study determined average water surface elevations for Ponds 2–6. By operating the ponds at this elevation and tracking water quality, the amount of well water needed to maintain acceptable water quality was reduced. A second well was installed onsite to supply water to the ponds in FY14. The new well increased the available volume of water needed to manage 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. A total of approximately 773 acre-feet is delivered to the ponds each 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 was managed through irrigation of a cover crop.

Marsh: A 13-acre marsh unit was created at Field 18 in the southeast corner of the Imperial NWR. This field was cleared in the winter of 2007–08 and was converted into a common and Olney's three-square bulrush-dominated marsh managed for rail species. The irrigation cycle was based on an adjacent field, Field 16, which was created and is managed for California black rails and Yuma clapper rails. The marsh has been managed for LCR MSCP covered species since 2008, and both California black rails and Yuma clapper rails have been detected in 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 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.

FY19 Accomplishments:

Maintenance and Management: Annual maintenance and operation of the cottonwood-willow, marsh, and disconnected backwater were completed.

Cottonwood-Willow: Irrigation water was supplied from February through September to maintain a cover crop to manage salinity. Additional groundwater wells were installed around the fields to enhance the existing soil salinity and groundwater monitoring and to support decisions on future restoration of the area. The LCR MSCP and U.S. Fish and Wildlife Service (USFWS) are still evaluating the best use of the 95 acres under evaluation, which includes the 34 acres scheduled for cottonwood-willow.

Marsh: The 13-acre marsh created in Field 18 continued to be managed for marsh covered species.

Disconnected Backwater: Approximately 760 acre-feet of water was delivered to the ponds in FY19.

Restoration:

Cottonwood-Willow: Construction for the irrigation system upgrade was completed in FY19. The fields are currently being irrigated to manage salinity until restoration occurs.

Disconnected Backwaters: In an August 7, 2019, memorandum from the LCR MSCP to the USFWS, the program committed to building Pond 7 within the 34 acres. A design and quantity estimate was created for the excavation of Pond 7 within the conservation area. The 12-acre backwater would utilize the existing groundwater well delivery system and drainage swale and is the primary reason for obligations being higher than approved.

Monitoring:

Disconnected Backwaters: Monitoring consisted of surveys for larval, juvenile, and adult native fishes. Population estimates for passive integrated transponder (PIT)-tagged razorback suckers and bonytail were calculated using remote PIT scanning detections. Pond population estimates for razorback suckers ranged from 204–228 individuals in Ponds 1, 3, and 4 and from 75–110 for bonytail in Ponds 2, 5, and 6. Recruits were captured in each bonytail pond, and the majority of captured fish were untagged, which suggests that the actual populations may be larger than estimated. Larval razorback suckers and untagged juveniles were captured in Pond 1, indicating that a successful recruitment event occurred. Limited recruitment has been documented in Pond 3, with the capture of a single recruit, and no recruitment has been observed in Pond 4 to date.

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: Vegetation and marsh birds were monitored at the Imperial Ponds Conservation Area. Vegetation data were collected using lidar technology.

The USFWS conducted marsh bird surveys throughout the Imperial NWR, including Field 18 and the ponds, in March and April as part of their annual monitoring program. They provided these data to the LCR MSCP: Yuma clapper rails and California black rails were detected in Field 18 on surveys in March and April. No covered marsh bird species were detected at the ponds.

FY20 Activities:

Maintenance and Management: Onsite maintenance, utility payments, and water management for the site will continue. One of the wells supplying the ponds had reduced flow, which may indicate a well screen failure; it will be evaluated, and minor repairs completed to allow continued operation until replacement.

Marsh: The 13-acre marsh created in Field 18 will continue to be managed for marsh covered species. The water surface elevations, prior to canal construction and after construction, will be monitored to ensure the upgraded canal is working as planned.

Disconnected Backwaters: Water will be supplied to the ponds following the water management schedule. Post-development monitoring is being completed under Work Task F5.

Restoration:

Cottonwood-Willow: The fields within the 95 acres under evaluation will be irrigated to manage salinity in the soils. The remaining acreage, excluding the acreage dedicated to construction of Pond 7, is to be converted to riparian, upland, moist soil units or marsh based on the results of the longer-term salinity monitoring, which is underway.

Monitoring: Monitoring will continue in FY20 for fishes and marsh birds. Vegetation data will be collected using lidar technology.

Proposed FY21 Activities:

Maintenance and Management: Onsite maintenance, utility payments, and water management for the site will continue. The original groundwater well delivering water to the ponds is scheduled for replacement.

Marsh: The 13-acre marsh created in Field 18 will continue to be managed for marsh covered species. A survey of the existing topography within Field 18 will be conducted, and recommendations for future water management will be made. These recommendations may include ground-disturbance activities designed to improve water delivery and management.

Disconnected Backwaters: Boat ramps and riprap shorelines will be maintained. The automated watering schedule for all six ponds will continue to be used.

Permitting and compliance activities will be initiated prior to the construction of Pond 7.

Restoration:

Cottonwood-Willow: An evaluation of the 95 acres will be completed, and recommendations for future habitat creation activities will be discussed between the LCR MSCP and USFWS. These recommendations may include field contouring and vegetation mosaics but excludes the acreage committed to construction of Pond 7.

Monitoring: Monitoring will continue in FY21 for fishes and marsh birds. Vegetation data will be collected using lidar technology.

Pertinent Reports: The *Imperial Ponds Conservation Area, 2009–2011 and 2018 Annual Reports* will be posted on the LCR MSCP website upon completion.

Work Task E16: Conservation Area Site Selection

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$200,000	$690,397.37	$8,011,282.03	$150,000	$60,000	60,000	$60,000

Contact: Terry Murphy, (702) 293-8140, tmurphy@usbr.gov

Start Date: FY05

Expected Duration: FY26

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 annual work plan process or, if acquisition is required, through a land and water resolution. This approval allows Reclamation to move forward with the new site and to 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 FY18, 16 conservation areas have been established.

FY19 Accomplishments: The Dennis Underwood Conservation Area was formally established as a conservation area after the signing of an easement for conservation purposes with the Metropolitan Water District of Southern California. Reclamation and the California Department of Fish and Wildlife amended the Palo Verde Ecological Reserve Agreement to expand this conservation area to include the Palo Verde Ecological Reserve-South property.

Hydraulic Dredge Support Equipment: A telehandler, used for movement of dredge pipe and materials, was acquired from Government excess and used to support dredging operations. A D-6 high track dozer was also acquired; this obligation exceeded the approved budget but will result in lower overall operating costs at multiple conservation areas under, or planned for, construction.

Reach 3: Additional investigation, such as obtaining topographic data with lidar, soil sampling, and a wetlands delineation were completed at the proposed Section 26 Conservation Area.

Reach 4 Cadastral Surveys: The Bureau of Land Management completed record searches for an area within Reach 4 that may be suitable for either a backwater or marsh complex. The task was to identify land status within Township 9S, Range 22E, Sections 5, 7, and 8, San Bernardino Meridian within the State of California. The final report and map were delivered in FY19.

FY20 Activities: Coordination efforts with resource agencies will be reduced since lands needed for future conservation areas to meet the minimum of 8,132 acres have been identified. Work Task E41 was established to track the development of the Section 26 Conservation Area. It is anticipated that all cadastral surveys will be completed. Enough land has been identified to meet the minimum land cover required by the Habitat Conservation Plan; however, this work task will remain open at a reduced funding level to identify lands with the potential for restoration if the need arises in the future.

FY21 Proposed Activities: Coordination efforts with resource agencies will continue. Additional acreage, beyond the minimum of 8,132 acres referenced in the Habitat Conservation Plan, is expected to be restored to ensure each conservation measure has been met at the end of the program. The 8,132 acres assumes that each acre restored will meet the needs of every species that utilize the land cover type (cottonwood-willow, honey mesquite, marsh, or backwater). The additional acreage is necessary to ensure the program has fully meet the habitat requirements of every species.

Pertinent Reports: Trip reports will be posted on the LCR MSCP website upon completion.

Work Task E17: Topock Marsh Pumping

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$1,000	$0	$554,091.96	$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 gravity diversion or pumping

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

Project Description: Topock Marsh has been identified as habitat for southwestern willow flycatchers, Yuma clapper rails, and northern Mexican gartersnakes. 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) constructed a concrete-lined inlet canal (fire break canal) that diverts water by gravity to Topock Marsh. Pumps are planned to be installed to supplement water delivery at river stages too low to provide gravity diversion. The combination of gravity diversion, supplemented by pumping, is necessary to maintain marsh elevations during the marsh bird nesting season.

Previous Activities: In early 2010, $1 million was provided by the LCR MSCP for the construction of the 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 provided 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.

The Bureau of Reclamation built the original inlets and outlets to Topock Marsh and have some responsibilities for the continued operation in coordination with the USFWS. Therefore, the Yuma Area Office, which is responsible for river operation and maintenance, is providing engineering support to advance the project. The Yuma Area Office presented the findings of an engineering and hydrological analysis to the USFWS in FY18. As a result of this analysis, multiple alternatives to maintain water levels in Topock Marsh were considered. The use of gravity diversion alone will not fill the marsh in time for the marsh bird breading season (March 15). To fill the marsh before March 15 using the current marsh operating protocol, the pumping system required is not technically feasible given the high flow rate necessary and the low river stage. One of the alternatives discussed included the use of a smaller flow rate pumping system and starting each calendar year with the marsh at a higher water surface elevation. This alternative incorporates a fixed pump station to augment flows delivered by gravity through the existing concrete-lined fire break canal into Topock Marsh. Therefore, less water is required between January 1 and March 15 to achieve the desired water surface elevation. This size pumping system is feasible and appears to satisfy the needs of all parties but requires changing the operating protocol of the marsh.

FY19 Accomplishments:

The *Topock Marsh Water Control Infrastructure Improvement Alternatives Analysis* was completed. Coordination meetings were held with the Yuma Area Office, the LCR MSCP, and the USFWS Havasu National Wildlife Refuge staff at Needles, California, and USFWS regional staff at Lake Havasu City, Arizona, to present the hydrologic and hydraulic analyses. During these presentations, consensus was gained to analyze feasible alternatives for a fixed-type pump station to meet annual Topock Marsh water demands. The Yuma Area Office began a feasibility and cost analysis for installing a fixed-type pump station

adjacent to the fire break canal at Topock Marsh. Concurrently, the Yuma Area Office performed topographic and bathymetric survey and site investigations along the fire break canal to support completion of a fire break canal maintenance plan and budget.

FY20 Activities: The Topock Marsh Feasibility Report and fire break canal maintenance plan and budget will be completed. The completed feasibility report will include a detail of explored and recommended alternatives and feasibility-level cost estimates. Upon selection of a preferred alternative, a set of 30% engineering design drawings and accompanying cost estimates will be developed. A Value Engineering Study of the recommended alternative(s) for the fixed-type pump station will also be conducted. The fire break canal maintenance plan will include anticipated annual maintenance activities and associated costs up to year 2055 and estimated full replacement costs in 2050.

Proposed FY21 Activities: Engineering design, permitting, and environmental compliance for the new pumping station are scheduled to be completed.

Pertinent Reports: N/A

Work Task E18: Law Enforcement and Wildland Fire Support

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$250,000	$204,434.32	$2,314,191.57	$250,000	$250,000	$250,000	$250,000

Contact: Jeremy Brooks, (702) 293-8257, jjbrooks@usbr.gov

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: Protect created habitat

Conservation Measures: CMM1

Location: Reaches 1–7

Purpose: To provide law enforcement and wildland fire 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: Law enforcement and wildland fire support 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 wildland fire support 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.

FY19 Accomplishments: Worked with local fire and law agencies to support management activities continued in FY19. Activities included patrols, monitoring, planning, site visits, coordination meetings, and attendance at agency staff meetings.

Law enforcement conducted 339 patrols of LCR MSCP conservation areas. The LCR MSCP began initial discussions with law enforcement and wildland fire support staff on renewing the respective 5-year Interagency Agreements.

Fire suppression efforts related to LCR MSCP conservation areas included responding to a small brush fire at Yuma East Wetlands. On November 20, 2018, a small fire burned approximately 0.1 acre in the southern portion of the conservation area. Fire crews utilized the trailer-mounted centrifugal pump to combat the fire and prevent expansion. As a result, the fire caused negligible damage to the land cover at Yuma East Wetlands. Investigators determined that the fire originated from a small, unauthorized campfire located on the site.

No other fires occurred on LCR MSCP managed lands. The National Park Service's (NPS's) Exotic Plant Management Team will perform $50,000 of weed management and fuels reduction at LCR MSCP conservation areas in support of this work task.

FY20 Activities: Coordination with law and fire agencies will continue through 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. Work to renew the 5-year law and fire Interagency Agreements will be finalized in FY20.

The NPS's Exotic Plant Management Team will perform $50,000 of weed management and fuels reduction at LCR MSCP conservation areas in support of this work task.

Proposed FY21 Activities: BLM law and fire personnel will continue to perform support activities.

The NPS's Exotic Plant Management Team will perform weed management and fuels reduction work.

Pertinent Reports: N/A

Work Task E21: Planet Ranch

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$4,000,000	$4,244,489.40	$15,934,258.33	$4,000,000	$1,000,000	$750,000	$750,000

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 cottonwood-willow and disconnected backwaters 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 (the site will be called the Middle Bill Williams River National Wildlife Refuge [Middle Bill Williams River NWR]). The Middle Bill Williams River NWR encompasses 396 acres of cottonwood-willow downstream from Planet Ranch that is afforded protection by securing Planet Ranch water rights.

The conservation area includes 3,418 acres of land; however, the habitat area west of the main north/south access road (approximately 1/3 of the conservation area) and some acreage east of the main north/south access road, defined as reserved under the lease amendment, will be managed for LCR MSCP covered species.

The area east of the main north/south access road and extending upstream (approximately 2/3 of the conservation area), except for lands reserved for LCR MSCP purposes in the lease amendment, would not be managed for LCR MSCP covered species. These lands would be managed by the Arizona Game and Fish Department.

Previous Activities: Planet Ranch was approximately 8,400 acres, of which approximately 2,400 acres had previously been farmed for alfalfa. On October 22, 2008, the Steering Committee approved Motion 09-001(r), 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 United States Secretary of the Interior to enter into 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.

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. The FMC retained ownership of lands on Planet Ranch that were not acquired by the Arizona Game and Fish Commission.

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.

To ensure the viability of water rights associated with the property, approximately 1,000 acres of alfalfa was grown as pasture from December 15, 2015, through December 15, 2017.

FY19 Accomplishments: The engineering design for site development was completed, and a Value Engineering Study was conducted. The study concurred with the design and provided a potential option to minimize seepage from the ponds, and offered recommendations for costs savings related to the movement of fill material.

Improvements were made to the two residences and furnishings added to prepare for the arrival of the construction crews.

Construction began in April 2019. Work included mobilization of heavy equipment; clearing of vegetation from the footprint of the ponds; the

procurement, transportation, delivery and installation of 4,000 linear feet of sheet pile for bank stabilization; the drilling of a new domestic well; the drilling of two pilot holes to inform the screen material for the production wells for the ponds; and the excavation of approximately 300,000 cubic yards of material.

Initial development plans had the construction crew departing in July 2019 and returning in November 2019. To expedite the project, a small contingent remained to continue pond excavation until the full crew was available to report back in November. This modification to the construction schedule will help ensure construction completion by the summer of 2020.

Based on the infiltration rate determined by in-situ sampling and analysis, construction of a test pond was determined to be unnecessary and, therefore, was eliminated from the scope of the project.

Obligations exceeded the approved estimate due to expediting the schedule and keeping a portion of the construction crew onsite from July through November, which will allow for the project to be completed by June 2020.

Monitoring: Planet Ranch has two distinct areas where monitoring occurred in FY19. Monitoring focused on vegetation composition and avian use in both Planet Ranch and the Middle Bill Williams River NWR.

Planet Ranch: Vegetation data were collected using lidar technology. Southwestern willow flycatcher surveys were conducted between mid-May and mid-July 2019. No southwestern willow flycatchers were detected. Four surveys for yellow-billed cuckoos were conducted between mid-June and mid-August 2019, and cuckoos were detected.

Middle Bill Williams River NWR: Vegetation data were collected using lidar technology. General riparian bird surveys were conducted from mid-April to mid-June. Arizona Bell's vireos, Gila woodpeckers, Sonoran yellow warblers, and summer tanagers were found breeding at the site. Yellow-billed cuckoos were detected as well as one nest. Reconnaissance visits to search for gilded flickers were conducted in January and February. No gilded flickers were detected, but suitable habitat was present, as saguaros are abundant adjacent to the riparian habitat.

FY20 Activities: Construction activities will continue and will include excavating approximately 700,000 cubic yards of soil to create the four ponds, contouring and shaping of fill areas, installing plumbing and water control structures; drilling two 24-inch production wells and installing pumps; installing fencing and gates; and planting honey mesquite in fill areas and marsh in the ponds. Construction is anticipated to be completed in the summer of 2020. The ponds will be filled and the water delivery and drainage systems tested.

Monitoring:

Planet Ranch: Vegetation data will be collected using lidar technology. Construction compliance monitoring will be conducted as needed to minimize impacts to listed and covered species. Monitoring for southwestern willow flycatchers and yellow-billed cuckoos will be conducted in potential habitat outside the construction area.

Middle Bill Williams River NWR: Vegetation data will be collected using lidar technology. 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.

Proposed FY21 Activities: Minor site improvements, such as connecting the domestic well, installing a small holding and sorting facility for native fishes, and replacing metal siding on the maintenance shop, will continue. Once filled, native fishes will not be stocked for several years while the pond ecosystem establishes, and pumping schedules and seepage rates are determined.

Monitoring:

Planet Ranch: Vegetation data will be collected using lidar technology. Water quality will be monitored. Construction compliance monitoring will be conducted as needed to minimize impacts to listed and covered species. 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 technology. 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 *Planet Ranch Restoration, Development, and Monitoring Plan* and the *Planet Ranch, 2016 and 2017 Annual Reports* are posted on the LCR MSCP website. The *Planet Ranch, 2018 and 2019 Annual Reports* will also be posted upon completion.

Work Task E24: Cibola National Wildlife Refuge Unit #1 Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$900,000	$945,231.23	$7,934,779.88	$1,000,000	$2,000,000	$4,000,000	$4,000,000

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 (Cibola NWR), 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 this work task.

Project Description: A Land Use Agreement was signed with the U.S. Fish and Wildlife Service to create and maintain habitat on Cibola NWR Unit #1.

The Bureau of Reclamation conducted multiple restoration research and demonstration projects at Cibola NWR Unit #1 as a precursor to the LCR MSCP. This work task incorporates the existing projects, active agricultural land, and undeveloped, adjacent acreage into a single conservation area, the Cibola NWR.

Cibola NWR Unit #1 is targeted primarily for the cottonwood-willow land cover type but will include a mosaic of native habitats, including wetland and riparian-upland interface areas.

The original 950 acres identified as Cibola NWR Unit #1 have been divided into five areas:

- Area #1 (192 acres) includes active agricultural fields, existing (converted agriculture) cottonwood-willow land cover type, and 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.

- Area #3 (Baseline 90) includes 108 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. It is scheduled for cottonwood-willow land cover.

- Area #5 (Crane Roost) includes 154 acres that have been planted with cottonwoods, willows, and honey mesquite.

In FY18, the U.S. Fish and Wildlife Service and LCR MSCP agreed to the expansion of Cibola NWR Unit #1. An exhibit to the 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 land cover, which includes a mosaic of honey mesquite, and marsh 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.

Annual Maintenance and Management: A local farmer diverts water to irrigate the conservation area 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 NWR and LCR MSCP, 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.

Previous Activities: Through FY18, 786 acres of cottonwood-willow have been established within the 950-acre site. Native trees have been irrigated and managed since 2007.

FY19 Accomplishments:

Maintenance and Management: Management, maintenance, flood irrigation, and monitoring of the established cottonwood-willow habitat continued.

Restoration:

Cottonwood-Willow: Approximately 57 acres were planted with a mix of cottonwoods, willows, and other riparian shrub and grass species in accordance with the Restoration Development and Monitoring Plan for the Eastside and Seed Feasibility areas, the last areas for planting and development within the original Cibola NWR Unit #1. Construction activities continued, including design changes to ensure the pump platform and basin would not be compromised. Invasive species control was completed in spring and fall primarily focusing on the Middle Hippy Fire and Lower Hippy Fire areas. Obligations in FY19 were higher than approved due to the size of the plant orders and the unforeseen pump replacement costs.

Expansion Area: A wetlands delineation was completed to meet requirements under Section 404 of the Clean Water Act; however, no wetlands were identified in the expansion area. Transects were cleared to allow for the installation of groundwater monitoring wells and for digging test pits for soil sampling.

In an August 7, 2019, memorandum from the LCR MSCP to the USFWS, both parties agreed to convert an additional 325 acres of active agricultural land within Cibola NWR Unit #1 to cottonwood-willow in addition to the 1,200 acre expansion area. After the Restoration Development and Monitoring Plan is drafted, the USFWS may request up to 325 acres within the 1,200-acre expansion be converted to low water use activities in return.

Monitoring: Vegetation data were collected using lidar technology. Monitoring stations as part of the salinity and soil moisture monitoring network were operated to assess whether adequate soil moisture was maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions were adequate for sustained vegetation health. Additional soil moisture stations were installed in areas that were planted in FY18.

Riparian bird surveys were conducted at the site from mid-April to mid-June using the LCR MSCP's double sampling protocol. Gila woodpeckers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers were confirmed breeding. Avian mist netting following the Monitoring Avian Productivity and Survivorship (MAPS) protocol was conducted from early May to early August. One Sonoran yellow warbler and two summer tanagers were captured and color banded. There were no recaptures or resightings of LCR MSCP covered species. Southwestern willow flycatcher surveys were conducted from mid-May to mid-July, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted from mid-June to mid-August. Yellow-billed cuckoos were detected, and there were seven confirmed, seven probable, and one possible breeding pair at the site.

A long-term acoustic bat station was used to detect the presence of LCR MSCP bat species from June to August. The results will be reported when the analysis is completed.

Rodent trapping was conducted in fall and spring. Colorado river cotton rats were captured at the site.

FY20 Activities:

Maintenance and Management: Management, maintenance, flood irrigation, and monitoring of the established habitat created will continue. Intensive invasive species control was completed primarily focusing on the Middle Hippy Fire and Lower Hippy Fire areas.

Restoration: The new pump station renovation was completed. The Restoration Development and Monitoring Plan is scheduled to be completed for the 325 acres in agricultural production, which is in addition to the 1,200-acre expansion area. Data collection in preparation of the development of the expansion area is ongoing. A conceptual design and preliminary construction plans, including irrigation and drainage features, are expected to be drafted for the expansion area.

Monitoring: Vegetation data will be collected using lidar technology. Data from the existing monitoring stations 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. Additional soil moisture stations were installed in areas that were planted in FY19. General bird surveys will be conducted from mid-April to mid-June. A MAPS station will be operated from early May to early August. 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.

Proposed FY21 Activities:

Maintenance and Management: Management, maintenance, flood irrigation, and monitoring of the established habitat created will continue. Intensive invasive species control will continue in spring and fall, primarily focusing on the Middle Hippy Fire and Lower Hippy Fire areas.

Restoration: The Restoration Development and Monitoring Plan for the 1,200 acres within the expansion area, permitting, design, and compliance to restore the expansion area are expected to be completed. Groundwork for the 1,200 acre expansion area, such as clearing of vegetation and excavation of drainage ditches, is expected to begin the following year and be completed in FY23.

Monitoring: Vegetation data will be collected using lidar technology. The data collected from the 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 early May to early August. 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.

Pertinent Reports: The *Cibola National Wildlife Refuge Unit #1 Conservation Area, 2017 Annual Report* is posted on the LCR MSCP website. The *Cibola National Wildlife Refuge Unit #1, 2018 and 2019 Annual Reports* will also be posted upon completion.

Work Task E25: Big Bend Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$20,000	$32,089.41	$1,256,918.33	$60,000	$60,000	$50,000	$50,000

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, FLSU1, and RASU2

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 were conducted under Work Tasks D1 and F7, rodent surveys were conducted under Work Task F3, and fish surveys have been conducted under multiple work tasks under Species Research (Section C) and Work Task F5.

Project Description: Boy Scout Camp, purchased by the Southern Nevada Water Authority, 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 Southern Nevada Water Authority 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 a backwater habitat credit that benefits razorback suckers, bonytail, and flannelmouth suckers in Reach 3 of the LCR MSCP planning area. Reach 3 maintains a 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: Since 2010, the Nevada Department of Wildlife has managed the connected backwater as wakeless. 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 rodent surveys were conducted annually.

FY19 Accomplishments:

Maintenance and Management: Minimal maintenance activities were conducted in FY19. One bathymetric lidar survey was conducted to provide elevation data, which has been used to confirm portions of the backwater have filled with sediment and are blocking access to the western portion. The sediment plug appears to be caused by summer thunderstorms and needs to be removed. A review of land ownership in the adjacent area was initiated to determine a location for disposal of excavated material, and a proposed maintenance dredging design was developed.

Monitoring: Larval sampling was conducted at the BBCA from January through May and resulted in the capture of 12 razorback sucker larvae and 26 flannelmouth sucker larvae. Mobile remote PIT scanners deployed once per month during this same period contacted 23 razorback suckers. No other native fishes were contacted by these units. In addition to the mobile PIT scanners deployed January through May, a single, permanent PIT scanner was also deployed to scan continuously throughout the year. This unit contacted 40 razorback suckers and 1 bonytail. Water quality monitoring was also completed quarterly, and all recorded parameters (i.e., temperature, dissolved oxygen, conductivity, and pH) were within suitable ranges for native fishes. No

trammel netting was conducted in FY19 due to sedimentation and reduced access in the BBCA backwater. These efforts will be resumed following completion of scheduled dredging activities.

FY20 Activities:

Maintenance and Management: Routine maintenance activities will be conducted. Environmental permits, compliance documents, and the final design will be completed to allow for maintenance dredging to remove sediment and deepen the backwater. A hydraulic analysis report and model were completed to assist in the final design of the backwater and proposed culvert system to help induce flow throughout the site. A boat launch to support the dredging operation will also be included in the final design for the BBCA.

One bathymetric lidar survey is scheduled to be conducted 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: Monitoring efforts will continue and will include larval fish collections, intensive remote PIT scanning, and water quality assessments from January through May. Additional monitoring will be completed during the remainder of the year using a single, permanent remote PIT scanner that will scan continuously. Water quality will also be recorded once per quarter outside of the January through May sampling period.

Proposed FY21 Activities:

Maintenance and Management: Routine maintenance activities will be conducted. Annual bathymetric lidar surveys will continue at the BBCA. Dredging is scheduled for FY24 after the completion of dredging at the Section 26 Conservation Area. Approximately 10 acres of backwater is to be dredged to a minimum of 10 feet in depth with a terraced step layout down to a target maximum depth of 16 feet. Approximately 275,000 cubic yards of dredge spoil is anticipated to be placed on Bureau of Reclamation withdrawn land 1 mile downstream from the BBCA. A culvert system is planned at the northern end of the training structure that divides the BBCA from the Colorado River to help induce flow through the backwater and maintain the target depth.

Monitoring: Fisheries monitoring may be conducted at a reduced level due to dredging. When possible, monitoring trips will include collecting water quality data, larval light trapping, and remote PIT scanning.

Pertinent Reports: The *Big Bend Conservation Area, 2018 Annual Report* is posted on the LCR MSCP website. The *Big Bend Conservation Area, 2019 Annual Report* will also be posted upon completion.

Work Task E27: Laguna Division Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$120,000	$61,353.64	$27,715,209.41	$120,000	$100,000	$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 was identified as having the potential for large-scale riparian and marsh restoration and enhancement. In 2007, a Laguna Division Planning Group comprised of interested parties was formed to identify potential restoration projects within the division. 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 undeveloped ground, which was shaped to become the Laguna Division Conservation Area (LDCA), was a relatively wide area with a series of low linear depressions that were remnants of former river meanders. The site was designed to create marsh and riparian land cover types that would be maintained with a maximum base flow of 100 cubic feet per second. Open water areas were created in the form of linear excavations aligned with historic river meanders east of lands identified as future stockpiling areas for dredged material removed from the Colorado River (Laguna settling basin). To minimize earthwork, cuts and fills followed the existing topography where feasible. Adjacent terraces were graded to allow for flooding and to promote the establishment of native riparian species. Water control structures within the conservation area were designed to manage water levels by raising and lowering the water surface.

The LCR MSCP adjusts water levels at the LDCA based on habitat requirements. The conservation area can also be 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 to minimize annual operation and maintenance costs. The water delivery and management 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 and delivered to the site through a pipeline via gravity (LDCA headworks).

"Preventative maintenance" of the water control structures within the conservation area occurs twice per year.

An "annual" inspection of the LDCA headworks structure is conducted. During the annual inspection, the LDCA headworks is drained, the cathodic protection is visually inspected, and the interior of the structure is pressure washed.

A "comprehensive" inspection is performed during outages of the Gila Gravity Main Canal. The comprehensive inspection is a more rigorous inspection of the LDCA headworks structure that includes a full inspection of the cathodic protection and visual inspection of the downstream side of the Gila Canal diversion structure sluice gate, which can only be conducted when the Gila Gravity Main Canal is drained and no water is present.

The annual cost for operation and maintenance of the LDCA includes road grading and soil stabilization within the conservation area.

Previous Activities: The *Laguna Division Conservation Area Restoration Development and Monitoring Plan* was approved by the California Department of Fish and Wildlife.

Maintenance and Management: Inlet modifications to the point of diversion at the westernmost sluice gate of the Gila Canal diversion structure were made to allow up to 100 cubic feet per second flow capacity. The diversion pipeline system was engineered to allow for maximum management flexibility, including diverting the entire flow to the Mittry Lake Wildlife Area or the historic river channel. Approximately 4,000 feet of 48-inch high-density polyethylene pipe was installed between 2011 and 2012.

Clearing and contouring of the northern portion of the conservation area (over 500 acres) began in the fall of 2011 and was completed in 2012. Clearing and contouring activities in the southern portion of the conservation area (over

500 acres) began in the summer of 2012 and were completed in April 2014. In all, approximately 3,200,000 cubic yards of earthen material was excavated. Over 800,000 marsh plants and over 1 million trees and plants were planted.

FY19 Accomplishments:

Maintenance and Management: Preventive maintenance of the water control structures and the annual inspection of the LDCA headworks was completed. A comprehensive inspection of the LDCA headworks has been indefinitely postponed until upstream gates at the Gila Canal headworks can be repaired; this resulted in less obligations than estimated. General site maintenance, which includes grading the roads, was also conducted.

Access, law enforcement, and wildland fire support at the LDCA were regulated by the Bureau of Land Management.

Monitoring: Vegetation data were collected using lidar technology.

Riparian bird surveys were conducted at the LDCA from mid-April to mid-June using the LCR MSCP's double sampling protocol. Arizona Bell's vireos, Gila woodpeckers, and Sonoran yellow warblers were detected breeding at the site. Southwestern willow flycatcher surveys were conducted between mid-May and mid-July, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted from mid-June to mid-August. Yellow-billed cuckoos were detected, and there were five possible and two probable breeding territories.

Rodent trapping was conducted in fall and spring. Yuma hispid cotton rats were captured for the first time at the site.

FY20 Activities:

Maintenance and Management: Preventive maintenance of the water control structures and the annual inspection of the LDCA headworks was completed. General site maintenance will include straw bale placement for soil stabilization and grading of the roads as needed.

Access, law enforcement, and wildland fire support at the LDCA is regulated by the Bureau of Land Management. Control of invasive plant species occurs on an as-needed basis by the National Park Service through an existing Interagency Agreement.

Monitoring: Vegetation data will be collected using lidar technology. Riparian 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. Rodent monitoring will be conducted in fall and/or spring.

Proposed FY21 Activities:

Maintenance and Management: Preventive maintenance of the water control structures and the annual inspection of the LDCA headworks is planned. A comprehensive inspection of the LDCA headworks has been indefinitely postponed until upstream gates can be repaired.

Access, law enforcement, and wildland fire support at the LDCA will be regulated by the Bureau of Land Management. Control of invasive plant species will occur on an as-needed basis by the National Park Service.

Monitoring: Vegetation data will be collected using lidar technology. Riparian 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. Rodent monitoring will be conducted in fall and/or spring.

Pertinent Reports: The *Laguna Division Conservation Area, 2017 and 2018 Annual Reports* are posted on the LCR MSCP website. The *Laguna Division Conservation Area, 2016 and 2019 Annual Reports* will also be posted upon completion.

Work Task E28: Yuma East Wetlands

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$275,000	$225,864.96	$2,950,228.89	$275,000	$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 restore the local wetlands along the Colorado River by removing overgrown non-native species. Approximately 380 acres have been restored to create a mosaic of marsh, mesquite, and cottonwood-willow. The project is located in Yuma, Arizona, on city of Yuma, Quechan Indian Tribe, and Arizona Game and Fish Department lands. In coordination with these partners and the Yuma Crossing National Heritage Area Corporation (YCNHAC), a 501(c)3 non-profit organization responsible for managing day-to-day operations, 70% of the funding will be provided 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 partners 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, and the remaining 30% is provided by the other partners.

Annual operation and maintenance activities anticipated throughout the 50-year term of the LCR MSCP include flood irrigation of the fields north and south of the Colorado River, pump maintenance and repair, minor repair of infrastructure, removal of invasive and non-native plant species, and general site maintenance such as road grading.

Previous Activities: In FY13, the Quechan Indian Tribe, Arizona Game and Fish Department, city of Yuma, YCNHAC, and the Bureau of Reclamation agreed to the terms and conditions in the multi-party Land Use Agreement. The agreement was signed in late FY13 after review by the Steering Committee. Monitoring began in FY13.

FY19 Accomplishments:

Maintenance and Management: YEW was operated and maintained in accordance with the work identified in the FY19 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 FY19, the FY20 Yuma East Wetlands Annual Management Plan was developed and approved.

In FY18, funding was provided to the YCNHAC to replace the vertical turbine pump that flood irrigates fields north and south of the Colorado River with a trailer-mounted centrifugal pump. The new pump was installed in FY19 during the irrigation off season and operated successfully through the entire irrigation calendar.

On November 20, 2018, a small fire burned approximately 0.1 acre near the outer boundary of the southern cottonwood stands. Fire crews utilized the trailer-mounted centrifugal pump to combat the fire and prevent further expansion. As a

result, the fire caused negligible damage to the land cover at YEW. Investigators determined that the fire originated from a small, unauthorized campfire located on the site.

A flow meter for the pump that delivers water to fields north of the Colorado River was installed. Stilling wells were installed to house sensors to track water levels within the north and south marsh complexes.

Monitoring: Vegetation data were collected using lidar technology. Monitoring stations, as part of the salinity and soil moisture monitoring network, were operated to assess whether adequate soil moisture was being maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions were adequate for sustained vegetation health.

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.

Riparian bird surveys were conducted at YEW from mid-April to mid-June using the LCR MSCP's double sampling protocol. Gila woodpeckers were detected breeding at the site. Southwestern willow flycatcher surveys were conducted between late June and early August, and no resident or breeding individuals were detected. Yellow-billed cuckoo surveys were conducted between late June and early August, and there were four detections. One confirmed breeding pair and one probable territory was detected. A nest was found, and at least one young was confirmed to have fledged.

A long-term acoustic bat station was used to detect the presence of LCR MSCP bat species from June to August as part of the system-wide monitoring network. The results will be reported when analysis is completed.

Rodent trapping was conducted in fall and spring. Yuma hispid cotton rats continue to be detected at the site.

FY20 Activities:

Maintenance and Management: YEW will be operated and maintained in accordance with the work identified in the FY20 Yuma East Wetlands Annual Management Plan. The FY21 Annual Management Plan will be developed with the partners in the spring of 2020.

A flow meter was installed for the pump that is used to flood irrigate fields south of the Colorado River. Stilling wells will be instrumented to track water levels within the north and south marsh complexes.

Monitoring: Vegetation data will be collected using lidar technology. Data from the existing monitoring stations 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. Riparian 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 as part of the system-wide monitoring network. Rodent monitoring will be conducted in fall and/or spring.

Proposed FY21 Activities:

Maintenance and Management: YEW is expected to be operated and maintained in accordance with the work identified in the FY21 Yuma East Wetlands Annual Management Plan. The FY22 Annual Management Plan will be developed with the partners in spring 2021. No significant changes to the operating plan or budget are anticipated.

Monitoring: Vegetation data will be collected using lidar technology. The data collected from the 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. Riparian 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. Rodent monitoring will be conducted in fall and/or spring.

Pertinent Reports: The *Yuma East Wetlands Restoration, Development, and Monitoring Plan* and the *Yuma East Wetlands, 2018 Annual Report* will be posted on the LCR MSCP website upon completion.

Work Task E31: Hunters Hole

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$30,000	$24,621.46	$559,343.83	$30,000	$30,000	$30,000	$330,000

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 in Arizona, within Reach 7 of the LCR MSCP planning area, approximately 3 miles north of the Southerly International Boundary with Mexico. The area historically consisted of interconnected ponds with adjacent marsh and stands of cottonwood-willow. Water levels in the ponds were maintained by groundwater, irrigation drainage flows, and by a channel connected to the river. Over time, the site degraded, and most of the habitat was lost due to declining groundwater levels, establishment of invasive plant species, and wildfires. Officials from State, local, Tribal, and Federal agencies joined together to restore the area while increasing public safety and border security. The LCR MSCP assumed management of Hunters Hole as a LCR MSCP conservation area in FY12. Hunters Hole is comprised of 43 acres of cottonwood-willow habitat.

Annual Maintenance and Management: Irrigation is provided by a groundwater well through a series of automated valves. One irrigation cycle is approximately 89 hours long and occurs once every 3 weeks from February to November. The annual cost associated with managing Hunters Hole includes maintenance of the pumps and valves, the electrical power utility bills, and grading the road within the site.

Previous Activities: Hunters Hole has been managed by the LCR MSCP since 2012. Monitoring began in 2013.

FY19 Accomplishments:

Maintenance and Management: Hunters Hole was irrigated via an automated irrigation system. No construction, restoration, or changes to management activities occurred. Irrigation cycles, water use, and costs were monitored in a continuing effort to manage the area as efficiently as possible. The groundwater pump that supplies water to the site was serviced and repaired as needed.

Monitoring: Vegetation data were collected using lidar technology. Monitoring stations as part of the salinity and soil moisture monitoring network were operated to assess whether adequate soil moisture was maintained during the nesting season for avian species and to assess whether soil moisture and salinity conditions were adequate for sustained vegetation health.

Riparian bird surveys were conducted at Hunters Hole from mid-April to mid-June using the LCR MSCP's double sampling protocol. No LCR MSCP species were detected, but six other riparian bird species were found. Southwestern willow flycatcher surveys were conducted from mid-May to mid-July. Migrant flycatchers were detected on the first survey in May, but no breeding or resident birds were detected. Yellow-billed cuckoo surveys were conducted between late June and early August. A yellow-billed cuckoo was detected on three surveys, so there is one possible breeding territory.

A long-term acoustic bat station was used to detect the presence of LCR MSCP bat species from June to August as part of the system-wide monitoring network. The results will be reported when the analysis is completed.

Rodent trapping was conducted in fall. Yuma hispid cotton rats were captured.

FY20 Activities:

Maintenance and Management: The groundwater pump that supplies water to the site is serviced or repaired as needed. The groundwater well, drilled by others prior to LCR MSCP involvement, was developed without a well screen or filter pack. It was assessed in FY20 and is failing; it is scheduled to be re-drilled in FY23 to ensure continued efficient management of the site.

Monitoring: Vegetation data will be collected using lidar technology. Data from the existing monitoring stations 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. Riparian 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 as part of the system-wide monitoring network. Rodent monitoring will be conducted in fall and/or spring.

Proposed FY21 Activities:

Maintenance and Management: Hunters Hole will continue to be irrigated via the automated irrigation system. No construction, restoration, or changes to management activities are anticipated at this time.

Monitoring: Vegetation data will be collected using lidar technology. Data from the 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. Riparian 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 as part of the system-wide monitoring network. Rodent monitoring will be conducted in fall and/or spring.

Pertinent Reports: The *Hunters Hole 2014 and 2016–2018 Annual* Reports are posted on the LCR MSCP website. The *Hunters Hole Restoration, Development, and Monitoring* Plan and the *Hunters Hole, 2012 and 2019 Annual Reports* will also be posted upon completion.

Work Task E33: Pretty Water Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$30,000	$33,951.14	$1,823,282.55	$20,000	$20,000	$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) consists of approximately 566 acres on the Cibola National Wildlife Refuge, located in California between River Miles 95 and 97. 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 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 with minimal long-term operational and maintenance costs. Annual management activities are limited to visual inspections of the honey mesquite, coordination with the U.S. Fish and Wildlife Service, and minor road grading. Invasive plant species control may be periodically required.

Previous Activities: The *Sharks Tooth Restoration Development and Monitoring Plan* was approved by the California Department of Fish and Wildlife in 2012. The name was later changed to the Pretty Water Conservation Area. A Land Use Agreement Exhibit between the LCR MSCP and 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 mesquites 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 maintained. Non-native species control was implemented after planting to allow native vegetation to mature without competition.

FY19 Accomplishments:

Maintenance and Management: Visual inspections were conducted to ensure that honey mesquite have successfully established. Minor road grading was completed. Minor invasive plant species control efforts were completed as needed.

Monitoring: Vegetation data were collected using lidar technology.

Riparian bird surveys were conducted from mid-April to mid-June using the LCR MSCP's double sampling protocol. No LCR MSCP species were detected. Surveys for MacNeill's sootywing skippers were conducted; they were detected in areas containing quailbush.

FY20 Activities:

Maintenance and Management: Visual inspections will be conducted to evaluate invasive plant species, and control efforts will be implemented on an as-needed basis. As a result, annual operating costs have been reduced again. Minor road grading will be completed, as needed.

Monitoring: Vegetation data will be collected using lidar technology. General bird surveys will be conducted from mid-April to mid-June. Surveys for MacNeill's sootywing skippers will be conducted.

Proposed FY21 Activities:

Maintenance and Management: Visual inspections will be conducted to evaluate invasive plant species, and control efforts will be implemented on an as-needed basis. Minor road grading will be conducted.

Monitoring: Vegetation data will be collected using lidar technology. General bird surveys will be conducted from mid-April to mid-June. Surveys for MacNeill's sootywing skippers may be conducted.

Pertinent Reports: The *Pretty Water Conservation Area, 2017 and 2018 Annual Reports* are posted on the LCR MSCP website. The *Pretty Water Conservation Area, 2019 Annual Report* will also be posted upon completion.

Work Task E35: Mohave Valley Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$1,750,000	$1,263,978.39	$10,326,731.83	$160,000	$300,000	$100,000	$100,000

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 was also conducted under that work task. Vegetation and species monitoring will be conducted under Work Tasks F1–F7.

Project Description: The Mohave Valley Conservation Area is located 13 miles south of Needles, California, along the Colorado River. The 149-acre property resides within the boundary of Park Moabi Regional Park. 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. A connected backwater was created that diverts water off the main stem of the Colorado River just below River Mile 237. Diverted flows 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. The connected backwater habitat created was 63.1 acres based on the as-built survey. The footprint of the Mohave Valley Conservation Area is 93 acres, with native land cover types lining the banks and upland slopes of the backwater accounting for the additional 30 acres.

Previous Activities: The land is owned by the California State Lands Commission (Commission) and was leased to San Bernardino County. Prior to approaching the Commission and county in 2012 about the backwater project,

the 149-acre parcel was used as an off-highway vehicle recreational area. The Commission (landowner) and the county (lessee) agreed to allow the creation of the conservation area, and the county was willing to divide the property to accommodate both uses. A lease was signed between the Commission and Bureau of Reclamation on November 2, 2016, for the 149-acre parcel for development of the conservation area. The *Mohave Valley Conservaton Area 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 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, were used to determine the volume of material to be excavated to achieve the desired depth of the backwater. A geotechnical survey was conducted in June 2014.

The project's area of impact involved 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 was used throughout the site to create the desired contour elevations, but the majority of the excavated material was used to create terrain within the county's off-highway vehicle area.

FY19 Accomplishments: Construction was completed in May 2019, and the Mohave Valley Conservation Area was opened to the public. A total of 1.475 million cubic yards of material was moved, including 1.15 million cubic yards using land-based equipment and 325,000 cubic yards by dredging. An as-built survey of the new backwater documented 63 acres of new connected backwater had been created. The removal of the southern outlet cofferdam took place in January 2019, opening the connection to the Park Moabi channel. The northern inlet was deepened in January, when the river stage was low and access easier. The northern inlet bridge stoplogs were installed in August 2019. Obligations in FY19 accounted for the labor; minor material costs, including the kiosk signs; and the operation of the dredge with its associated support equipment. Obligations were less than what were approved, as the contracts for purchase and rental of equipment were completed in FY18.

Monitoring: Native fish monitoring was completed using remote passive integrated transponder (PIT) scanners, which were integrated into the northern inlet and southern outlet bridges. Scanners ran for a large portion of the year, but the outflow scanner was only accessible to fishes once the cofferdam was removed at the end of January. In total, the scanners contacted 1,931 unique razorback suckers and 1 bonytail in FY19.

FY20 Activities: Planting occurred on a small portion (2 acres) of the spoil material to reduce wind erosion. Two staff gages and a temporary gage were installed to monitor the backwater and river stage. During winter, off-highway vehicles operators did not follow the posted "Keep Out" signage, which resulted in low survivorship of planted marsh. Additional costs were incurred to resurvey the property for the lease amendment between the Bureau of Reclamation and the Commission. The lease was amended to delineate the boundary of the habitat area that will be managed by the LCR MSCP from the soil disposal area, which was returned to the Commission.

Monitoring: Native fish monitoring will initially be completed using remote PIT scanners, which were integrated into the northern inlet and southern outlet bridges. Scanning data will be used to confirm the presence of native fishes, and supplemental sampling will be completed as needed.

Proposed FY21 Activities: Management and monitoring of the conservation area will continue. A post and cable fence (5,200 linear feet) may be installed along the eastern boundary of the conservation area to limit off-highway vehicle intrusion and allow the habitat to establish around the backwater. Routine maintenance activities, including road maintenance and the removal of invasive plant species, may occur.

Monitoring: Native fish monitoring will continue via remote PIT scanning. If scanning data confirm the presence of native fishes, supplemental sampling, including trammel netting and larval fish surveys, will be completed. Data collected through these efforts will be used to direct future monitoring and sampling activities.

Pertinent Reports: The FY19 annual report will be posted on the LCR MSCP website upon completion.

Work Task E36: Parker Dam Camp

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$40,000	$8,000.00	$17,591.82	$5,000	$5,000	$5,000	$5,000

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 (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: Parker Dam Camp is located 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.

Parker Dam Camp was established by Reclamation to house workers during the construction of Parker Dam. The property consisted of numerous residences and other buildings, including a school. In the 1990s, Reclamation determined that the facility was no longer required for project activities and began the process of disposing of the houses and other buildings. Asphalt roads, concrete sidewalks, and sparse landscaping are all that remain of the Government town. Public access was restricted by fencing on the north and east sides and by the Whipple Mountains to the south and west.

After the structures were removed, Reclamation evaluated potential options for use of this property. The LCR MSCP entered into an agreement with the Lower Colorado Dams Office (LDCO) to transfer management responsibility to the LCR MSCP so Parker Dam Camp could be managed as a conservation area to

promote the natural establishment of honey mesquite. Exotic vegetation is being selectively removed to promote the growth and expansion of honey mesquite within the camp. Additional land cover types may be created at a later date.

Previous Activities: In FY16, an agreement was signed by the LCR MSCP and the Lower Colorado Dams Office to transfer management responsibility of Parker Dam Camp from the Lower Colorado Dams Office to the LCR MSCP. Invasive vegetation maintenance has been completed as needed.

FY19 Accomplishments:

Operations and Management: The disposal of the town left debris within the conservation area. Cleanup of the debris piles was mostly completed. Several small areas may need to be addressed later. This presents little to no hazard to the site.

Monitoring: Riparian bird surveys were conducted between mid-April to mid-June using the LCR MSCP's double sampling protocol. Gila woodpeckers were documented breeding. No gilded flickers were detected during a reconnaissance visit in December.

FY20 Activities:

Operations and Management: General site maintenance activities will be conducted if necessary. A power line has been identified as needing repair or replacement. The power line does not service Parker Dam Camp.

Monitoring: Riparian bird surveys will be conducted from May to early August. Reconnaissance surveys will be conducted to determine if gilded flicker breeding habitat may be present.

Proposed FY21 Activities:

Operations and Management: Site maintenance and general cleanup will continue as needed.

Monitoring: Riparian bird surveys will be conducted from May to early August. Surveys for gilded flickers may be conducted if habitat is found in FY20.

Pertinent Reports: The *Parker Dam Camp, 2017 and 2018 Annual Reports* are posted on the LCR MSCP website. The *Parker Dam Camp, 2019 Annual Report* will also be posted upon completion.

Work Task E37: Palo Verde Ecological Reserve-South

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$100,000	$68,295.77	$78,323.06	$500,000	$0	$0	$0

Contact: Andrea Finnegan, (702) 293-8203, afinnegan@usbr.gov

Start Date: FY17

Expected Duration: FY20

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): This work task will be combined with Work Task E4 starting in FY21 as a result of the inclusion of the Palo Verde Ecological Reserve (PVER)-South property in the PVER Agreement. Vegetation monitoring is conducted under Work Task F1, and wildlife monitoring is conducted under Work Tasks F2–F4 and F7.

Project Description: PVER-South, located within the Palo Verde Irrigation District (PVID), is 338 acres with a mix of active agricultural fields, undeveloped ground, and portions of an old river meander. The California Department of Fish and Wildlife has made this property available for LCR MSCP habitat restoration activities. 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 PVID. 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.

Previous Activities: Identification of the property and evaluation for inclusion into the LCR MSCP were completed under Work Task E16.

FY19 Accomplishments: The *Restoration Development and Monitoring Plan for Palo Verde Ecological Reserve-South* was approved by the California Department of Fish and Wildlife.

Maintenance/Restoration/Management: No habitat creation or management activities occurred in FY19.

Monitoring: No monitoring activities were conducted in FY19.

FY 20 Activities: The LCR MSCP and California Department of Fish and Wildlife amended the Agreement for Restoration Activities Consistent with the LCR MSCP, Palo Verde Ecological Reserve, to include the PVER-South property. The LCR MSCP will assume management responsibilities of the property, provide irrigation to the site, evaluate and repair the canal system as necessary, and provide any other maintenance needed.

The LCR MSCP planted approximately 101 acres of honey mesquite in accordance with the approved development plan. The PVID will provide water to PVER-South and will send a record of diversionary amounts to the LCR MSCP. The LCR MSCP will begin incurring annual costs, such as water tolls.

This work task will be closed, and the work will be tracked under Work Task E4.

Monitoring: Pre-development monitoring may be conducted if additional data are needed for compliance documentation. This work will be funded under Post-Development Monitoring (Section F) work tasks.

Proposed FY21 Activities: This work task was closed in FY20.

Pertinent Reports: The report titled *Palo Verde Ecological Reserve-South Restoration Development and Monitoring Plan* is posted on the LCR MSCP website.

Work Task E38: Three Fingers Lake

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$100,000	$53,795.06	$342,885.39	$10,000	$10,000	$10,000	$10,000

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 Task 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 672-acre conservation area being restored to create a 245-acre marsh complex within the State of California. Honey mesquite and cottonwood-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 earthen and sheet pile structures.

Discussions with the U.S. Fish and Wildlife Service have resulted in a restoration concept that would create a large marsh complex similar in size to Hart Mine

Marsh (E9). 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 to reduce the permeability of the structures. The existing pump stand and pumps will 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. The *Three Fingers Lake Restoration Development and Monitoring Plan* was prepared.

FY19 Accomplishments:

Restoration: A wetlands delineation and an appraisal-level design, including quantities and cost estimates, were completed. Environmental compliance activities have been initiated, but permitting will be delayed until a start date for construction is chosen, which will result in obligations being less than approved.

Monitoring: The U.S. Fish and Wildlife Service conducted marsh bird surveys at Three Fingers Lake in March and April as part of their annual monitoring program. Western least bitterns and Yuma clapper rails were detected within the lake. Three groundwater monitoring wells were installed to track groundwater elevations.

FY20 Activities:

Restoration: Cultural and environmental compliance activities have been initiated and will continue through most of FY20.

Monitoring: Periodic site visits to collect and store data gathered by groundwater and surface water data loggers will continue.

Proposed FY21 Activities:

Restoration/Monitoring: No restoration activities are planned for FY21 at this time. Periodic site visits may be conducted to collect and store data gathered by groundwater and surface water data loggers.

Pertinent Reports: N/A

Work Task E39: Dennis Underwood Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$10,230,000	$11,325,356.98	$11,338,500.28	$1,500,000	$1,500,000	$350,000	$350,000

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 (PVID) and is owned by the Metropolitan Water District of Southern California (Metropolitan). The Metropolitan has made 635 acres of active agricultural ground available for inclusion in the LCR MSCP. The development of this 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. Restoration of the site includes planting both the honey mesquite and cottonwood-willow land cover types.

Annual Maintenance and Management: A local farmer irrigates the various habitat types based on site conditions. 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 and concerns. The farmer is also responsible for assessing the water needs of the trees and, in coordination with the PVID 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 the conservation area within the PVID, such as water taxes, water tolls, and assessments for district operation, are included in the annual maintenance costs.

Cottonwood-Willow: Water is ordered through and provided by the PVID. 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. The PVID provides water order data monthly to the LCR MSCP. Irrigation does not occur from November through January, unless irrigation is needed for salinity management, because the trees are dormant.

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: In support of the development plan, AutoCAD drawings were prepared to incorporate swales (low depressions) within the laser-level fields. The drawings were used to calculate quantities of material to be excavated and the cost of excavation. The swales lower the ground surface, which brings the roots of the trees closer to the water table and are intended to provide areas of moist soil using less water. The district delivers water to the site through the C-28 Canal, but the LCR MSCP is responsible for the laterals that deliver water to the fields. The existing concrete water canal laterals were surveyed to determine elevation, and the condition of the canals was assessed for future repair. This is a new start FY18.

FY19 Accomplishments:

Restoration: On October 24, 2018, the Steering Committee approved Program Decision Document 19-001, *Land and Water Approval*, which authorized the Bureau of Reclamation to enter a permanent easement for conservation purposes with the Metropolitan. The LCR MSCP secured the easement at a cost of $9,730,000 for 635 acres of land, including 575 water toll acres. Compensation for the use of the land and water was made based on the Federal appraisal.

The *Restoration Development and Monitoring Plan for the Dennis Underwood Conservation Area* was prepared. The LCR MSCP began incurring annual costs, such as water tax and coalition fees, from the PVID. The LCR MSCP assumed management responsibilities on the property, provided irrigation to the site, and evaluated and repaired the canal system as necessary. A total of 122 acres of

honey mesquite were planted in accordance with the development plan. Construction activities to excavate swales within the remaining acres scheduled for cottonwood-willow establishment were completed and a cover crop planted.

Compliance monitoring was conducted prior to construction activities to ensure avoidance of all endangered or threatened species.

FY20 Activities:

Maintenance and Management: Regular management, maintenance, and irrigation will continue. The honey mesquite land cover type will be irrigated once per month from February through October 2020. The cottonwood-willow habitat will be irrigated twice per month following planting through October 2020.

Restoration: Cottonwood-willow was planted on 249 acres in the spring of FY20.

Proposed FY21 Activities:

Maintenance and Management: The established cottonwood-willow and honey mesquite habitat will be maintained and irrigated. The 74 E and 78 E Canals are scheduled to be replaced.

Restoration: The cottonwood-willow habitat will be planted on 258 acres.

Monitoring: Post-development monitoring will begin after restoration is complete and habitat is mature enough to provide habitat.

Pertinent Reports: The report titled *Dennis Underwood Conservation Area Restoration, Development and Monitoring* Plan is posted on the LCR MSCP website. The *Dennis Underwood Conservation Area, 2019 Annual Report* will also be posted upon completion.

Work Task E40: Yuma Meadows Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$4,000,000	$399,228.48	$425,707.12	$2,000,000	$1,500,000	$1,000,000	$1,000,000

Contact: Arien Chavez, (702) 293-8027, amchavez@usbr.gov

Start Date: FY18

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: Located within Reach 6 of the LCR MSCP planning area, the Yuma Meadows Conservation Area (YMCA) is in the State of California on Bureau of Reclamation (Reclamation) withdrawn lands, approximately 13 miles northeast of Yuma, Arizona. Dense saltcedar stands dominate much of the landscape with small areas of riparian vegetation. 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.

The YMCA is expected to include the development of 123 acres of disconnected backwaters that will be managed for bonytail and razorback suckers. The conservation area will consist of several large disconnected backwaters ranging in size from 10 to 30 acres each. The total size of these refugia ponds will be approximately 111 acres. Twelve smaller disconnected backwaters (referred to as grow-out ponds) will be approximately 1 acre each in size. The conservation area will include the Laguna Field Office, which is owned and operated by Reclamation's Yuma Area Office. These existing facilities will be used for the management of the YMCA.

Previous Activities:

The *Yuma Meadows Conservaton Area Restoration Development and Monitoring Plan* was prepared.

Maintenance/Restoration/Management: This project was not expected to begin until FY19; however, the opportunity arose to begin management of the area. In order to accelerate the design of the project, preliminary site suitability investigations, environmental compliance, and permitting activities for development of data collection were completed in FY18.

Environmental compliance activities, specifically a wetland delineation and a Class III Cultural Pedestrian Survey, were initiated. Nine observation wells were installed around the perimeter of the project boundary to monitor the groundwater level. In September 2018, a Value Planning Study of the conservation area conceptual design took place in Provo, Utah, and included subject matter experts from different Reclamation regions. The study was conducted to identify areas of concern that need to be addressed early in the design process. Most project costs were incurred using funding from Work Task E16.

An agreement between the LCR MSCP and Reclamation's Yuma Area Office was signed to allow the property to be developed and managed as a conservation area in perpetuity.

FY19 Accomplishments:

Maintenance and Management: Hourly groundwater level readings were collected monthly from the nine groundwater observation wells to monitor the hydrology of the project site.

Restoration: A wetland delineation and cultural surveys were completed to assist in permitting and obtaining National Environmental Policy Act compliance. An evaluation of the existing structures and office complex at the YMCA was conducted to determine the level of refurbishment required to bring the existing buildings up to code. Clearing of transects, to allow access for geotechnical investigations, was also conducted to obtain samples from four borings and six test pits to assist in the design of the backwater. Design drawings of the site were completed. A Value Engineering Study was held in February and conducted using the 30% design. The goal of the study was to evaluate the design drawing set and identify areas of concern that need to be addressed before completing the final design. Additional geotechnical investigations occurred throughout the year to refine and calibrate the design drawings. Final design drawings for construction of the grow-out and refugia ponds were completed. The complex nature of the site hydrology and the large quantity of material to be excavated and

placed, along with the commitment to complete the disconnected backwater ponds at Planet Ranch, delayed the start of development of the site and resulted in obligations being less than approved.

FY20 Activities:

Maintenance and Management: Non-native vegetation was cleared from the 18-acre footprint of the grow-out ponds outside of the migratory bird nesting season. Repairs to existing offices and warehouses will begin in FY20 and are scheduled to occur over the next 3–4 years. All buildings will be fully functional by FY23, when construction of the grow-out ponds is anticipated to be complete. A security review of the site is planned, and any security recommendations will be scheduled and implemented.

Restoration: The area is closed to the public; authorized staff access the site through a locked steel gate off State Route 24. Only the office complex and warehouses are secured with a chain link fence. To enhance security, a 7-foot-high chain link fence is scheduled to be procured and installed around the perimeter. Over 21,000 linear feet of fencing is required to minimize unauthorized access to the project area. Minor upgrades to the existing offices and warehouses will be initiated.

Proposed FY21 Activities:

Maintenance and Management: Upgrades to existing offices and warehouses started in FY20 are expected to continue.

Restoration: Construction of the 12 grow-out ponds will require building an elevated earthen pad on a stable foundation. To obtain a stable foundation for the grow-out ponds, excavation of the top 6 feet of material (approximately 300,000 cubic yards) may be required, and then placement of 600,000 cubic yards of engineered fill to raise the pad to final grade may be necessary. Initial geotechnical investigations identified a portion of this material necessary onsite; however, additional geotechnical exploration is planned to determine the exact locations and quantities from within the conservation area that contain suitable building material. In addition, offsite borrow areas previously used by Reclamation will be evaluated to determine their suitability for use as engineered fill.

The exterior of the fishery sorting facility (metal building) will be procured and installed. Drilling of a replacement groundwater well for the sorting facility and office complex, along with a new well for the grow-out ponds is also scheduled. Drilling of the well for the grow-out ponds, will replace the construction of an elevated pad to match grades after pond construction.

Monitoring: Compliance monitoring will be conducted as needed prior to and during construction and funded under Post-Development Monitoring (Section F) work tasks.

Pertinent Reports: N/A

Work Task E41: Section 26 Conservation Area

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$0	$0	$0	$400,000	$3,000,000	$2,500,000	$2,000,000

Contact: Laken Anderson, (702) 293-8153, landerson@usbr.gov

Start Date: FY20

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BONY2, FLSU1, and RASU2

Location: Reach 3, River Miles 238–239, California

Purpose: To create and manage a connected backwater to provide habitat for LCR MSCP covered fish species

Connections with Other Work Tasks (Past and Future): This project was identified under Work Task E16. Vegetation and species monitoring will be conducted under Work Tasks F1–F7.

Project Description: The Section 26 Conservation Area (Section 26) is roughly 218 acres of Bureau of Reclamation withdrawn land adjacent to the lower Colorado River between River Miles 238–239, just north of Beal Slough. Section 26 is located within Township 8N, Range 23E, Section 26, San Bernardino Meridian within the State of California. Section 26 is within the historic Colorado River floodplain, bounded by the Colorado River on the east and railroad tracks to the west. The landscape is dominated with invasive saltcedar. The project proposal includes a minimum of 10 acres and a maximum of 25 acres of connected backwater habitat to be created and managed for razorback suckers, bonytail, and flannelmouth suckers. Connected backwaters typically involve the removal of overburden to a depth slightly below the water table and dredging to reach the targeted water depths. 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.

Previous Activities: A cadastral survey was conducted in FY17 to confirm land ownership. Aerial photos and lidar data were collected in April 2018 to

evaluate topography of the site. A wetlands delineation to assist in the design process was initiated in FY19. Obligations incurred prior to an approved budget are tracked under Work Task E16.

FY19 Accomplishments: This is a new start in FY20.

FY20 Activities: Drafting of the *Section 26 Conservation Area Restoration, Development, and Monitoring Plan* is anticipated. The design phases (30%, 60%, and 90%) are scheduled to be initiated. A hydraulic analysis study is being completed to minimize future sedimentation and to provide information for the backwater design. A Memorandum of Agreement with the Bureau of Reclamation's Yuma Area Office to transfer management responsibilities for the property to the LCR MSCP is being drafted. A Value Engineering Study is scheduled to review the 30% design. The final design phase is scheduled to be completed and would include the acreage of backwater to be created, the quantity of material to be excavated, and estimated cost. The environmental compliance and permitting process is expected to be completed.

Proposed FY21 Activities: Land-based excavation will start in order to provide access for the dredge and to remove dry overburden. Dredging is scheduled to remove approximately 750,000 cubic yards of material to create 25 acres of connected backwater. Two dredge shifts, a day and swing shift, are planned to operate year round to remove approximately 250,000 cubic yards of material each year for the next 3 years.

Monitoring: Compliance monitoring will be conducted before construction.

Pertinent Reports: The report titled *Section 26 Conservation Area Restoration, Development, and Monitoring Plan* will be posted on the LCR MSCP website upon completion.

WORK TASKS – SECTION F

Post-Development Monitoring

Work Task F1: Habitat Monitoring at Conservation Areas

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$700,000	$447,229.73	$6,491,228.00	$700,000	$600,000	$600,000	$600,000

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 be used to make informed 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 conservation areas detailed in the Conservation Area Development and Management (Section E) work tasks. Soil moisture data collected under Work Task E34 (closed) were 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 make informed management decisions.

Previous Activities: During FY10 to FY14, ground-based vegetation monitoring was conducted at most established conservation areas. Monitoring protocols focused on the following variables: density, species richness, vegetation structure, ground cover, canopy closure, distance to nearest standing water, distance to nearest open space, temperature, and relative humidity. In FY14, after an external review, adaptive management recommendations for vegetation monitoring were implemented, which included selecting plots in an improved, spatially randomized approach and targeting areas where the vegetation structure and soils were more consistent with southwestern willow flycatcher and yellow-billed cuckoo habitat characteristics.

In FY14, long-term vegetation monitoring began the transition to using remote sensing techniques. This decision was based on improvements in 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 compared to ground-based monitoring.

A tool was developed in FY16 to automate vegetation classification using lidar data according to the Anderson and Ohmart classification system. The tool is used to assign the Anderson-Ohmart structure type to 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. Results from ground-based vegetation surveys are used to validate the accuracy of the remote sensing-based vegetation classification.

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.

The LCR MSCP began acquisition of lidar data for the entire LCR MSCP planning area during FY18 in cooperation with other Bureau of Reclamation offices and the U.S. Geological Survey. 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.

FY19 Accomplishments: Some of the lidar data associated with the vegetation classification project initiated in FY18 was not acquired as planned due to unforeseen delays. The remainder of the data was collected in FY19. The delays were caused by difficulties in attaining landowner approval in a timely manner. The lidar data collected in FY18 and FY19 were not available yet to perform the habitat creation accomplishment analysis. Ground-based vegetation surveys will be conducted on a periodic basis and will be used to validate the accuracy of the remote sensing-based vegetation classification.

The salinity and soil moisture monitoring network was operated at seven established conservation areas, expansion areas of conservation areas, and potential future conservation areas. Instrumentation includes shallow groundwater monitoring stations to monitor groundwater levels and groundwater salinity, and soil monitoring stations that monitor soil moisture and soil salinity.

Obligations were less than approved, as the costs associated with acquiring lidar data were less than expected. Lidar technology has become more efficient as the technology matures and commercial usage has increased.

FY20 Activities: Long-term habitat monitoring is continuing. Lidar data will be acquired to assess vegetation characteristics and will be analyzed using the tools developed under Work Task C60.

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 newly planted phases of the Cibola National Wildlife Refuge Unit #1 Conservation Area. The network continued to be operated at all other existing locations.

A tool to monitor vegetation health at established conservation areas will be established. The tool will use satellite imagery from a constellation capable of providing medium-resolution imagery on at least a weekly basis. The tool will automatically generate rasters of normalized difference vegetation index on a pre-programmed time step and generate change rasters between time steps. The change rasters will be used to identify areas that have experienced negative changes in normalized difference vegetation index indicative of a decline in vegetation health and warrant additional monitoring.

Proposed FY21 Activities: Long-term habitat monitoring will continue using the previously developed techniques. Using the lidar data collected from FY14 to FY19, a data collection schedule will be developed based on the needs of 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 established locations and will be expanded as needed to include all conservation areas where these parameters are of concern for evaluating species' habitat requirements and for 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.

The vegetation health monitoring tool will continue to be used to identify areas of concern where declines in vegetation health may have occurred.

Pertinent Reports: During the development of remote sensing vegetation monitoring techniques, an annual report for FY19 will not be prepared. Once remote sensing monitoring techniques are finalized, the reports will then be prepared annually and posted on the LCR MSCP website upon completion.

Work Task F2: Avian Monitoring at Conservation Areas

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$450,000	$411,774.03	$3,120,797.09	$450,000	$475,000	$475,000	$475,000

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 (Middle Bill Williams NWR), Bill Williams National Wildlife Refuge, Arizona; Planet Ranch Conservation Area, 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 (YEW), 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 (closed), C36 (closed), and C52 (closed) 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 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, PVER-South, Planet Ranch, Three Fingers Lake, and the LDCA. Post-development monitoring for avian covered species was conducted at the BLCA, the Middle Bill Williams River NWR, Parker Dam Camp, Cibola NWR Unit #1, the CVCA, the PVER, the LDCA, YEW, 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. 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 multi-species survey protocol and 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.

FY19 Accomplishments: Avian post-development monitoring was conducted at existing conservation areas. The following conservation areas were surveyed: the BLCA, the Middle Bill Williams River NWR, Parker Dam Camp, the PVER, the CVCA, Cibola NWR Unit #1, the PWCA, the LDCA, YEW, and Hunters Hole. Eighty-one 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.

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 73 pairs of territorial birds confirmed breeding comprising 14 species. Nine pairs of Arizona Bell's vireos, 11 pairs of Sonoran yellow warblers, and 1 summer tanager pair were confirmed breeding.

- Cibola NWR Unit #1 – Ten area search plots were surveyed at this conservation area. There were 149 pairs of territorial birds confirmed breeding comprising 16 species. One Gila woodpecker pair, one summer tanager pair, two pairs of vermilion flycatchers, and three pairs of Sonoran yellow warblers were confirmed breeding.

- CVCA – Fourteen area search plots were surveyed at this conservation area. There were 247 pairs of territorial birds confirmed breeding comprising 15 species. One Gila woodpecker pair, one summer tanager pair, and two pairs of Sonoran yellow warblers were confirmed breeding.

- Hunters Hole – One area search plot was surveyed at this conservation area. There were 10 pairs of territorial birds confirmed breeding comprising 5 species. No LCR MSCP covered species were confirmed breeding.

- LDCA – Ten area search plots were surveyed at this conservation area. There were 238 pairs of territorial birds confirmed breeding comprising 15 species. Twelve pairs of Arizona Bell's vireos, two pairs of Gila woodpeckers, and one Sonoran yellow warbler pair were confirmed breeding.

- Middle Bill Williams River NWR – Fourteen area search plots were surveyed at this creditable area. There were 1,298 pairs of territorial birds confirmed breeding comprising 22 species. Sixty pairs of Arizona Bell's vireos, 23 pairs of Gila woodpeckers, 130 pairs of Sonoran yellow warblers, and 12 pairs of summer tanagers were confirmed breeding.

- Parker Dam Camp – Two area search plots were surveyed at this conservation area. There were 93 pairs of territorial birds confirmed breeding comprising 16 species. One Gila woodpecker pair was confirmed breeding.

- PVER – Fifteen area search plots were surveyed at this conservation area. There were 262 pairs of territorial birds confirmed breeding comprising 16 species. Two pairs of Arizona Bell's vireo and eight pairs of summer tanagers were confirmed breeding.

- PWCA – Nine area search plots were surveyed at this conservation area. There were 87 pairs of territorial birds confirmed comprising 12 species. There were no LCR MSCP covered species confirmed breeding.

- YEW – Four area search plots were surveyed at this conservation area. There were 77 pairs of territorial birds confirmed breeding comprising 10 species. Four pairs of Gila woodpeckers were confirmed breeding.

All conservation areas had numerous pairs of non-territorial breeders as well.

Refinement of the multi-species survey mobile electronic field form continued so that all data were collected and summarized in ArcGIS Online. Data and record management activities continued.

The multi-species survey protocol and monitoring evaluation continued. The goals and objectives were finalized, and the vegetation map was prepared using remote sensing tools. Potential analysis and survey methods continued to be analyzed for suitability and cost efficiency. A power analysis of multiple survey methods was conducted. This evaluation will ensure that monitoring methods and statistical analyses are meeting the LCR MSCP long-term objectives.

FY20 Activities: Avian post-development monitoring will be conducted at existing conservation areas, including the BLCA, Parker Dam Camp, the PVER, the CVCA, Cibola NWR Unit #1, the PWCA, the LDCA, YEW, 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. 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 records management activities will continue. Monitoring of the Middle Bill Williams NWR creditable area will be moved to system-wide monitoring under Work Task D6. The multi-species survey protocol and monitoring plan evaluation will continue. The vegetation map and associated remote sensing tools will be refined. A decision on the suite of analysis and survey methods that may be used for multi-species monitoring will be made. Refinement of the mobile electronic field form platform for the multi-species survey will continue.

Proposed FY21 Activities: Avian post-development monitoring for LCR MSCP covered species will be conducted at conservation areas supporting riparian vegetation, including the BLCA, Parker Dam Camp, the PVER, Planet Ranch, the CVCA, Cibola NWR Unit #1, the PWCA, the LDCA, YEW, and Hunters Hole. 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 records management activities will continue. A long-term monitoring plan will be prepared as well as updated survey protocols and training materials.

Pertinent Reports: The *Riparian Bird Surveys at Conservation Areas in the Lower Colorado Region, 2019 Annual Report* is posted on the LCR MSCP website.

Work Task F3: Rodent Monitoring at Conservation Areas

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$65,000	$80,097.23	$676,237.21	$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 rodent species

Conservation Measures: CRCR1, DPMO1, MRM1 (CRCR, DPMO, and YHCR), MRM2 (DPMO), and YHCR1

Location: Reaches 3–7

Purpose: To monitor presence of covered and evaluation rodent species within conservation areas

Connections with Other Work Tasks (Past and Future): Post-development rodent monitoring will be conducted at conservation areas 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 rodent monitoring methods. Protocol improvements developed under Work Task C27 (closed) were incorporated under this work task.

Project Description: Rodent 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 conservation areas from FY06 to FY18. Trapping occurred for 1–2 nights at the sites sampled each year and was conducted in vegetation anticipated to provide the best habitat to capture Colorado River and Yuma hispid cotton rats. Colorado River cotton rats were captured at the Palo Verde Ecological Reserve (PVER) and Hart Mine Marsh (HMM). Yuma hispid cotton rats were captured at Yuma East Wetlands (YEW) and Hunters Hole.

FY19 Accomplishments: Presence live trapping surveys were conducted at the Beal Lake Conservation Area (BLCA), the PVER, the Cibola Valley Conservation Area (CVCA), the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1), HMM, YEW, the Laguna Division Conservation Area (LDCA), and Hunters Hole. Colorado River cotton rats were captured at the PVER, Cibola NWR Unit #1, the CVCA, and HMM; none were captured at the BLCA. Yuma hispid cotton rats were captured at the LDCA and Hunters Hole; none were captured at YEW.

FY19 obligations exceeded the estimate, as more surveys were conducted at conservation areas than under system-wide surveys (D10).

FY20 Activities: Rodent live trapping surveys will continue as part of the post-development monitoring efforts at the Big Bend Conservation Area, the BLCA, Cibola NWR Unit #1, the CVCA, the PVER, HMM, YEW, the LDCA, and Hunters Hole to detect the presence of cotton rats.

Proposed FY21 Activities: Rodent live trapping surveys will continue as part of the post-development monitoring efforts at the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the LDCA, the PVER, Parker Dam Camp, and YEW.

Pertinent Reports: The Fiscal Year 2017, 2018, and 2019 *Post-Development and System-Wide Monitoring of Rodent Populations Annual Reports* are posted on the LCR MSCP website.

Work Task F4: Bat Species Monitoring at Conservation Areas

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$140,000	$68,278.84	$1,354,029.11	$140,000	$90,000	$90,000	$90,000

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, Arizona; 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 (the western red bat and western yellow bat) and the two evaluation species (the pale Townsend's big-eared bat and California leaf-nosed bat).

Connections with Other Work Tasks (Past and Future): Pre- and post-development monitoring will be conducted at 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 (the western red bat and western yellow bat) and the two evaluation species (the pale Townsend's big-eared bat and California leaf-nosed bat) will be conducted at conservation areas. Acoustic monitoring will record bat

echolocation calls in order to determine species presence. Bats may be captured with mist nets at these sites to determine the age, sex, and reproductive status of the covered and evaluation bat species.

Previous Activities: Conservation areas were monitored from FY07 to FY18 using acoustic and/or capture techniques. Western red bats, western yellow bats, and California leaf-nosed bats have been detected at the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, Planet Ranch, the PVER, and Yuma East Wetlands. 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 FY08–18 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 cottonwood-willow riparian forest would be needed to identify bat roosting and foraging habitat characteristics.

FY19 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, and Cibola NWR Unit #1. The results will be reported when the analysis is completed.

Obligations were less than estimated, as the acoustic monitoring stations at Yuma East Wetlands and Hunters Hole were moved to the system-wide network in FY19.

FY20 Activities: Bat presence will continue to be monitored in Reaches 3–5 at the BLCA, the PVER, the CVCA, and Cibola NWR Unit #1 using six acoustic monitoring stations. Data will be analyzed, presence documented, and activity level rates calculated.

Proposed FY21 Activities: Acoustic stations will be installed at the Dennis Underwood Conservation Area and Planet Ranch, and the second stations at the PVER and CVCA will not be used. Bat presence will be monitored in Reaches 3–5 at the BLCA, the PVER, the Dennis Underwood Conservation Area, the CVCA, Cibola NWR Unit #1, and Planet Ranch using six acoustic monitoring stations. Data will be analyzed, presence documented, and activity level rates calculated.

Pertinent Reports: The *Post-Development Acoustic Monitoring of LCR MSCP Bat Species, 2017 Annual Report* and the *Post-Development Acoustic Monitoring of LCR MSCP Bat Species, 2018 Annual Report* are posted on the LCR MSCP website. The FY19 annual report will also be posted upon completion.

Work Task F5: Post-Development Monitoring of Fishes at Conservation Areas

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$450,000	$395,696.03	$2,898,559.24	$450,000	$400,000	$400,000	$400,000

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 conservation areas 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. Other related work tasks have included Work Tasks C23 (closed), C31 (closed), C33 (closed), C34 (closed), C40 (closed), and C41 (closed).

Project Description: Fishes and created backwater 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 remote passive integrated transponder (PIT) scanning, trapping (hoop, fyke, and minnow traps), trammel netting, electrofishing, larval collections, and ocular surveys (including scuba and snorkeling where necessary and practical). Water

quality assessments will require annual monitoring of temperature, oxygen, pH, and conductivity (salinity) as well as periodic evaluations of chemical makeup and selenium.

Previous Activities: Between FY06 and FY12, Beal Lake was 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 fishes were marked with PIT tags. Subsets of stocked native fishes were contacted through annual surveys, but long-term survival was low. Stocking was discontinued in 2012. A large fishkill was observed the following year, and water samples confirmed the presence of toxic golden algae. Subsequent water sampling over a 4-year sampling period (FY14–17) resulted in no additional detections. With renovation of Beal Lake planned for future years, native fish activities were postponed until renovation could be completed.

Routine monitoring of the Big Bend Conservation Area (BBCA) has been conducted monthly from February through May each year since FY11. Monitoring has included recording water quality and electrofishing, trammel netting, remote PIT scanning, and larval light trapping in areas where native fishes were historically contacted. Low numbers of razorback and flannelmouth suckers were contacted through these efforts, including larvae of both species and subadult flannelmouth suckers. This backwater has a direct surface connection to the lower Colorado River; consequently, water quality parameters have remained within suitable ranges for native fishes.

Monitoring of the Imperial ponds was previously completed under Work Task C25 (closed) and was moved to this work task in FY18. Monitoring has consisted of surveys for larval, juvenile, and adult native fishes. Adult razorback suckers stocked into Ponds 1, 3, and 4 in December 2016 averaged 64% survival through September 2018, and bonytail stocked into Ponds 2, 5, and 6 in March 2017 averaged 22% survival during the same period. Recruits were captured in each of the bonytail ponds, and the low survival of adult bonytail may be a result of increased competition for food resources. A single razorback sucker recruit (319 millimeters in total length) was captured in Pond 1 in FY18.

FY19 Accomplishments:

BBCA – Larval sampling was conducted at the BBCA from January through May and resulted in the capture of 12 razorback sucker larvae and 26 flannelmouth sucker larvae. Mobile remote PIT scanners deployed once per month during this same period contacted 23 razorback suckers. No other native fishes were contacted by these units. In addition to the mobile PIT scanners deployed January through May, a single, permanent PIT scanner was also deployed to scan continuously throughout the year. This unit contacted 40 razorback suckers and 1 bonytail. Water quality monitoring was also completed quarterly, and all recorded parameters (i.e., temperature, dissolved oxygen, conductivity, and pH)

were within suitable ranges for native fishes. No trammel netting was conducted in the BBCA backwater due to sedimentation and reduced access. These efforts will be resumed following completion of dredging activities.

Mohave Valley Conservation Area – Construction of the Mohave Valley Conservation Area was completed in FY19. Two permanent PIT scanners installed at the inflow and outflow structures ran continuously, but the outflow scanner was only accessible to fishes once the cofferdam was removed at the end of January. In total, the scanners contacted 1,931 razorback suckers and 1 bonytail.

Imperial Ponds Conservation Area – Monitoring of the Imperial ponds consisted of surveys for larval, juvenile, and adult native fishes. Population estimates for PIT-tagged razorback suckers and bonytail were calculated using remote PIT scanning detections. Population estimates for FY19 are summarized in table 1.

Table 1.—Imperial Ponds Population Estimates

Pond	Species	Population Estimate	95% Confidence Interval
1	Razorback sucker	228	109–476
2	Bonytail	93	72–121
3	Razorback sucker	219	190–252
4	Razorback sucker	204	162–257
5	Bonytail	110	77–153
6	Bonytail	75	55–99

Recruits were captured in each bonytail pond, and the majority of captured fish were untagged, which suggests that the actual populations may be larger than estimated. Larval razorback suckers and untagged juveniles were captured in Pond 1, indicating that a substantial recruitment event occurred. Ponds 3 and 4 have yet to show any signs of recruitment, with the exception of a single razorback sucker recruit that was captured in Pond 3.

FY20 Activities:

BBCA – Monitoring efforts will continue and will include larval fish collections, intensive remote PIT scanning, and water quality assessments from January through May. Additional monitoring will be completed during the remainder of the year using a single, permanent remote PIT scanner, which will scan continuously, and quarterly trips to record water quality data.

Mohave Valley Conservation Area – Native fish monitoring will continue via remote PIT scanners that were integrated into the inflow and outflow structures. Scanning data will be used to confirm the presence of native fishes, and supplemental sampling will be completed as needed.

Imperial Ponds Conservation Area – Field work will continue to focus on population monitoring and documenting recruitment. Activities will include 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.

Proposed FY21 Activities: The BBCA is scheduled for dredging in FY21, which will likely result in reduced monitoring at this site. Monitoring of native fishes at other conservation areas will continue at levels similar to previous years. Construction of four refugia ponds at Planet Ranch is expected to be complete. Native fishes will not likely be stocked for several years while pond productivity and water quality are monitored.

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

Work Task F6: Post-Development Monitoring of MacNeill's Sootywing Skippers at Conservation Areas

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$20,000	$15,943.78	$581,620.11	$20,000	$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 of MacNeill's sootywing skippers (sootywings)

Conservation Measures: MNSW1 and MRM2 (MNSW)

Location: Habitat conservation areas, Reaches 1–4

Purpose: To monitor 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 cottonwood-willow habitat containing quailbush along the lower Colorado River will be conducted under Work Task D14 starting in FY19 to inform management of creditable habitat.

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 (CVCA) and Palo Verde Ecological Reserve (PVER) 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 CVCA, the PVER, the Cibola National Wildlife Refuge Unit #1 Conservation Area, and Hart Mine Marsh in Reaches 3–5 and at Hunters Hole in Reach 7.

FY19 Accomplishments: The PVER, CVCA, and the Pretty Water Conservation Area were surveyed for sootywing presence in April. Sootywings were detected at all three conservation areas. Sootywings were recorded at all sites during April 2019, so no further surveys were completed in May or June.

FY20 Activities: Presence surveys for sootywings will be conducted in March, April, May, and June in potential habitat within the CVCA, PVER, and the Pretty Water Conservation Area. Once sootywings are detected, surveys in the remaining months will not be conducted.

Proposed FY21 Activities: The honey mesquite land cover type at conservation areas in Reaches 3 and 4 will be surveyed to monitor for continued presence of sootywings. Presence surveys for sootywings will be conducted in potential habitat during March, April, May, and June. Once sootywings are detected, surveys in the remaining months will not be conducted.

Pertinent Reports: The *Monitoring of the MacNeill's Sootywing Skipper and its Habitats, 2019 Annual Report* is posted on the LCR MSCP website.

Work Task F7: Marsh Bird Monitoring at Conservation Areas

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$40,000	$38,311.68	$208,641.22	$10,000	$10,000	$10,000	$10,000

Contact: Joe Kahl, Jr. (702) 293-8568, jkahl@usbr.gov

Start Date: FY11

Expected Duration: FY55

Long-Term Goal: Post-development monitoring of California black rails, western least bitterns, and Yuma clapper rails

Conservation Measures: MRM1 and MRM2 (BLRA, CLRA, and LEBI)

Location: Presence surveys will be conducted at conservation areas where marsh habitat was created, including Hart Mine Marsh (HMM) on the Cibola National Wildlife Refuge; the Imperial Ponds Conservation Area (IPCA) on the Imperial National Wildlife Refuge; and Yuma East Wetlands (YEW), 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 and under Work Task D1 since FY05.

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: HMM and the IPCA were surveyed for marsh birds prior to development. Marsh bird surveys were conducted at HMM and IPCA Field 18 after restoration was completed and at YEW after its inclusion into the LCR MSCP. In addition, marsh bird surveys were conducted at the Big Bend Conservation Area, the Beal Lake Conservation Area (BLCA), the ponds at the IPCA, and the Laguna Division Conservation Area to determine if areas containing marsh vegetation at these conservation areas were also utilized by

LCR MSCP covered marsh bird species. From FY12 to FY18, the LCR MSCP partnered with the U.S. Fish and Wildlife (USFWS) to share the costs and labor needed to conduct the surveys at HMM and the IPCA.

FY19 Accomplishments: Marsh bird surveys were conducted once during March and twice in April (tables 1 to 3). Surveys were not conducted at IPCA Field 18 in March, as the field was dry during irrigation ditch reconstruction.

Table 1.—California Black Rail Detections

Conservation Area	Survey 1 (March)	Survey 2 (April)	Survey 3 (late April)
Hart Mine Marsh	0	0	0
Imperial Ponds Conservation Area Field 18	No survey	1	1
Yuma East Wetlands	0	0	0
Beal Lake Conservation Area	0	0	0

Table 2.—Western Least Bittern Detections

Conservation Area	Survey 1 (March)	Survey 2 (April)	Survey 3 (late April)
Hart Mine Marsh	4	7	7
Imperial Ponds Conservation Area Field 18	No survey	0	0
Yuma East Wetlands	0	0	1
Beal Lake Conservation Area	0	5	11

Table 3.—Yuma Clapper Rail Detections

Conservation Area	Survey 1 (March)	Survey 2 (April)	Survey 3 (late April
Hart Mine Marsh	6	7	20
Imperial Ponds Conservation Area Field 18	No survey	6	5
Yuma East Wetlands	0	1	4
Beal Lake Conservation Area	11	11	13

FY20 Activities: Marsh bird surveys will only be conducted on conservation areas with creditable marsh land cover: HMM, IPCA Field 18, and YEW. Data will be entered into the LCR MSCP and Avian Knowledge Network (AKN) databases and analyzed.

Obligations in FY20 are expected to be lower than in previous years, as surveys funded from this work task will only be conducted at YEW. The USFWS is funded to conduct the surveys at HMM and IPCA Field 18 through Work Tasks E9 and E14.

Proposed FY21 Activities: Marsh bird surveys will be conducted on conservation areas with creditable marsh land cover: HMM, IPCA Field 18, and YEW. Data will be entered into the LCR MSCP and AKN databases and analyzed. The USFWS is funded to conduct the surveys at HMM and IPCA Field 18 through Work Tasks E9 and E14.

Pertinent Reports: The *Marsh Bird Surveys at Conservation Areas, 2019 Annual Report* is posted on the LCR MSCP website.

Work Task F8: Reptile and Amphibian Monitoring at Conservation Areas

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$25,000	$1,211.89	$10,911.47	$25,000	$25,000	$25,000	$25,000

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

Start Date: FY18

Expected Duration: FY55

Long-Term Goal: Post-development monitoring for Colorado River toads, lowland leopard frogs, and northern Mexican gartersnakes

Conservation Measures: CRTO1, LLFR1, and MRM2 (NMGS)

Location: Presence surveys will be conducted at conservation areas where marsh habitat was created, including adjacent cottonwood-willow habitat where northern Mexican gartersnakes may be present, such as the Beal Lake Conservation Area, the Havasu National Wildlife Refuge, and Planet Ranch, Arizona.

Purpose: To monitor the use of created marsh habitat and associated cottonwood-willow 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 conservation areas where marsh habitat was created, and nearby cottonwood-willow habitat, where northern Mexican gartersnakes may be present.

Previous Activities: Site visits were conducted in FY18 at the Bubbling Ponds Fish Hatchery, Santa Maria River, and the Big Sandy River in February to view created fish backwaters that are being used by northern Mexican gartersnakes and natural riparian habitat. The U.S. Fish and Wildlife Service (USFWS) and Arizona Game and Fish Department shared lessons learned regarding facility

management challenges, habitat characteristics, and species activity periods. The LCR MSCP participated in the annual Northern Mexican Gartersnake Coordination Meeting.

FY19 Accomplishments: Northern Mexican gartersnake surveys and avoidance monitoring were not required in FY19, resulting in less obligations. LCR MSCP biologists observed surveys conducted by the USFWS at the Havasu National Wildlife Refuge and participated in an end-of-season briefing conducted by the USFWS at the refuge to observe the habitat gartersnakes are using in and around the Beal Lake Conservation Area.

FY20 Activities: Pre-construction presence surveys and monitoring for northern Mexican gartersnakes may 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.

Proposed FY21 Activities: Pre-construction presence surveys and monitoring for northern Mexican gartersnakes may 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. A monitoring plan for northern Mexican gartersnakes will be prepared.

Pertinent Reports: N/A

Work Task F9: Southwestern Willow Flycatcher Monitoring at Conservation Areas

FY19 Estimates	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$500,000	$352,596.64	$359,167.53	$360,000	$360,000	$360,000	$360,000

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 the 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 was split into separate work tasks beginning in FY18, with system-wide monitoring continuing under Work Task D2 and post-development monitoring conducted under this work task.

Project Description: Presence surveys are conducted at LCR MSCP conservation areas.

Previous Activities: Presence surveys and life history studies of southwestern willow flycatchers have been conducted along the LCR since 1996, with surveys funded from FY05 to FY17 under Work Task D2.

FY19 Accomplishments: Presence surveys for southwestern willow flycatchers were conducted at 37 sites on LCR MSCP conservation areas and the Middle Bill Williams River National Wildlife Refuge (Middle Bill Williams River NWR) (E21) containing the cottonwood-willow land cover type. This included the Beal Lake Conservation Area, the Palo Verde Ecological Reserve,

the Cibola Valley Conservation Area, the Cibola Valley National Wildlife Refuge Unit #1 Conservation Area, the Middle Bill Williams River NWR, Planet Ranch, the Laguna Division Conservation Area, Yuma East Wetlands, and Hunters Hole. Migratory willow flycatchers were detected at all conservation areas, but no resident southwestern willow flycatchers were detected at any conservation area. Nest monitoring and color banding activities were not conducted.

FY19 obligations were less than estimated. When Work Task D2 was split into Work Tasks D2 and F9, more funding was estimated under Work Task F9 than needed. The funding was shifted to Work Task D2; Work Task F9 obligations reflect the actual cost of conducting the conservation area surveys.

FY20 Activities: Presence surveys for southwestern willow flycatchers will be conducted at LCR MSCP conservation areas containing the cottonwood-willow land cover type. Nest monitoring and color banding may occur if potentially breeding southwestern willow flycatchers are detected at LCR MSCP conservation areas.

Proposed FY21 Activities: Presence surveys for southwestern willow flycatchers will be conducted at LCR MSCP conservation areas containing the cottonwood-willow land cover type. Nest monitoring and color banding may occur if potentially breeding southwestern willow flycatchers are detected at LCR MSCP conservation areas. Surveys in the Middle Bill Williams River NWR will be conducted under Work Task D2.

Pertinent Reports: The *Southwestern Willow Flycatcher Monitoring Along the Lower Colorado River and Tributaries, 2019 Annual Report* is posted on the LCR MSCP website.

Work Task F10: Yellow-billed Cuckoo Monitoring at Conservation Areas

FY19 Estimates	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$650,000	$652,369.99	$1,191,143.06	$650,000	$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 of 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 was 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 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: Surveys were conducted in FY18 at all LCR MSCP conservation areas with suitable cottonwood-willow habitat, including the Beal Lake Conservation Area (BLCA), the Palo Verde Ecological Reserve (PVER), the Cibola Valley Conservation Area (CVCA), the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1), Yuma East Wetlands (YEW), the Laguna Division Conservation Area (LDCA), the Middle Bill Williams River National Wildlife Refuge (Middle Bill Williams River NWR), Planet Ranch, and

Hunters Hole. Birds banded in previous years were resighted, and nests were found incidental to these activities. Followup visits to find cuckoos tagged with geolocator devices in previous years were conducted at the PVER. Followup visits to determine breeding status were conducted at conservation areas where breeding has yet to be documented, or has not been documented recently, including the LDCA, YEW, the CVCA, and Hippy Fire.

Cuckoos were detected at the BLCA, the Middle Bill Williams River NWR, the PVER, the CVCA, Cibola NWR Unit #1, YEW, the LDCA, Planet Ranch, and Hunters Hole. Thirty-five confirmed breeding territories, 24 nests, and an additional 11 probable and 26 possible breeding territories were detected in FY18. One breeding territory was confirmed at the BLCA. There were 26 confirmed breeding territories and 18 nests at the PVER and 5 confirmed territories and 3 nests at Cibola NWR Unit #1. Two nests were found at the CVCA, and one nest was found at YEW.

FY19 Accomplishments: Surveys were conducted at all LCR MSCP conservation areas with suitable cottonwood-willow habitat, including the BLCA, the PVER, the CVCA, Cibola NWR Unit #1, YEW, the LDCA, the Middle Bill Williams River NWR, Planet Ranch, and Hunters Hole. Birds banded in previous years were resighted, and nests were found incidental to these activities. Followup visits to determine breeding status were conducted at conservation areas where breeding has yet to be documented (LDCA and Hunters Hole) or has not been documented recently. Followup visits to find cuckoos tagged with geolocator devices in previous years (D7) were conducted at the PVER, which provided opportunities to collect additional cuckoo activity and breeding evidence to refine the number of estimated territories under this work task.

There were 263 detections of cuckoos throughout the LCR MSCP's conservation areas. Cuckoos were detected at the BLCA, the Middle Bill Williams River NWR, the PVER, the CVCA, Cibola NWR Unit #1, YEW, the LDCA, Planet Ranch, and Hunters Hole. There were 20 confirmed, 26 probable, and 31 possible breeding territories estimated in FY19. No breeding territories were confirmed at the BLCA. There were eight confirmed breeding territories, including six nests, at the PVER (Phases 3, 5, 6, and 7). At Cibola NWR Unit #1, there were seven confirmed territories, including seven nests, found at the Crane Roost, Hippy Fire, Mass Transplanting, and Seed Feasibility sites. Three territories were confirmed at the CVCA, with three nests found in Phases 7 and 8. One confirmed territory with one nest was found at YEW.

Second-generation mobile electronic field forms for monitoring yellow-billed cuckoos were designed and used during the field season.

FY20 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.

Proposed FY21 Activities: Surveys will continue at all conservation areas, and the work will be similar to the effort in FY20. Future monitoring intensity will be evaluated.

Pertinent Reports: The *Yellow-billed Cuckoo Surveys on the Lower Colorado River and Tributaries, 2014–2018 Summary Report* is posted on the LCR MSCP website. The *Yellow-billed Cuckoo Surveys on the Lower Colorado River, 2019 Annual Report* will also be posted upon completion.

WORK TASKS – SECTION G

Adaptive Management Program

Work Task G1: Data Management

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$1,250,000	$892,299.95	$8,620,497.02	$1,000,000	$850,000	$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 LCR MSCP manages 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: The Database Management System Requirements Analysis was completed in FY06, which outlined several options and recommendations for implementing a database management system. Some recommendations from this analysis were implemented.

Support for the LCR Native Fish Database has been provided since FY04. The primary purpose of the database is to support periodic population estimates of native fishes.

Mobile data loggers and software for collection of data in the field were acquired. These units helped to standardize data collection across LCR MSCP projects. Mobile electronic field forms (MEFFs)/data dictionaries for data collection were developed and used for most field data collection. The data from these first-generation MEFFs were transferred from single-year, single-project databases to a single enterprise database system. This allowed for cross-project data management and analysis.

A new platform was selected in FY17 for field data collection. The platform was selected based on its ability to (1) integrate with current LCR MSCP systems, (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 platform are considered second-generation MEFFs.

FY19 Accomplishments: Maintenance and updates to the LCR MSCP website continued, including posting of all reports, Steering Committee information, and status updates for ongoing projects. The conceptual redesign portion of the LCR MSCP website update was completed. The next steps include implementation of the new design and migration to a content management system to take place during FY20. Obligations were less than expected due to delays in establishing the agreement for implementation of the website redesign.

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.

Additional projects were transferred to second-generation MEFFs. Proofing and reporting tools were developed for projects using second-generation MEFFs using the same platform used for field data collection. Use of this uniform platform for both field data collection and proofing/reporting adds additional efficiency to the data management workflow. Field data collection devices compatible with this new platform and software tools to assist with the transition were acquired.

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.

The LCR MSCP continued to participate in the Reclamation Information Sharing Environment (RISE) (https://water.usbr.gov/docs/RISE.pdf). RISE is an open data initiative sponsored by the Bureau of Reclamation, with the goal of sharing its data in consistent, open, machine-readable formats via a centralized,

sustainable public data portal. This will help provide reasonable data access for members of the Steering Committee for monitoring the progress and performance of the LCR MSCP. The LCR MSCP also continued to participate in planning for a U.S. Fish and Wildlife Service (USFWS) initiative to allow for cloud-based electronic delivery of southwestern willow flycatcher data instead of older, less-efficient methods. These data will be submitted using the Avian Knowledge Network infrastructure.

FY20 Activities: Maintenance and updates to the LCR MSCP website continue, including posting of all published reports, Steering Committee information, and status updates for ongoing projects. Work on implementation of the website redesign has begun. Launching of the new website is scheduled for mid- to late FY20.

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.

The field data collection processes continue to be updated and/or maintained. Additional projects are being transitioned to the second-generation MEFF platform. Improvements are being made to data collection protocols, quality assurance and quality control procedures, and post-processing techniques using the new platform.

The LCR MSCP continues to participate in the RISE effort and the USFWS Avian Knowledge Network initiatives.

Proposed FY21 Activities: Once the new website is launched, updates and additional content will be incorporated into the new content management system.

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. It is also anticipated that native fish stocking data in legacy formats will be incorporated into the LCR MSCP database. Field collection of native fish stocking data and other fisheries related data will be updated to use second-generation MEFFs.

Any wildlife or restoration field data collection project not using MEFFs will be updated to second-generation MEFFs. 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. Participation in the RISE project and the USFWS Avian Knowledge Network initiative will continue.

Pertinent Reports: N/A

Work Task G3: Adaptive Management Research Projects

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$300,000	$59,455.02	$2,877,655.71	$100,000	$100,000	$100,000	$100,000

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 will be developed and evaluated that can measure the effectiveness of conservation actions, and data will be provided to improve the efficacy of techniques for creating and maintaining habitat.

Funding will be provided to initiate high-priority research projects identified during the year that were not identified as work tasks in the work plan. 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 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.

FY19 Accomplishments: Hydrologic models of Reach 3 of the lower Colorado River were updated. The results of these models, primarily water surface elevations under different flow regimes, will be used primarily for continued marsh bird occupancy modeling that was originally funded under Work Task C66 (closed). The updated model can also be used for other work tasks that can use this information, combined with biological data, to explore interactions of water surface and species presence. This work was funded under this work task because there was no money budgeted for this activity under other existing work tasks.

FY20 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. Due to an expected decrease in the need for adaptive management research projects, proposed budget estimates have been reduced for FY20 and later.

Proposed FY21 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 website upon completion.

Work Task G4: Science/Adaptive Management Strategy

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$400,000	$302,803.39	$2,800,159.04	$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 (HCP) 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: a 5-year planning cycle and 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.

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 HCP. This includes internal and external peer reviews 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 HCP and other program documents.

Previous Activities: The science strategy was developed in August 2006 and finalized in October 2007. The LCR MSCP hosted and attended the Colorado River Terrestrial and Riparian meetings and the Colorado River Aquatic Biologists meetings. 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 (BONY3, BLRA1, RASU3, 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 BEVI1, CRCR2, WRBA1, and WYBA3.

Independent program reviews were completed on bat and vegetation monitoring projects.

FY19 Accomplishments: Scientific peer reviews were conducted on approximately 40 reports, which are posted on the LCR MSCP website. These reviews were accomplished through the established internal and external peer review process.

The LCR MSCP *Five-Year Monitoring and Research Priorities Report 2018–22* was completed in FY18 and posted on the website in early FY19.

Feedback and input were provided on internal study plan designs, 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.

The multi-species survey protocol and monitoring evaluation continued. The monitoring goals and objectives were finalized, and the vegetation map was prepared using remote sensing tools. Potential analysis and survey methods continued to be analyzed for suitability and cost efficiency. A power analysis of multiple survey methods was conducted. This evaluation will ensure that monitoring methods and statistical analyses are meeting the LCR MSCP long-term objectives.

Based on the independent review of all fish genetic data collected to date, and the current methods and available technology, a panel of five genetic experts recommended a plan for updating the genetic monitoring of native fishes. This plan aligns with the goals/needs/objectives of the LCR MSCP and describes the necessary level of effort expected to meet long-term needs for monitoring fish genetics. The panel of experts will be available to review proposals to accomplish the provided recommendations.

The development of adaptive management plans for each research and monitoring effort continued in FY19. Four drafts were completed and went through the internal review process. 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
- Potential adaptive management actions

These plans will feed into the development of the conservation area management plans for each conservation area.

The LCR MSCP hosted and attended an occupancy modeling workshop with interested Federal partners and contractors. The LCR MSCP attended the 15th Biennial Conference on Science and Management for the Colorado River Plateau and Southwest Region.

The habitat creation accomplishment analysis was not conducted during FY19 due to the lidar vegetation data not being available. Lidar acquisition for FY18 and FY19 included the entire LCR MSCP planning area. Due to the volume of data being collected and delays in obtaining landowner approvals, processed data will not be available until mid-FY20.

FY20 Activities: Research and monitoring activities continue to be reviewed and evaluated internally as well as through independent, external reviewers.

The multi-species survey protocol and monitoring evaluation will continue. The vegetation map and associated remote sensing tools will be refined. A decision on the suite of analysis and survey methods that may be used for multi-species monitoring will be made.

Initial steps for implementing the recommendations from the fish genetics panel will be completed, and the panel will review any proposals received for implementing the genetics monitoring program.

Development of adaptive management plans for each research and monitoring effort continue. Development of decision support tools has been postponed until completion of the adaptive management plans.

Proposed FY21 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 conceptual ecological models 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 to refine existing plans. At each conservation area, proposed management guidelines must be agreed upon by the LCR MSCP and the landowner. After concurrence, 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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$40,000	$40,488.91	$145,280.59	$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: To ensure successful and efficient implementation of the LCR MSCP conservation measures

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, NMGS1, 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 decision making, 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 inform 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.

The CEM developed in FY14 for the razorback sucker was updated in FY17 to reflect new information about the species.

FY19 Accomplishments: Updates to all existing CEMs continued (except for the razorback sucker, which was updated in FY17). The literature was reviewed for new information, and subject matter experts were consulted. These updates will be included as addendums. When more substantial updates are performed, new versions of the CEMs will be generated.

CEMs for the five LCR MSCP evaluation species (California leaf-nosed bat, Colorado River toad, desert pocket mouse, lowland leopard frog, and pale Townsend's big-eared bat) and the northern Mexican gartersnake have been developed.

CEMs for the bonytail, flannelmouth sucker, and MacNeill's sootywing skipper were finalized and published on the LCR MSCP website.

The CEMs were used in the development of four drafts of adaptive management plans being developed under Work Task G4.

FY20 Activities: Work on updates to all existing CEMs continues. CEMs for the five evaluation species are being reviewed and finalized.

Proposed FY21 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 LCR MSCP covered species.

Pertinent Reports: The CEMs for bonytail, flannelmouth suckers, and MacNeill's sootywing skippers are posted on the LCR MSCP website. The remaining CEMs will also be posted upon completion.

WORK TASKS – SECTION H

Funding Accounts

Work Task H1: Habitat Maintenance Fund

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19[1]	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$0	$0	$32,466,770.00	$0	$0	$0	$0

[1] Cumulative expenditures reflect total required contributions to develop the fund without interest.

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. The highest priority is the protection of marsh, 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 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 California black rail and Yuma clapper rail key population centers at Topock Marsh and Mittry Lake.

Discussions between the LCR MSCP, the USFWS Arizona Ecological Services Field Office, and the USFWS Region 2 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. Funding from the HMF will not be used or budgeted until AMM2 funding is exhausted.

FY19 Accomplishments: No funds were expended from the HMF for project purposes. The total dollar value of the HMF at the end of FY19, with interest, was $36,967,064.61.

The USFWS developed a 10-year plan to manage marshes that were suitable habitat for marsh birds covered under the LCR MSCP at the time of the signing of the Record of Decision (2005). Discussions continued with the USFWS regarding the use of the HMF to fund a coordinated, long-term, controlled burn program at the Havasu and Imperial National Wildlife Refuges, but no proposal was submitted from the USFWS.

FY20 Activities:

Existing Marsh Maintenance on National Wildlife Refuges: The LCR MSCP is providing general support and guidance to the USFWS to develop a proposal to manage marshes for the next 10 years on all four refuges along the lower Colorado River. Implementation of this 10-year plan would begin after a proposal is submitted and the project is authorized. A formal proposal is anticipated in late FY20.

Topock Marsh: No activities will be conducted under the HMF until all AMM2 funding is spent and the USFWS submits a proposal to make infrastructure improvements to benefit marsh birds covered under the LCR MSCP.

Mittry Lake: No activities or proposals are anticipated.

Proposed FY21 Activities:

Existing Marsh Maintenance on National Wildlife Refuges: If a proposal is received in FY20, it would be reviewed and considered.

Topock Marsh: A proposal is anticipated in FY21 when an engineering design and cost estimate for new pumping platform have been prepared.

Mittry Lake: Activities will be conducted if proposals are received by the LCR MSCP.

Pertinent Reports: N/A

Work Task H2: Remedial Measures Fund

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19[1]	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$1,147,832	$1,147,832	$8,477,667.38	$1,194,796	$1,208,328	$1,208,328	$1,208,328

[1] 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 to establish interest-bearing Remedial Measure Funds managed by each State. 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.

Previous Activities: A Remedial Measures Fund process was established and approved by the Steering Committee in FY12.

FY19 Accomplishments: A total of $1,147,832 was deposited into three non-Federal interest-bearing accounts among Arizona, California, and Nevada. They consisted of $286,958 of funding from Arizona, $286,958 from Nevada, and $573,916 from California. The total dollar value of the Remedial Measures Fund at the end of FY19, with interest, was $9,142,832,05. No funds have been withdrawn from the Remedial Measures Fund to date.

FY20 Activities: A total of $1,194,796 will be deposited into three non-Federal interest-bearing accounts among Arizona, California, and Nevada.

Proposed FY21 Activities: A total of $1,208,328 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

FY19 Estimate	FY19 Actual Obligations	Cumulative Expenditures Through FY19	FY20 Approved Estimate	FY21 Proposed Estimate	FY22 Proposed Estimate	FY23 Proposed Estimate
$125,000	$112,752.67	$1,003,571.49	$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: Provide information about LCR MSCP goals and implementation activities 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: 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 school groups, 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 has hosted the Colorado River Terrestrial and Riparian meeting since FY06 and participated in the Colorado River Aquatic Biologists meeting since FY05. These meetings provide centralized forums for scientists and resource managers to discuss current research and monitoring projects taking place on the lower Colorado River. Information from these meetings is available on the LCR MSCP website.

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 detailed

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.

FY19 Accomplishments: LCR MSCP information was exhibited at numerous science education events, including the eighth annual Las Vegas Science and Technology Festival, the Colorado River Water Users Association annual conference (CRWUA), and the Arizona Game and Fish Department Outdoor Expo, as well as numerous smaller events. The Outdoor Expo was the largest event, drawing more than 44,000 attendees during the two main days that the LCR MSCP participated.

The LCR MSCP provided tours of conservation areas for the Water Education Foundation and other stakeholder groups. The LCR MSCP presented programs at one continuing education workshop for Project WET (Water Education for Teachers). Participation in this project is through a partnership between the National Park Service and Bureau of Reclamation. These workshops focus on explaining Colorado River water, science, and other related issues to Nevada teachers and providing information to be used in classrooms. The LCR MSCP also visited several elementary schools in southern Nevada, contacting approximately 180 students.

The LCR MSCP received 41 hours of volunteer labor during the year. Volunteers participated in wildlife monitoring at several locations and razorback sucker monitoring on Lake Havasu. These volunteers assisted the LCR MSCP, engaged the public and youth in conservation work, and fostered relationships between the community and the program.

FY20 Activities: During March 2020, a multi-day tour will be conducted to commemorate 15 years of program implementation. This will involve extensive planning efforts, contract preparation, and coordination. Efforts are underway to set up contracts for transportation and meeting space for the tour.

The existing four-panel display banner will be replaced this year with a new set of banners to be used at conferences and other special events. Costs for renting exhibit space at the CRWUA, the Colorado River Terrestrial and Riparian meeting, and the Las Vegas Science and Technology Festival will be funded from this work task. The LCR MSCP will participate in educational events, science and conservation-themed community events, and several conferences, including the CRWUA, the Las Vegas Science and Technology Festival, and Project WET workshops.

Proposed FY21 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 annual CRWUA 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 2019 annual report will be posted on the LCR MSCP website 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 2019

B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2019

B-3: LCR MSCP Non-Federal Covered Activities and Incidental Take Summary, Fiscal Year 2019

C Recommendations from Resource Agencies

D Financial Statement

D-1: Required Contributions, FY06 – FY10, FY11 – FY15, FY16, FY17

D-1: Required Contributions, FY18, FY19, FY06 – FY19

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, FY04 – FY15, FY16, and FY17

D-4: Cumulative Program Accomplishment, FY18, FY19, and FY04 – FY19

E Reports Published in Fiscal Year 2019

Attachment A – Letter from Central Arizona Water Conservation District

CAP
CENTRAL ARIZONA PROJECT

May 21, 2020

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 2021, both annually and quarterly, are shown by state below. The inflation index used is 1.518.

FY21 is year 16 of the program and the sixth year of Arizona's 20 year payback period.

FY 2021 Non-Federal Share (2003 $)	$ 9,991,000
FY 2021 Inflation Index	1.518
FY 2021 Non-Federal Share (Escalated $)	$15,166,338

FY 2021 Non-Fed	Arizona Payback	Other Work Tasks	Remedial Measures	Total Non-Fed Payment Due
Arizona	$ 799,192.84	$3,489,502.50	$ 302,082.00	$ 4,590,777.34
Nevada	(399,596.42)	3,489,502.50	302,082.00	3,391,988.08
California	(399,596.42)	6,979,005.00	604,164.00	7,183,572.58
Totals	$ 0.0	$13,958,010.00	$1,208,328.00	$15,166,338.00

P.O. Box 43020 – Phoenix, AZ 85080-3020 • 23636 North Seventh Street – Phoenix, AZ 85024 • 623-869-2333 • www.cap-az.com

FY 2020 Quarterly Payments		Arizona Payback	Other Work Tasks	Remedial Measures	Total Non-Fed Payment Due
Arizona	Q1	$ 199,798.21	$ 875,375.63	$ 75,520.50	$1,147,694.34
	Q2	199,798.21	875,375.63	75,520.50	1,147,694.34
	Q3	199,798.21	875,375.63	75,520.50	1,147,694.34
	Q4	199,798.21	875,375.61	75,520.50	1,147,694.32
	FY Totals	$ 799,192.84	$3,489,502.50	$302,082.00	$4,590,777.34
Nevada	Q1	$ (99,899.11)	$ 872,375.63	$ 75,520.50	$ 847,997.02
	Q2	(99,899.11)	872,375.63	75,520.50	847,997.02
	Q3	(99,899.11)	872,375.63	75,520.50	847,997.02
	Q4	(99,899.09)	872,375.61	75,520.50	847,997.02
	FY Totals	$ (399,596.42)	$3,489,502.50	$302,082.00	$3,391,988.08
California	Q1	$ (99,899.11)	$1,744,751.25	$151,041.00	$1,795,893.14
	Q2	(99,899.11)	1,744,751.25	151,041.00	1,795,893.14
	Q3	(99,899.11)	1,744,751.25	151,041.00	1,795,893.14
	Q4	(99,899.09)	1,744,751.25	151,041.00	1,795,893.16
	FY Totals	$ (399,596.42)	$6,979,005.00	$604,164.00	$7,183,572.58

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,

T Cooke

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
Chris Hall, Director-Finance and Administration, CAP
Douglas Dunlap, Manager-Finance and Accounting, CAP
Dana Sedig, Supervisor-Financial Operations, CAP

Section 8.1.1 - Fiscal Year 2021 Final Inflation Calculation for Lower Colorado River Multi-Species Conservation Program (Actual Indices through September 2019)

Item		Description / Formula		Values		Result
FY	=	Federal Fiscal Year Being Adjusted for Inflation		2021		2021
FY-2	=	Federal Fiscal Year for 2 years prior to Federal Fiscal Year Being Adjusted for Inflation		2019		2019
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	=	251.1/ 152.1	=	1.652
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		**144.306** / 104.243	=	**1.384**
Base Year for GDPIP	=	*Validate base year of GDPIP (Original index year = 2000)*	=	2012		
		Adjust published numbers for 2019 (112.664) to match base year of 2000. Ajustment formula is (112.664 / 78.073) X 100 = 144.306		112.664	=	144.306
		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		(1.652+1.384)/2	=	**1.518**
Non-Federal Funding Obligation for FY	=	(5 - year Amount from Table 7-1 of HCP 2003 dollars adjusted to yearly amount)/2	=	$99,910 / 5 = $19,982 $19,982 / 2	=	$9,991
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	=	$9,991
Non-Federal Indexed Funding Obligation for FY	=	(Non-Federal Funding Obligation for FY) X (Inflation Index for FY)		$9,991 X 1.518	=	$15,166,338
Federal Indexed Funding Obligation for FY	=	(Federal Funding Obligation for FY) X (Inflation Index for FY)		$9,991 X 1.518	=	$15,166,338

All $ are in thousands

Individual State's share in $			
California Share - 50%	50%	$	7,583,169.00
Arizona Share - 25%	25%	$	3,791,584.50
Nevada Share - 25%	25%	$	3,791,584.50
Total Non-Federal Share		$	15,166,338.00

Arizona Payback ($10,529,550/20yrs = $526,477.50 X 1.518 =	$	799,192.84
California	$	(399,596.42)
Nevada	$	(399,596.42)

Total Non-Federal Share for FY21		
California Share	$	7,183,572.58
Arizona Share	$	4,590,777.34
Nevada Share	$	3,391,988.08
Total Non-Federal Share	$	15,166,338.00

Attachment B – Acronyms and Abbreviations

AOP	Annual Operating Plan
ARF	Arizona Recreational Facilities, LLC
BCPA	Boulder Canyon Project Act
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CFR	Code of Federal Regulations
CRIT	Colorado River Indian Tribes, Arizona
CVWD	Coachella Valley Water District
Decree	Supreme Court Consolidated Decree of 2006 in *Arizona* v. *California*, 547 U.S. 150
DPOC	Drain Pump Outlet Channel
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*
kWh	kilowatt hour(s)
LCWSP	Lower Colorado Water Supply Project
LHC	Lake Havasu City
Lower Division States	Arizona, California, and Nevada
LROC	Long-Range Operation of Colorado River Reservoirs
maf	million acre-feet
MCWA	Mohave County Water Authority
Metropolitan	The Metropolitan Water District of Southern California
mi	mile(s)
MODE	Main Outlet Drain Extension
NIB	Northerly International Boundary
PPR	Present Perfected Right
Reclamation	Bureau of Reclamation
RRA	Reclamation Reform Act
SDCWA	San Diego County Water Authority
Secretary	United States Secretary of the Interior
SIB	Southerly International Boundary
SLR	San Luis Rey
U.S.	United States

Attachment B – Description of Take

B-1: Federal Flow-Related Covered Actions and Accomplishments, Calendar Year 2019

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 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)	—	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 2019, the Lake Mead elevation varied between 1,081.47 and 1,090.49 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 2019, 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 2,491,707 acre-feet, California consumptively used 3,840,686 acre-feet, and Nevada consumptively used 233,996 acre-feet. In 2019, unused entitlement within the Lower Division States was made available to the junior priority entitlement holders; however, 119,942 acre-feet of Arizona's unused apportionment was left in Lake Mead to benefit system storage. Also in 2019, 97,444 acre-feet of California's unused apportionment was left in Lake Mead; of this amount, the Imperial Irrigation District (IID) and The Metropolitan Water District of Southern California (Metropolitan) submitted proposals requesting that 81,966 acre-feet, generated by extraordinary conservation activities implemented by the IID and the Metropolitan, remain in Lake Mead with the potential to be credited as future Intentionally Created Surplus (ICS) (41,826 acre-feet to the IID; 40,140 acre-feet to the Metropolitan).

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 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 for Colorado River reservoirs (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 Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs (LROC) within the year to reflect current hydrologic conditions • Determinations and delivery of post-2016 unused apportionment water from one State to another within the Lower Basin on an annual basis • Execution of agreements and the delivery of surplus water pursuant to the Reclamation Reform Act (RRA) and the Reclamation States Emergency Drought Relief Act • Periodic review of the LROC	• Delivery of water to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree	The AOP for 2019, which documented the operating tier for Lake Mead under the Interim Guidelines, was issued on July 12, 2019. Annual operations were revised through the AOP pursuant to the LROC and the Interim Guidelines to reflect current hydrologic conditions. An ICS condition was determined for 2019. The ICS was created in 2019 in accordance with the Interim Guidelines and Lower Basin Drought Contingency Plan. 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 2019.
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, to deliver 1944 Water Treaty water to Mexico, and to 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 Lake Mohave and Lake 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 Lake Mohave and Lake 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]	2019 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, to deliver 1944 Water Treaty water to Mexico, and to 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 to 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 to generate hydropower with these water releases. The timing of releases was varied based on available downstream storage, operational constraints for Lake Mohave and Lake 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, to deliver 1944 Water Treaty water to Mexico, and to 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 to generate hydropower with these water releases	Water releases from Parker Dam were made to satisfy beneficial use requirements of entitlement holders in the United States, to deliver 1944 Water Treaty water to Mexico, and to 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, to deliver 1944 Water Treaty water to Mexico, and to 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 Dam, Laguna Dam, and Warren H. Brock Reservoir were made to satisfy beneficial use requirements of entitlement holders in the United States and/or to deliver 1944 Water Treaty water to Mexico. Water releases from Senator Wash, Imperial Dam, Laguna Dam, and Warren H. Brock Reservoir 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 – 3,494,136,386 kilowatt hours (kWh) • Davis Dam – 1,079,895,000 kWh • Parker Dam – 433,728,000 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]	2019 Accomplishments[2, 3]
2.2.1.6 Lower Colorado Water Supply Project – California (page 2-15; Table 2-8, page 2-16)	• Delivery of water under executed Lower Colorado Water Supply Project (LCWSP) contracts	• The Bureau of Reclamation's (Reclamation) execution and administration of individual LCWSP contracts	• Participate in the development of, and consult on the execution of, individual contracts under the LCWSP	In 2019, 9,997 acre-feet of water was pumped by the LCWSP well field. In accordance with its contractual obligations, the IID reduced its consumptive use of Colorado River water by 9,997 acre-feet, which were made available for use by the LCWSP contractors, including the Metropolitan, 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 United States Secretary of the Interior (Secretary) determines that sufficient mainstream water is available to satisfy in excess of 7,500,000 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	• 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 the NIB and the SIB • Operation of variable-speed pumps and diversion canal at the SIB to reduce salinity • Routing of water through the Yuma Division during flood control conditions	—	Water delivery met the Mexico allotment (1.5 maf) pursuant to the 1944 Water Treaty and related Minutes. Deliveries to Mexico were made pursuant to the 1944 Water Treaty and related Minutes as follows: Delivery at the Limitrophe – 3,997 acre-feet Diversion for delivery at Tijuana – 705 acre-feet Delivery at the SIB – 111,247 acre-feet Diversion channel discharge – 2,441 acre-feet Delivery at the NIB – 1,344,672 acre-feet Pursuant to Minute No. 323 and the *Joint Report of the Principal Engineers with the Implementing Details of the Binational Water Scarcity Contingency Plan in the Colorado River Basin*, dated July 11, 2019, Mexico deferred delivery of 36,938 acre-feet in 2019 for the creation of Mexico's water reserve. A total of 39,676 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 143,007 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 to Mexico at the NIB and the SIB.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 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 2019*, was published on May 15, 2020. 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 = 3,241,215 acre-feet Measured returns = 577,687 acre-feet Unmeasured returns = 171,821 acre-feet Consumptive use = 2,491,707 acre-feet **California**: Diversions = 4,329,425 acre-feet Measured returns = 522,162 acre-feet Unmeasured returns = 81,804 acre-feet Consumptive use = 3,840,606 acre-feet* *Includes 115,227 acre-feet delivered from William H. Brock Reservoir **Nevada**: Diversions = 472,314 acre-feet Measured returns = 236,830 acre-feet Unmeasured returns = 1,488 acre-feet Consumptive use = 233,996 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]	2019 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 the Article II(B)(3) of the Decree (shortage) • Determination of shortage conditions based on criteria developed in the Interim Guidelines • Determination of surplus conditions based on criteria listed in the Interim Guidelines	• Adoption of specific post-2026 surplus guidelines • Adoption of specific post-2026 shortage guidelines	• Consult with States on development of specific post-2026 surplus guidelines or specific post-2026 shortage guidelines • Delivery of water to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree	No surplus water was delivered pursuant to Article II(B)(2) of the Decree. No reductions in deliveries pursuant to Article II(B)(3) of the Decree occurred.
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	—	—	—	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]	2019 Accomplishments[2, 3]
Flow Changes Below Hoover Dam to Davis Dam (Table 2-14, after page 2-26)	—	—	—	**Pilot System Conservation Program Conservation:** • City of Bullhead City – 306 acre-feet • Colorado River Indian Tribes, Arizona (CRIT) – 26,805 acre-feet • Fort McDowell Yavapai Nation – 13,683 acre-feet • Bard Water District – 3,571 acre-feet • City of Needles –158 acre-feet • Coachella Valley Water District (CVWD) – 163 acre-feet **Arizona Unused Apportionment Voluntarily Left in Lake Mead** – 119,942 acre-feet **ICS:** • Creation of Extraordinary Conservation ICS by the Central Arizona Water Conservation District (CAWCD) – 24,283 acre-feet • Creation of Extraordinary Conservation ICS by the CRIT – 6,274 acre-feet • Creation of Extraordinary Conservation ICS by the Gila River Indian Community – 117,000 acre-feet[1] • Creation of Extraordinary Conservation ICS by the Metropolitan – 409,860 acre-feet[1] • Creation of Extraordinary Conservation ICS by the IID – 1,579 acre-feet [1] ICS creation amounts are provisional until verified by Reclamation. **IID Conservation for Resolution of 2010 Salton Sea Pre-Delivery –** 46,546 acre-feet **Reclamation Yuma Desalting Plant** – 108 acre-feet **California Unused Apportionment Voluntarily Left in Lake Mead[2]** – 81,966 acre-feet [2] Colorado River water apportioned to, but not consumptively used by, California in 2019. By separate letters dated May 13, 2020, the IID and Metropolitan notified Reclamation that, due to current limitations regarding the creation and storage of Extraordinary Conservation ICS, each agency created, and left in Lake Mead, excess extraordinary conservation. The IID and Metropolitan propose that this excess extraordinary conservation remain in Lake Mead with the possibility of being credited as Extraordinary Conservation ICS (provisionally, 41,826 acre-feet to the IID and 40,140 acre-feet to the Metropolitan) at a future date, subject to applicable conditions, including matters as outlined in their letters. Extraordinary Conservation ICS credited to the IID and Metropolitan under these proposals, if any, will be reflected in a future Colorado River Accounting and Water Use Report. Collectively, these actions contributed to a net reduction in flow below Hoover Dam of 770,278 acre-feet if no California unused apportionment is ultimately determined to be ICS or up to 852,244 acre-feet if a portion of California's provisional unused apportionment is ultimately determined to be ICS[3]. Values are provided on a consumptive use basis. [3] Compliance and other appropriate actions would need to be completed in the future if a portion of California's provisional unused apportionment is ultimately determined to be ICS.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 Accomplishments[2, 3]
Flow Changes Below Davis Dam to Parker Dam (Table 2-15, after page 2-26)	—	—	—	**Pilot System Conservation Program Conservation:** • CRIT – 26,805 acre-feet • Fort McDowell Yavapai Nation – 13,683 acre-feet • Bard Water District – 3,571 acre-feet • City of Needles – 158 acre-feet • CVWD – 163 acre-feet **Arizona Unused Apportionment Voluntarily Left in Lake Mead** – 119,942 acre-feet **ICS:** • Creation of Extraordinary Conservation ICS by the CAWCD – 24,283 acre-feet • Creation of Extraordinary Conservation ICS by the CRIT – 6,274 acre-feet • Creation of Extraordinary Conservation ICS by the Gila River Indian Community – 117,000 acre-feet[1] • Creation of Extraordinary Conservation ICS by the Metropolitan – 409,860 acre-feet[1] • Creation of Extraordinary Conservation ICS by the IID – 1,579 acre-feet[1] [1] ICS creation amounts are provisional until verified by Reclamation. **IID Conservation for Resolution of 2010 Salton Sea Pre-delivery** – 46,546 acre-feet **Reclamation Yuma Desalting Plant** – 108 acre-feet **California Unused Apportionment Voluntarily Left in Lake Mead[2]** – 81,966 acre-feet [2] Colorado River water apportioned to, but not consumptively used by, California in 2019. By separate letters dated May 13, 2020, the IID and Metropolitan notified Reclamation that, due to current limitations regarding the creation and storage of Extraordinary Conservation ICS, each agency created, and left in Lake Mead, excess extraordinary conservation. The IID and Metropolitan propose that this excess extraordinary conservation remain in Lake Mead with the possibility of being credited as Extraordinary Conservation ICS (provisionally, 41,826 acre-feet to the IID and 40,140 acre-feet to the Metropolitan) at a future date, subject to applicable conditions, including matters as outlined in their letters. Extraordinary Conservation ICS credited to the IID and Metropolitan under these proposals, if any, will be reflected in a future Colorado River Accounting and Water Use Report. Collectively, these actions contributed to a net reduction in flow below Davis Dam of 769,972 acre-feet if no California unused apportionment is ultimately determined to be ICS or up to 851,938 acre-feet if a portion of California's provisional unused apportionment is ultimately determined to be ICS[3]. Values are provided on a consumptive use basis. [3] Compliance and other appropriate actions would need to be completed in the future if a portion of California's provisional unused apportionment is ultimately determined to be ICS.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 Accomplishments[2, 3]
Flow Changes Below Parker Dam to Imperial Dam (Table 2-16, after page 2-26)	—	—	—	**Pilot System Conservation Program:** • CRIT – 26,805 acre-feet • Bard Water District – 3,571 acre-feet • CVWD – 163 acre-feet **ICS*:** • Creation of Extraordinary Conservation ICS by the CRIT – 6,274 acre-feet • Creation of Extraordinary Conservation ICS by the Metropolitan – 44,477 acre-feet** • Creation of Extraordinary Conservation ICS by the IID – 1,579 acre-feet *ICS creation amounts are provisional until verified by Reclamation. **For the Parker Dam – Imperial Dam reach, the Metropolitan's ICS creation amount includes only conservation from the Palo Verde Irrigation District/Metropolitan Forbearance and Fallowing Program (44,477 acre-feet). **Colorado River Water Delivery Agreement Conservation:** • IID Transfer to the San Diego County Water Authority (SDCWA) – 160,000 acre-feet • IID All-American Canal Lining Conservation – 67,700 acre-feet – IID transfer to SDCWA – 56,200 acre-feet – IID transfer to San Luis Rey (SLR) Settlement Parties – 11,500 acre-feet • CVWD Coachella Canal Lining Project Conservation – 26,011 acre-feet – CVWD transferred to the SDCWA – 21,511 acre-feet – CVWD transferred to the Metropolitan/SLR Settlement Parties – 4,500 acre-feet • IID reduction for miscellaneous PPRs – 6,992 acre-feet • CVWD reduction for miscellaneous PPRs – 1,497 acre-feet

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 Accomplishments[2, 3]
Flow Changes Below Parker Dam to Imperial Dam (Table 2-16, after page 2-26) – continued				**Water Transfers/Changes in Points of Diversion** – 3,078 acre-feet • On November 15, 2012, Arizona Recreational Facilities, LLC (ARF), assigned and transferred 14 acre-feet per year, on a diversion basis, to EPCOR Water Arizona, Inc., pursuant to Contract No. 07-XX-30-W0517, Partial Assignment, and Transfer No. 1. The consumptive use equivalent of this transfer is 10 acre-feet per year. • On October 5, 2016, the Mohave County Water Authority (MCWA) designated 1,000 acre-feet per year, on a diversion basis, to Bullhead City and Lake Havasu City (LHC), respectively, pursuant to Contract No. 04-XX-30-W0341, Exhibit B, Revision 5. On December 22, 2017, the MCWA moved 1,139 acre-feet per year to Bullhead City and LHC, respectively, pursuant to Contract No. 04-XX-30-W0341, Exhibit B, Revision 5. The consumptive use equivalent of this transfer is 3,059 acre-feet per year. • On February 25, 2013, ARF assigned and transferred 12.7 acre-feet per year, on a diversion basis, to Lake Havasu City pursuant to Contract No. 07-XX-30-W0517, Partial Assignment and Transfer No. 2. The consumptive use equivalent of this transfer is 9 acre-feet per year. **IID Conservation for Resolution of 2010 Salton Sea Pre-delivery** – 46,546 acre-feet **Reclamation Yuma Desalting Plant** – 108 acre-feet **California Unused Apportionment Voluntarily Left in Lake Mead[1]** – 41,826 acre-feet [1] Colorado River water apportioned to, but not consumptively used by, California in 2019. By letter dated May 13, 2020, the IID notified Reclamation that, due to current limitations regarding the creation and storage of Extraordinary Conservation ICS, the IID created and left in Lake Mead excess extraordinary conservation. The IID proposed that this excess extraordinary conservation remain in Lake Mead with the possibility of being credited as Extraordinary Conservation ICS (provisionally, 41,826 acre-feet) at a future date, subject to applicable conditions, including matters as outlined in the IID's letter. Extraordinary Conservation ICS credited to the IID under these proposals, if any, will be reflected in a future Colorado River Accounting and Water Use Report. Collectively, these actions contributed to a net reduction in flow below Parker Dam of 394,801 acre-feet if no California unused apportionment is ultimately determined to be ICS or up to 436,627 acre-feet if a portion of California's provisional unused apportionment is ultimately determined to be ICS[2]. Values are provided on a consumptive use basis. [2] Compliance and other appropriate actions would need to be completed in the future if a portion of California's provisional unused apportionment is ultimately determined to be ICS.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 Accomplishments[2, 3]
Water Conservation Field Services Program (page 2-27; Table 2-17, page 2-28)	• Develop water conservation program pursuant to RRA Section 210(a)	Implementation of the Field Services Program	• Consult in the development of conservation plans pursuant to RRA Section 210(a)	All water conservation plans for the Interior Region 8: Lower Colorado Basin are complete.
Unlawful Use (page 2-28; Table 2-18, page 2-30)	• BCPA requires all Colorado River water users to have a contract with the Secretary	• 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 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)	• Delivery of water pursuant to executed contracts for unallocated water in Arizona (non-CAP)	• Execution of water delivery contracts for unallocated water in Arizona (non-CAP)	• Review of water delivery contracts and consultation with Arizona on contract recommendations	Unallocated non-CAP Arizona water was delivered to the CAWCD for the CAP and 5th priority Arizona water contractors as allowed under the CAWCD's contract with the United States and the 5th priority Arizona water delivery contracts. This water is unallocated because it has not yet been placed under permanent contract.
Central Arizona Project (CAP) 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. On May 6, 2019, the San Carlos Apache Tribe and the Pascua Yaqui Tribe entered into a lease for the delivery of up to 1,750 acre-feet of San Carlos Apache Tribe CAP water to the Pascua Yaqui Tribe during calendar year 2019. On December 2, 2019, the San Carlos Apache Tribe and the town of Gilbert entered into a lease for the delivery of 6,216 acre-feet of Tribal CAP water to the town of Gilbert during calendar year 2019. On June 8, 2019, the San Carlos Apache Tribe and the town of Gilbert entered into a lease for the delivery of 5,295 acre-feet per year for a term not to exceed 100 years. On May 6, 2019, the San Carlos Apache Tribe and the Freeport Minerals Corporation entered into a lease for the delivery of up to 17,000 acre-feet of Tribal CAP water to the corporation during calendar year 2019.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 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	**Water Transfers/Changes in Points of Diversion** – 3,078 acre-feet • On November 15, 2012, ARF assigned and transferred 14 acre-feet per year to EPCOR Water Arizona, Inc., pursuant to Contract No. 07-XX-30-W0517, Partial Assignment, and Transfer No. 1. The consumptive use equivalent of this transfer is 10 acre-feet per year. • On October 5, 2016, the MCWA) designated 1,000 acre-feet per year, on a diversion basis, to Bullhead City and LHC, respectively, pursuant to Contract No. 04-XX-30-W0341, Exhibit B, Revision 5. On December 22, 2017, the MCWA moved 1,139 acre-feet per year, on a diversion basis, to Bullhead City and LHC, respectively, pursuant to Contract No. 04-XX-30-W0341, Exhibit B, Revision 5. The consumptive use equivalent of this transfer is 3,059 acre-feet per year. • On February 25, 2013, ARF assigned and transferred 12.7 acre-feet per year, on a diversion basis, to LHC pursuant to Contract No. 07-XX-30-W0517, Partial Assignment, and Transfer No. 2. The consumptive use equivalent of this transfer is 9 acre-feet per year. The following conservation and transfers were made pursuant to the Colorado River Water Delivery Agreement. The actions represent changes in delivery amounts and points of diversion required to implement the Quantification Settlement Agreement. **1988 IID/Metropolitan Water Conservation Agreement:** • IID transfer to the Metropolitan – 105,000 acre-feet • IID Transfer to the SDCWA – 160,000 acre-feet • IID All-American Canal Lining Conservation – 67,700 acre-feet • IID transfer to the SDCWA – 56,200 acre-feet • IID transfer to SLR Settlement Parties – 11,500 acre-feet **Coachella Canal Lining Project Conservation** – 26,011 acre-feet • CVWD transfer to the SDCWA – 21,511 acre-feet • CVWD transfer to SLR Settlement Parties – 4,500 acre-feet • IID Intra-Priority 3 transfer to the CVWD – 68,000 acre-feet • IID reduction for miscellaneous PPRs – 6,992 acre-feet • CVWD reduction for miscellaneous PPRs – 1,497 acre-feet

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 Accomplishments[2, 3]
Changes in Delivery Related to Off-Stream Storage (page 2-32; Table 2-22, page 2-33)	• Delivery of water under executed off-stream storage agreements pursuant to 43 CFR Part 414	• Execution of a Storage and Interstate Release Agreements pursuant to 43 CFR Part 414	• Delivery of water under executed off-stream storage agreements pursuant to 43 CFR Part 414	No off-stream storage activities occurred in 2019.
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	On October 8, 2019, the United States and Carol J. and Terry E. Campbell entered into Contract No. 19-XX-30-W0650 for the delivery of 0.71 acre-feet per year of Colorado River water for domestic use.
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	No inclusions or exclusions to contract service areas occurred during calendar year 2019.
Contract Terminations (page 2-35; Table 2-26, page 2-36)	• None	• Termination of water contract due to abandonment • Execution of contract amendments when entitlement holder has relinquished water	• Consultation on the disposition of any water allocated for use, but not consumptively used within, a State	No contracts were terminated in calendar year 2019.
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.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2019 Accomplishments[2, 3]
2.5.3.2 Future Water Conservation Practices (page 2-77)	—	• Institute new conservation measures for efficient water use	—	No implementation in 2019.
2.5.3.5 Headgate Rock Dam Operation and Maintenance (page 2-88)	—	• Water releases and generation of 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 2019.

B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2019

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	—		Cibola Division	88.4				Walters Camp wash fan removal.
Protected Bankline Maintenance and Care of Unprotected Banklines (page 2-43)	—	• Protected bankline location and maintenance	—							No implementation in fiscal year (FY) 2019.
Levee Maintenance (page 2-44)	—	• Levee location and maintenance	—							No implementation in FY19

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	
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 FY19.
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 FY19.
Stockpiles (page 2-49; Table 2-37, page 2-49)	—	• Location of three future stockpiles	—	4	Palo Verde		None	0	1, 3, and 6	Replenishing material within the Palo Verde division.
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 43	None	0	1, 3, and 6	Yuma: 158.1 mi
				6	Laguna	43 to 49	None	0	1, 3, and 6	Laguna: 3 mi
				6	Gila River Area	49 to 87	None	0	1, 3, and 6	Gila River Area: 19.4 mi
				4	Cibola	87 to 107	None	0	1, 3, and 6	Cibola: 67.6 mi
				4	Palo Verde	107 to 134	None	0	1, 3, and 6	Palo Verde: 10 mi
				3	Mohave Valley	234 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	Yuma Valley Well Field	A0 to A29	None	0	1, 3, and 6	Maintenance work on YV-13, remove Supervisory Control and Data Acquisition System, working on power.
				7	South Gila Wells	A34 to A36	None	0	1, 3, and 6	Maintenance work on SG-716.
				7	Yuma Mesa Wells	A5 to A19	None	0	1, 3, and 6	Maintenance work on YM-9, YM-10, YM-11-discharge line installation and power, YM-12, YM-13-trench and tank pad, discharge line.
		• Maintenance of open channel drains and outfall channels		7	DPOCs	A34 to A36	None	0	1, 3, and 6	Drain Pump Outlet Channels (DPOCs) were cleaned. Canal lining at DPOC 2. Weir repair at DPOC 3.
				7	MODE	26	None	0	1, 3, and 6	Clearing Main Outlet Drain Extension (MODE) 7E to Prison Hill. Sediment removed at MODE 2 and gages MODE 3.
		• Senator Wash penstock repairs		5	Senator Wash	C51.2	None	0	1, 3, and 6	Work on relief wells and pump maintenance.
		• Maintenance and replacement of gauging stations, survey line markers, and boat ramps		4	Water Wheel Gaging Station	151.9	None	0	1, 3, and 6	Assemble stairs for gauge at Water Wheel.
				5	Martinez Lake Gaging Station	A56.0	None	0	1, 3, and 6	Communications repairs at Martinez gauging station.
Maintenance Activities at the Southerly International Boundary (page 2-52)	—			7	242 Well Field and Conveyance System	0 to 5	None	0	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 was also performed. Bypass canal was cleaned.

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	
2.2.3.3 Backwater Maintenance (page 2-53; Table 2-37, page 2-54)	—	• Backwater maintenance	—							See lines below for each division.
Mohave Division (page 2-55; Table 2-38, page 2-56)	—	• Backwater maintenance	—	3	Laughlin Lagoon	N268.9 to N267.65	None	0	1, 3, and 6	Dredging completed, and work on the inlet and outlet completed.
Parker Division (page 2-57; Table 2-39, page 2-57)	—	• Backwater maintenance	—							No implementation in FY19.
Palo Verde Division (page 2-58; Table 2-40, page 2-58)	—	• Backwater maintenance	—							No implementation in FY19.
Cibola Division (page 2-58; Table 2-41, page 2-59)	—	• Backwater maintenance	—							No implementation in FY19.
Imperial Division (page 2-59; Table 2-42, page 2-59)	—	• Backwater maintenance	—							No implementation in FY19.
Laguna Division (page 2-60; Table 2-43, page 2-60)	—	• Backwater maintenance	—							No implementation in FY19.
Yuma Division (page 2-60; Table 2-44, page 2-61)	—	• Backwater maintenance	—							No implementation in FY19.
Limitrophe Division Mitigation Obligations (page 2-61; Table 2-45, page 2-62)	—	—	—							No implementation in FY19.

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	
2.2.3.4 Limitrophe Division Maintenance (page 2-62)	—	—	—							No implementation in FY19.
2.2.4 Future Non-Flow-Related Actions (page 2-63)	—	—	—							
2.2.4.1 Topock Marsh (page 2-63)	—	—	—							No implementation in FY19.
2.2.4.2 Laguna Reservoir (page 2-63)	—	—	—	6	Laguna Dam	49.0	None	0	1, 3, and 6	Laguna Reservoir Restoration Project. Ongoing dredging activities above Laguna Dam (area D). Gate installation and repairs.
2.2.4.3 Bankline Maintenance – Unprotected Banklines (page 2-65; Table 2-46, page 2-66)	—	—	—							No implementation in FY19.
2.2.4.4 Proposed Jetties (page 2-67; Table 2-48, page 2-67)	—	—	—							No implementation in FY19.
2.3 WESTERN AREA POWER ADMINISTRATION										No implementation in FY19.
2.4 NATIONAL PARK SERVICE										

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	
2.4.2 Riparian Habitat Restoration (page 2-70)		• Riparian habitat restoration on Lake Mead and Lake Mohave			Lake Mead Lake Mohave		Sahara mustard Tamarisk and athel Sahara mustard Fountain grass	3 acres Small infestation 2.6 acres 0.2 acres		Habitat restoration through removal of exotic plants (gross infested acres).
2.4.3 Fishery Management (page 2-71)		• Habitat modifications on Lake Mead and Lake Mohave, including development and enhancement of grow-out ponds, construction of docks, and creation of angler enhancement structures			Lake Mohave					Enhancement of fish habitat, through submersion of brush or polyvinyl chloride structures, to create structural diversity – no Implementation in FY19.
2.4.4 Boating Access (page 2-72)		• Maintenance and enhancemen t of boating access on Lake Mead and Lake Mohave								No implementation in FY19.
2.5 BUREAU OF INDIAN AFFAIRS										

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	
2.5.2.1 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.
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 FY19.
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 FY19.
2.5.3.2 Future Water Conservation Practices (page 2-85)		• Installation, operation, and maintenance of new equipment								No implementation in FY19.
2.5.3.3 Future Farmland Development (page 2-85)		• Develop additional agricultural acreage, including construction of irrigation systems								No Implementation in FY19.

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	
2.5.3.6 Future Wildland Fire Management (page 2-88)		• Implementation of new fuel management projects								No implementation in FY19.
2.6 U.S. FISH AND WILDLIFE SERVICE										No non-flow-related actions are covered under the Lower Colorado River Multi-Species Conservation Program.
2.7 BUREAU OF LAND MANAGEMENT										No non-flow-related actions are covered under the Lower Colorado River Multi-Species Conservation Program.

B-3: Lower Colorado River Multi-Species Conservation Program MSCP Non-Federal Covered Activities and Incidental Take Summary, Fiscal Year 2019

Non-Federal Covered Activities *Habitat Conservation Plan* Chapter 2	Covered Activities Summary	Covered Activities Implemented						Notes
		Reach	Location	River Miles	Habitat Type Impacted	Number of Acres Impacted	Complied with Avoidance and Minimization Measures	
2.2 ARIZONA								
2.2.1 Ongoing Flow-Related Covered Activities[1] (page 2-4)	• Diversion of up to 2.8 million acre-feet (maf) of Arizona's full annual entitlement, plus surplus, plus Arizona's share of any unused apportionment, plus the volume of return flow, as applicable • Generation and transmission of hydroelectric power • Power contracting							Non-Federal flow-related covered activities are included in the Federal flow-related covered actions and accomplishments (see 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 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 FY19.
Fish Surveys (page 2-8)	• Surveys for non-native fish species							Surveys for sport fishes are covered under separate compliance.
Fish Stocking (page 2-9)	• Stocking of trout							Fish stocking is covered under separate compliance.
Maintenance of Aids to Navigation and Boating Access (page 2-9)	• Place and maintain aids to navigation							Maintained approximately 130 buoys. Boat dock and ramp maintenance is covered under separate environmental compliance.
Law Enforcement Patrol Activities (page 2-9)	• Administer law enforcement and boating safety program using watercraft patrols							An estimated 4,301 hours of watercraft law enforcement. Includes all Arizona Game and Fish Department Regions III and IV watercraft law enforcement patrols within the Lower Colorado River Multi-Species Conservation Program action area.

Non-Federal Covered Activities *Habitat Conservation Plan* Chapter 2	Covered Activities Summary	Covered Activities Implemented						Notes
		Reach	Location	River Miles	Habitat Type Impacted	Number of Acres Impacted	Complied with Avoidance and Minimization Measures	
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 table B-1).
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 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	4	Palo Verde Irrigation District	—	—	—	1 and 3	14.35 acres
	• 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	6	Bard Water District				1 and 3	4.49 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 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 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 FY19.

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 20 habitat modules were placed on approximately 0.1 acre at Carp Cove, Bass Cove, and Box Cove 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 FY19.
	• Place and maintain aids to navigation and boating access	3	Clark County, downstream from Davis Dam	257.5–275.0	None	0	1 and 3	Performed routine maintenance and inspection of aids to navigation.
	• Administer law enforcement and boating safety program using watercraft patrols	1 and 2	—	Lake Mead – 275.0	None	0	1 and 3	Conducted routine law enforcement patrols on Lake Mead, Lake Mohave, the 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 North 31st Avenue, C3
Phoenix, Arizona 85051
Telephone: (602) 242-0210 Fax: (602) 242-2513

In Reply Refer to:
AESO/SE
22410-2004-F-0161

August 12, 2019

Memorandum

To: John Swett, Program Manager, Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada (LC-8000)

From: Jeffrey A. Humphrey, Field Supervisor, Arizona Ecological Service Field Office

Subject: Acceptance of Lower Colorado River Multi-Species Conservation Program *Consistency Review for Final Implementation Report, Fiscal Year 2020 Work Plan and Budget, Fiscal Year 2018 Accomplishment Report*

This responds to your memorandum dated July 8, 2019, requesting consistency review by the Fish and Wildlife Service (Service) of the combined document containing the Fiscal Year 2020 Work Plan and Budget, Fiscal Year 2018 Accomplishment Report 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) and the biological and conference opinion dated March 4, 2005, as amended March 5, 2018; and requirements of the Funding and Management Agreement sections 7.4.2. and 7.4.3.

The Fiscal Year 2018 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 2018 covered by the LCR MSCP (October 1, 2017-September 31, 2018), 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 26, 2019.

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 2020 Work Plan and Budget contains the work tasks and estimated costs for LCR MSCP implementation during Fiscal Year 2020 beginning on October 1, 2019. 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.

Sincerely,

Jeffrey A. Humphrey

cc (electronic):
Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES, Marty Tuegel)

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Attachment D – Financial Statement

D-1: Required Contributions, FY06 – FY10, FY11 – FY15, FY16, FY17

	Subtotal FY06 – FY10	Subtotal FY11 – FY15	FY16	FY17
Bureau of Reclamation[1]				
Cash	33,058,872.00	86,558,220.00	15,370,734.00	15,437,226.00
Funding Credit	0.00	3,800,520.00	0.00	0.00
Bureau of Reclamation Total	**33,058,872.00**	**90,358,740.00**	**15,370,734.00**	**15,437,226.00**
Arizona				
Cash	3,270,883.60	5,506,147.38	4,296,894.80	4,315,482.66
Funding Credit	0.00	165.12	0.00	0.00
Cash Tribal Contractors	*n/a*	*n/a*	*n/a*	*n/a*
Habitat Maintenance Fund	737,000.00	7,379,692.50	0.00	0.00
Remedial Measures Fund	*n/a*	667,806.00	276,013.00	277,207.00
Arizona Total	**4,007,883.60**	**13,553,811.00**	**4,572,907.80**	**4,592,689.66**
Nevada				
Cash	9,220,135.20	18,053,715.27	3,201,558.35	3,215,407.92
Funding Credit	0.00	330.23	0.00	0.00
Cash Tribal Contractors	*n/a*	*n/a*	*n/a*	*n/a*
Habitat Maintenance Fund	737,000.00	7,379,692.50	0.00	0.00
Remedial Measures Fund	*n/a*	1,237,884.00	276,013.00	277,207.00
In-Kind Credit	436,000.00	436,000.00	0.00	0.00
Nevada Total	**10,393,135.20**	**27,107,622.00**	**3,477,571.35**	**3,492,614.92**
California				
Cash	**16,846,894.93**	**28,693,127.34**	**6,399,331.23**	**6,427,014.00**
Metropolitan Water District of Southern California	9,924,055.91	12,095,549.69	3,545,435.31	3,560,772.46
Imperial Irrigation District	2,727,356.94	7,454,596.05	1,268,085.56	1,273,571.15
Coachella Valley Water District	1,487,649.26	4,066,143.30	691,683.03	694,675.17
Los Angeles Department of Water and Power	843,001.25	2,304,147.87	391,953.72	393,649.26
San Diego County Water Authority	456,454.63	0.00	0.00	0.00
Palo Verde Irrigation District	664,552.28	739,618.77	156,332.10	157,008.37
Southern California Public Power Authority	347,118.16	948,766.78	161,392.71	162,090.87
Southern California Edison Company	297,529.86	813,228.66	138,336.61	138,935.03
Bard	33,058.88	90,358.74	15,370.73	15,437.23
Colorado River Board of California	33,058.88	90,358.74	15,370.73	15,437.23
Needles	33,058.88	90,358.74	15,370.73	15,437.23
Cash Schedule D Contractors	*n/a*	*n/a*	*n/a*	*n/a*
Funding Credit				
San Diego County Water Authority	336,958.27	2,168,609.76	368,897.62	370,493.42
Metropolitan Water District of Southern California	0.00	1,987,279,52	0.00	0.00
Habitat Maintenance Fund	**1,474,000.00**	**14,759,385.00**	**0.00**	**0.00**
Remedial Measures Fund	***n/a***	**2,088,905.38**	**552,026.00**	**554,414.00**
California Total	**18,657,853.20**	**49,697,307.00**	**7,320,254.85**	**7,351,921.42**
TOTAL	**66,117,744.00**	**180,717,480.00**	**30,741,468.00**	**30,874,452.00**

[1] Reflects the Bureau of Reclamation's required funding amount. Reclamation's credits and debits are tracked in table D-2e.

D-1: Required Contributions, FY18, FY19, FY06 – FY19

	FY18	FY19	Total FY06 – FY19
Bureau of Reclamation[1]			
Cash	15,625,620.00	15,980,244.00	**182,030,916.00**
Funding Credit	0.00	0.00	**3,800,520**
Bureau of Reclamation Total	**15,625,620.00**	**15,980,244.00**	**185,831,436.00**
Arizona			
Cash	4,362,836.17	4,461,850.88	**26,214,095.49**
Funding Credit	0.00	0.00	**165.12**
Cash Tribal Contractors	5,312.11	5,432.68	**10,744.79**
Habitat Maintenance Fund	0.00	0.00	**8,116,692.50**
Remedial Measures Fund	280,590.00	286,958.00	**1,788,574.00**
Arizona Total	**4,648,738.28**	**4,754,241.56**	**36,130,271.90**
Nevada			
Cash	3,254,018.48	3,327,653.82	**40,272,489.04**
Funding Credit	0.00	0.00	**330.23**
Cash Tribal Contractors	629.88	858.90	**1,488.78**
Habitat Maintenance Fund	0.00	0.00	**8,116,692.50**
Remedial Measures Fund	280,590.00	286,958.00	**2,358,652.00**
In-Kind Credit	0.00	0.00	**872,000.00**
Nevada Total	**3,535,238.36**	**3,615,470.72**	**51,621,652.55**
California			
Cash	**6,505,448.48**	**6,653,089.86**	**71,524,905.84**
Metropolitan Water District of Southern California	3,582,429.90	3,663,733.30	**36,371,976.57**
Imperial Irrigation District	1,289,113.65	1,318,370.13	**15,331,093.48**
Coachella Valley Water District	703,152.90	719,110.98	**8,362,414.64**
Los Angeles Department of Water and Power	388,545.22	397,363.28	**4,718,660.60**
San Diego County Water Authority	0.00	0.00	**456,454.63**
Palo Verde Irrigation District	158,924.48	162,531.28	**2,038,967.28**
Southern California Public Power Authority	160,105.78	163,739.38	**1,943,213.68**
Southern California Edison Company	136,667.35	139,769.02	**1,664,466.53**
Bard	15,625.62	15,980.24	**185,831.44**
Colorado River Board of California	15,625.62	15,980.24	**185,831.44**
Needles	15,625.62	15,980.24	**185,831.44**
Cash Schedule D Contractors	39,632.34	40,531.77	**80,164.11**
Funding Credit			
San Diego County Water Authority	375,014.88	383,525.86	**4,003,499.81**
Metropolitan Water District of Southern California	0.00	0.00	**1,987,279.52**
Habitat Maintenance Fund	**0.00**	**0.00**	**16,233,385.00**
Remedial Measures Fund	**561,180.00**	**573,916.00**	**4,330,441.38**
California Total	**7,441,643.36**	**7,610,531.72**	**98,079,511.55**
TOTAL	**31,251,240.00**	**31,960,488.00**	**371,662,872.00**

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	1.501	399,217.97
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[1]	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	1.294	5,486,734.71	11,599,336.44
2011	796,149.37	1.258[2]	632,869.13	12,232,205.57
2012	(3,105,120.42)	1.278[2]	(2,429,671.69)	9,802,533.88
2013	(2,260,293.50)	1.321[2]	(1,711,047.31)	8,091,486.57
Underfunding 2014	(3,800,520.00)	1.347[2]	(2,821,469.93)	5,270,016.64
2014	(1,054,326.44)	1.347[2]	(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
2018	1,295,823.63	1.410	919,023.85	5,512,111.43
2019	2,012,002.08	1.442	1,395,285.77	6,907,397.20

[1] Based on expenditures.

[2] Revised inflation index.

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
2018										$34,285,574.82
2019										$36,967,064.61
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
2018										$8,294,910.30
2019										$8,472,182.18
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 Habitat Maintenance Fund

FY	HCP Table 7-1 2003 Dollars	Required 2003 Dollars	Additional 2003 Dollars	Total 2003 Dollars	i	Required Current Year Dollars	Additional Current Year Dollars	Total Current Year Dollars	Cumulative Current Year Dollars	Cumulative With Interest Current Year Dollars
2006	$125,000	$125,000		$125,000	1.083	$135,375.00		$135,375.00	$135,375.00	$137,378.85
2007	$125,000	$125,000		$125,000	1.122	$140,250.00		$140,250.00	$275,625.00	$286,813.26
2008	$125,000	$125,000		$125,000	1.187	$148,375.00		$148,375.00	$424,000.00	$453,778.83
2009	$125,000	$125,000		$125,000	1.210	$151,250.00		$151,250.00	$575,250.00	$619,413.59
2010	$125,000	$125,000		$125,000	1.294	$161,750.00		$161,750.00	$737,000.00	$789,731.22
2011	$1,125,000	$1,125,000		$1,125,000	1.191[1]	$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
2018										$8,440,801.13
2019										$10,475,346.10
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
2018										$17,549,863.39
2019										$18,019,536.33
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	$7,329,835.38	$7,542,121.16
2019	$796,000	$796,000	$0	$796,000	1.442	$1,147,832.00	$0	$1,147,832.00	$8,477,667.38	$9,142,832.05
2020	$796,000	$796,000	$0	$796,000	1.501	$1,194,796.00	$0	$1,194,796.00		
2021	$796,000	$796,000	$0	$796,000	1.518	$1,208,328.00	$0	$1,208,328.00		
Total	**$6,106,000**	**$6,106,000**	**$1,648,780.54**	**$7,754,780.54**						
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	$1,501,616.00	$1,526,352.71
2019	$199,000	$199,000	$0	$199,000	1.442	$286,958.00	$0	$286,958.00	$1,788,574.00	$1,849,270.61
2020	$199,000	$199,000	$0	$199,000	1.501	$298,699.00	$0	$298,699.00		
2021	$199,000	$199,000	$0	$199,000	1.518	$302,082.00	$0	$302,082.00		
Total	**$1,526,500**	**$1,526,500**	**$166,580.55**	**$1,693,080.55**						
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	$2,071,694.00	$2,114,338.50
2019	$199,000	$199,000	$0	$199,000	1.442	$286,958.00	$0	$286,958.00	$2,358,652.00	$2,703,995.03
2020	$199,000	$199,000	$0	$199,000	1.501	$298,699.00	$0	$298,699.00		
2021	$199,000	$199,000	$0	$199,000	1.518	$302,082.00	$0	$302,082.00		
Total	**$1,526,500**	**$1,526,500**	**$589,801.04**	**$2,116,301.04**						
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	$3,756,525.38	$3,901,429.95
2019	$398,000	$398,000	$0	$398,000	1.442	$573,916.00	$0	$573,916.00	$4,330,441.38	$4,589,566.41
2020	$398,000	$398,000	$0	$398,000	1.501	$597,398.00	$0	$597,398.00		
2021	$398,000	$398,000	$0	$398,000	1.518	$604,164.00	$0	$604,164.00		
Total	**$3,053,000**	**$3,053,000**	**$892,398.95**	**$3,945,398.95**						
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	$0[1]	$9,730,000[2]	$5,670,000
2020	$0	$0	$5,670,000
2021	$0	$0	$5,670,000

[1] Resolution 19-003 (Increase FY2019 Work Plan and Budget, FY2017 Accomplishment Report) approved amount.
[2] PDD 19-001 (Dennis Underwood Conservation Area Land and Water Approval).

D-4: Cumulative Program Accomplishment, FY04 – FY15, FY16, and FY17

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures
A1	$403,953.57	$5,449,608.25	$5,141,558.77	$1,188,765.48	$1,140,032.88	$1,196,839.51	$1,169,900.60
G2	$0.00	$130,535.22	$0.00	$0.00	$0.00	$0.00	$0.00
Total A	**$403,953.57**	**$5,580,143.47**	**$5,141,558.77**	**$1,188,765.48**	**$1,140,032.88**	**$1,196,839.51**	**$1,169,900.60**
B1	$170,868.72	$1,066,391.84	$921,401.81	$216,932.74	$195,408.34	$137,699.21	$207,830.04
B2	$145,568.04	$1,659,561.45	$1,605,411.67	$309,156.64	$221,205.32	$299,717.05	$254,893.46
B3	$14,527.30	$417,611.27	$812,275.52	$269,149.88	$152,729.68	$19,643.79	$130,928.66
B4	$9,857.95	$845,339.56	$1,287,567.57	$253,146.40	$156,044.68	$236,605.59	$243,054.67
B5	$40,720.81	$1,115,649.42	$1,583,166.66	$731,953.63	$335,097.81	$162,031.14	$441,157.56
B6	$25,878.76	$234,358.80	$390,860.55	$241,051.09	$256,919.15	$280,966.59	$408,840.78
B7	$186,003.61	$862,848.38	$1,001,518.88	$149,862.21	$162,654.16	$174,790.62	$175,104.04
B8	$124,792.00	$316,603.38	$437,409.68	$140,133.31	$165,503.33	$130,604.88	$51,591.78
B9	$3,073.11	$534.14	$0.00	$0.00	$0.00	$0.00	$0.00
B10	$0.00	$537,148.73	$17,672.96	$0.00	$0.00	$0.00	$0.00
B11	$0.00	$250,664.96	$178,289.49	$62.19	$62.19	$0.00	$0.00
B12	$0.00	$0.00	$0.00	$70,499.86	$30,123.36	$76,778.77	$114,158.57
Total B	**$721,290.30**	**$7,306,711.93**	**$8,235,574.79**	**$2,381,947.95**	**$1,675,748.02**	**$1,518,837.64**	**$2,027,559.56**
C1	$45,276.00	$101,382.15	$0.00	$0.00	$0.00	$0.00	$0.00
C2	$0.00	$50,000.00	$65,851.18	$11,311.51	$9,416.92	$10,844.47	$2,739.06
C3	$0.00	$225,763.98	$52,899.88	$0.00	$0.00	$0.00	$0.00
C4	$0.00	$64,782.41	$50,050.43	$0.00	$4,898.43	$0.00	$0.00
C5	$0.00	$319,598.56	$234,278.88	$0.00	$0.00	$0.00	$0.00
C6	$0.00	$101,441.68	$0.00	$0.00	$0.00	$0.00	$0.00
C7	$0.00	$546,964.77	-$2,315.00	$0.00	$0.00	$0.00	$0.00
C8	$136,060.00	$444,257.78	$0.00	$0.00	$0.00	$0.00	$0.00
C9	$43,816.00	$69,039.62	$0.00	$0.00	$0.00	$0.00	$0.00
C10	$0.00	$576,061.87	$488,660.39	$0.00	$31,450.75	$0.00	$0.00
C11	$0.00	$548,492.74	$578,795.96	$0.00	$27,562.06	$0.00	$0.00
C12	$0.00	$813,567.37	$222,699.50	$0.00	$0.00	$0.00	$0.00
C13	$99,996.80	$1,131,690.20	$463,921.41	$184.39	$232,180.41	$0.00	$0.00
C14	$0.00	$85,336.94	$202,650.17	$0.00	$0.00	$229.50	$229.50
C15	$22,255.00	$450,245.67	$23,239.78	$0.00	$0.00	$0.00	$0.00
C16	$0.00	$55,332.60	$0.00	$0.00	$0.00	$0.00	$0.00

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures
C17	$9,750.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C18	$41,981.82	$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
C20	$53,779.96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C21	$70,000.00	$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
C23	$0.00	$356,826.42	$0.00	$0.00	$0.00	$0.00	$0.00
C24	$0.00	$618,939.19	$1,088,443.70	$302,717.48	$328,007.72	$349,373.16	$282,033.90
C25	$0.00	$592,084.80	$1,052,356.76	$197,068.70	$156,562.06	$186,861.08	$216,239.86
C26	$0.00	$50,111.40	$78,699.67	$0.00	$0.00	$0.00	$0.00
C27	$0.00	$258,044.64	$180,660.54	$801.21	$13,260.91	$0.00	$5,887.09
C28	$0.00	$121,555.67	$31,527.07	$0.00	$0.00	$0.00	$0.00
C29	$0.00	$106,526.28	$100,000.00	$0.00	$0.00	$0.00	$0.00
C30	$0.00	$153,121.71	$186,897.58	$0.00	$0.00	$0.00	$0.00
C31	$0.00	$140,518.71	$509,512.62	$148,968.92	$109,157.90	$145,010.65	$118,591.23
C32	$0.00	$173,121.81	$517,835.16	$99,638.94	$99,638.94	$117,484.11	$117,484.11
C33	$0.00	$81,186.05	$450,438.52	$0.00	$0.00	$0.00	$0.00
C34	$0.00	$111,714.31	$12,304.81	$0.00	$0.00	$0.00	$0.00
C35	$0.00	$10,688.46	$510,228.60	$0.00	$0.00	$0.00	$0.00
C36	$0.00	$93,004.96	$158,863.99	$0.00	$0.00	$0.00	$0.00
C37	$0.00	$113,822.56	$177,340.58	$0.00	$0.00	$0.00	$0.00
C38	$0.00	$6,250.70	$0.00	$0.00	$0.00	$0.00	$0.00
C39	$0.00	$170,403.17	$1,000,552.97	$0.00	$0.00	$0.00	$0.00
C40	$0.00	$2,106.76	$758,341.60	$274,332.93	$168,168.67	$399,170.09	$171,772.56
C41	$0.00	$5,885.67	$180,615.94	$0.00	$0.00	$0.00	$0.00
C42	$0.00	$49,236.73	$410,961.44	$0.00	$0.00	$0.00	$0.00
C43	$0.00	$0.00	$110,099.63	$39,374.35	$47,121.13	$4,473.02	$10,459.89
C44	$0.00	$0.00	$242,133.66	$0.00	$0.00	$0.00	$0.00
C45	$0.00	$0.00	$717,366.60	$0.00	$0.00	$0.00	$0.00
C46	$0.00	$0.00	$296,058.13	$0.00	$0.00	$0.00	$0.00
C47	$0.00	$0.00	$717,535.15	$0.00	$0.00	$0.00	$0.00
C48	$0.00	$0.00	$101,084.94	$0.00	$0.00	$0.00	$0.00
C49	$0.00	$0.00	$249,235.78	$0.00	$0.00	$0.00	$0.00
C50	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C51	$0.00	$0.00	$42,560.10	$0.00	$0.00	$0.00	$0.00

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures
C52	$0.00	$0.00	$513,269.60	$151,012.21	$119,347.25	$169,883.43	$193,058.85
C53	$0.00	$0.00	$410,889.16	$112,896.35	$122,886.58	$81,661.52	$103,342.63
C54	$0.00	$0.00	$9,110.44	$0.00	$0.00	$0.00	$0.00
C55	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C56	$0.00	$0.00	$22,208.29	$0.00	$0.00	$0.00	$0.00
C57	$0.00	$0.00	$541,878.93	$3,227.48	$150,244.17	$4,210.82	$4,210.82
C58	$0.00	$0.00	$30,179.14	$0.00	$0.00	$0.00	$0.00
C59	$0.00	$0.00	$110,385.45	$167,129.76	$31,396.71	$169,998.97	$65,937.84
C60	$0.00	$0.00	$120,067.55	$11.05	$77,329.28	$230,860.93	$42,373.65
C61	$0.00	$0.00	$209,893.35	$175,395.05	$163,661.99	$38,271.69	$123,566.67
C62	$0.00	$0.00	$251,387.83	$147,788.13	$165,922.17	$12,554.37	$70,977.85
C63	$0.00	$0.00	$102,751.51	$90,290.50	$90,290.50	$141,661.66	$60,524.10
C64	$0.00	$0.00	$502,874.59	$656,351.17	$540,791.98	$452,557.00	$334,261.50
C65	$0.00	$0.00	$20,738.26	$99,329.26	$84,318.17	$135,135.12	$74,131.08
C66	$0.00	$0.00	$0.00	$83,717.80	$83,717.80	$43,378.83	$43,378.83
Total C	**$522,915.58**	**$8,799,108.34**	**$15,108,022.22**	**$2,761,547.19**	**$2,857,332.50**	**$2,693,620.42**	**$2,041,201.02**
D1	$29,367.09	$130,308.25	$130,797.53	$36,470.97	$36,470.97	$37,432.99	$37,432.99
D2	$370,174.62	$3,602,160.66	$3,649,573.42	$748,047.05	$760,095.13	$812,409.57	$985,972.16
D3	$0.00	$427,612.12	$310,908.17	$0.00	$0.00	$0.00	$0.00
D4	$60,520.00	$200,571.38	$0.00	$0.00	$0.00	$0.00	$0.00
D5	$247,118.33	$1,245,689.80	$1,358,964.39	$234,559.10	$234,559.10	$233,591.60	$233,591.60
D6	$0.00	$761,484.19	$1,555,281.71	$152,057.03	$297,303.10	$21,818.80	$21,818.80
D7	$0.00	$2,309,256.14	$3,019,380.04	$688,770.88	$860,371.04	$621,507.82	$588,971.56
D8	$134,246.08	$2,089,212.74	$3,500,095.26	$943,608.61	$775,008.88	$940,176.70	$964,561.65
D9	$0.00	$477,001.13	$1,193,232.34	$379,451.91	$470,531.02	$125,396.79	$196,587.81
D10	$0.00	$51,830.67	$160,396.07	$44,452.69	$44,452.69	$32,248.98	$32,248.98
D11	$269,097.12	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
D12	$0.00	$7,730.12	$429,684.25	$31,285.23	$31,006.41	$17,835.26	$17,835.26
D13	$0.00	$0.00	$29,381.98	$0.00	$0.00	$0.00	$0.00
D14	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total D	**$1,110,523.24**	**$11,302,857.20**	**$15,337,695.16**	**$3,258,703.47**	**$3,509,798.34**	**$2,842,418.51**	**$3,079,020.81**

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures
E1	$1,223,657.72	$948,680.39	$1,815,137.41	$209,035.87	$208,513.89	$205,584.41	$163,333.70
E2	$147,333.85	$508,005.30	$140,060.18	$0.00	$0.00	$0.00	$0.00
E3	$484,011.77	$325,862.80	$61,353.62	$0.00	$0.00	$0.00	$0.00
E4	$17,278.54	$3,952,533.88	$5,351,078.84	$449,393.91	$424,660.32	$488,325.18	$484,508.12
E5	$100,548.43	$8,981,972.21	$2,269,193.14	$661,721.39	$627,510.72	$436,085.32	$478,696.89
E6	$79,586.39	$39,474.36	$0.00	$0.00	$0.00	$0.00	$0.00
E7	$312,199.68	$18,421.87	$0.00	$0.00	$0.00	$0.00	$0.00
E8	$1,035.50	$837,004.58	$22,143.98	$0.00	$0.00	$0.00	$0.00
E9	$53,320.19	$4,226,506.44	$2,543,130.10	$293,218.97	$354,396.15	$131,649.13	$135,626.92
E10	$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
E12	$32,427.43	$43,784.10	$0.00	$0.00	$0.00	$0.00	$0.00
E13	$25,912.33	$101,424.49	$0.00	$0.00	$0.00	$24,709.69	$24,709.69
E14	$84,309.07	$7,171,901.60	$2,413,003.65	$403,637.91	$339,732.72	$496,526.61	$503,105.02
E15	$0.00	$1,265,224.57	$428,756.47	$0.00	$0.00	$0.00	$0.00
E16	$5,392.59	$993,317.46	$1,955,608.78	$785,451.33	$771,277.61	$2,966,489.85	$1,678,250.45
E17	$0.00	$37,724.66	$1,102,894.00	$0.00	$104,457.79	$0.00	($769,251.82)
E18	$0.00	$372,729.14	$1,236,035.62	$179,921.81	$96,635.50	$212,393.13	$171,340.52
E19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E20	$35,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E21	$19,739.97	$109,196.40	$215,275.85	$10,548,669.63	$9,372,466.23	$689,679.10	$1,309,830.18
E22	$4,028.00	$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
E24	$0.00	$2,020,229.12	$2,458,779.14	$843,168.99	$685,408.82	$900,063.09	$753,973.54
E25	$0.00	$201,394.44	$115,873.76	$12,101.05	$12,101.05	$29,993.90	$29,993.90
E25 In-Kind	$0.00	$436,000.00	$436,000.00	$0.00	$0.00	$0.00	$0.00
E26	$0.00	$147.62	$0.00	$0.00	$0.00	$0.00	$0.00
E27	$0.00	$295,869.31	$25,958,686.14	$846,914.71	$992,624.60	$179,098.65	$267,944.75
E28	$0.00	$156,905.74	$1,538,805.52	$318,447.52	$410,664.22	$269,402.54	$266,187.67
E29	$0.00	$173,512.57	$59,683.31	$0.00	$0.00	$0.00	$0.00
E30	$0.00	$0.00	$255,733.98	$0.00	$0.00	$0.00	$0.00
E31	$0.00	$0.00	$440,441.26	$42,096.23	$17,811.23	$41,975.85	$39,439.69
E32	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E33	$0.00	$0.00	$1,268,018.44	$322,214.66	$250,882.25	$173,882.03	$205,985.55
E34	$0.00	$0.00	$133,159.02	$123,672.64	$123,672.64	$11.83	$11.83

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 Obligations	FY16 Expenditures	FY17 Obligations	FY17 Expenditures
E35	$0.00	$0.00	$324,968.99	$158,178.28	$236,841.95	$4,765,001.75	$2,970,491.64
E36	$0.00	$0.00	$0.00	$0.00	$0.00	$16,424.69	$16,424.69
E37	$0.00	$0.00	$0.00	$0.00	$0.00	$10,027.29	$10,027.29
E38	$0.00	$0.00	$0.00	$0.00	$0.00	$115,742.63	$115,742.63
E39	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total E	**$2,625,781.46**	**$33,217,823.05**	**$52,543,821.20**	**$16,197,844.90**	**$15,029,657.69**	**$12,153,066.67**	**$8,856,372.85**
F1	$199,492.67	$1,338,304.56	$2,741,582.10	$471,224.34	$541,133.66	$839,620.04	$509,888.32
F2	$65,235.81	$558,948.29	$1,023,786.96	$273,682.73	$273,966.32	$487,309.71	$330,715.45
F3	$23,023.55	$178,096.37	$224,767.11	$63,377.64	$63,377.64	$42,126.44	$42,126.44
F4	$0.00	$370,759.30	$683,041.46	$36,810.41	$36,810.41	$123,507.75	$62,102.16
F5	$0.00	$508,229.54	$1,013,665.04	$241,313.96	$238,890.68	$362,211.47	$268,516.37
F6	$0.00	$58,283.91	$389,433.51	$49,043.49	$54,639.37	$22,198.36	$22,198.36
F7	$0.00	$0.00	$78,366.68	$23,225.44	$23,225.44	$30,633.05	$30,633.05
F8	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
F9	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
F10	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total F	**$287,752.03**	**$3,012,621.97**	**$6,154,642.86**	**$1,158,678.01**	**$1,232,043.52**	**$1,907,606.82**	**$1,266,180.15**
G1	$0.00	$1,124,098.20	$3,436,647.91	$919,025.71	$840,662.37	$1,277,295.14	$1,107,997.12
G3	$0.00	$1,478,396.05	$991,137.22	$190,240.44	$183,255.64	$4,493.69	$99,375.32
G4	$0.00	$217,908.07	$919,478.57	$420,190.00	$311,930.98	$692,311.87	$347,011.93
G6	$0.00	$0.00	$0.00	$27,482.43	$3,359.07	$97,582.09	$21,032.38
Total G	**$0.00**	**$2,820,402.32**	**$5,347,263.70**	**$1,556,938.58**	**$1,339,208.06**	**$2,071,682.79**	**$1,575,416.75**
H1	$0.00	$2,948,000.00	$29,518,770.00	$0.00	$0.00	$0.00	$0.00
H2	$0.00	$0.00	$3,994,595.38	$1,104,052.00	$1,104,052.00	$1,108,828.00	$1,108,828.00
Total H	**$0.00**	**$2,948,000.00**	**$33,513,365.38**	**$1,104,052.00**	**$1,104,052.00**	**$1,108,828.00**	**$1,108,828.00**
I1	$0.00	$35,376.14	$473,628.79	$106,930.04	$96,930.04	$133,126.02	$143,126.02
G5	$0.00	$61,059.68	$0.00	$0.00	$0.00	$0.00	$0.00
Total I	**$0.00**	**$96,435.82**	**$473,628.79**	**$106,930.04**	**$96,930.04**	**$133,126.02**	**$143,126.02**
GRAND Totals	**$5,672,216.18**	**$75,084,104.10**	**$141,855,572.87**	**$29,715,407.62**	**$27,984,803.05**	**$25,626,026.38**	**$21,267,605.76**

D-4: Cumulative Program Accomplishment, FY18, FY19, and FY04 – FY19

Work Task	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	FY04 – FY19 Expenditures
A1	$1,288,045.42	$1,262,277.18	$1,133,593.18	$1,155,923.06			$15,723,254.31
G2	$0.00	$0.00	$0.00	$0.00			$130,535.22
Total A	**$1,288,045.42**	**$1,262,277.18**	**$1,133,593.18**	**$1,155,923.06**			**$15,853,789.53**
B1	$211,549.45	$196,391.51	$216,528.83	4203,562.77			$2,961,855.03
B2	$324,870.50	$398,475.00	$326,397.91	$368,089.66			$4,653,204.60
B3	$166,345.03	$190,503.35	$170,190.62	$100,272.82			$1,818,848.60
B4	$259,697.43	$454,126.36	$256,244.89	$250,441.80			$3,246,432.59
B5	$541,538.62	$520,027.96	$500,850.04	$415,584.50			$4,451,404.72
B6	$324,717.13	$264,823.02	$536,445.62	$226,633.50			$1,808,314.56
B7	$183,822.20	$174,313.63	$187,448.44	$178,380.35			$2,740,823.05
B8	$137,535.12	$137,957.22	$147,859.37	$226,450.37			$1,460,307.76
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	$0.00	$0.00	$0.00	$0.00			$429,016.64
B12	$65,881.81	$50,871.00	$65,734.38	$49,753.11			$244,906.04
Total B	**$2,215,957.29**	**$2,387,489.05**	**$2,407,700.10**	**$2,019,168.88**			**$24,373,542.53**
C1	$0.00	$0.00	$0.00	$0.00			$146,658.15
C2	$11,101.09	$21,101.09	$15,564.32	$14,548.14			$163,656.39
C3	$0.00	$0.00	$0.00	$0.00			$278,663.86
C4	$0.00	$0.00	$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
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	$0.00	$0.00	$0.00			$1,096,173.01
C11	$0.00	$0.00	$0.00	$0.00			$1,154,850.76
C12	$0.00	$0.00	$0.00	$0.00			$1,036,266.87
C13	$0.00	$0.00	$0.00	$0.00			$1,927,788.82
C14	$0.00	$0.00	$7,500.00	$0.00			$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

Work Task	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	FY04 – FY19 Expenditures
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	$124,254.93	$240,573.87	($12,369.66)	$24,482.20			$2,582,480.58
C25	$537.58	$17,429.47	$0.00	($533.79)			$2,034,139.16
C26	$0.00	$0.00	$0.00	$0.00			$128,811.07
C27	$0.00	$0.00	$0.00	$0.00			$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	$149,136.13	$124,008.07	$318.58	$81,123.02			$1,082,911.55
C32	($7,531.34)	($7,531.34)	$0.00	$0.00			$900,548.68
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	$413,755.84	$274,527.11	$537.24	$194,542.94			$1,569,459.64
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	$0.00	$0.00	$0.00	$0.00			$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

Work Task	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	FY04 – FY19 Expenditures
C52	$254.54	$6,317.50	$0.00	$0.00			$831,993.20
C53	$42,475.54	$37,590.71	$2,797.81	$14,345.28			$689,054.36
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	$0.00	$0.00	$0.00	$0.00			$696,333.92
C58	$0.00	$0.00	$0.00	$0.00			$30,179.14
C59	$153,470.62	$130,206.20	$160,260.22	$130,786.15			$468,712.35
C60	$156,839.19	$102,018.29	$161,453.42	$208,037.85			$549,826.62
C61	$288,857.26	$111,718.12	($2,391.06)	$29,672.08			$638,512.21
C62	($43.31)	$40,147.65	$0.00	$0.00			$528,435.50
C63	$98,270.13	$75,725.19	$0.00	$21,298.10			$350,589.40
C64	$451,416.35	$446,430.08	$442,497.69	$542,326.26			$2,366,684.41
C65	$44,359.14	$74,827.43	$342.24	$45,174.04			$299,188.98
C66	$25,505.31	$25,505.31	($8,023.77)	($8,023.77)			$144,578.17
Total C	**$1,952,659.00**	**$1,720,594.75**	**$768,487.03**	**$1,297,778.50**			**$32,346,952.91**
D1	$40,504.44	$40,504.44	$32,614.21	$32,614.21			$437,495.48
D2	$706,478.94	$617,477.07	$321,685.83	$426,926.93			$10,412,379.99
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	$269,757.00	$269,757.00	$299,283.00	$299,283.00			$3,888,963.22
D6	$94,088.91	$94,088.91	$258,540.61	$242,853.41			$2,972,830.12
D7	$62,281.40	$206,807.56	$54,267.18	$54,267.18			$7,039,053.52
D8	$1,043,344.18	$1,006,230.02	$1,292,410.96	$1,125,387.40			$9,594,742.03
D9	$129,056.63	$129,265.87	$96,950.99	$59,394.44			$2,526,012.61
D10	$31,374.56	$31,374.56	$25,446.36	$25,446.36			$345,749.33
D11	$0.00	$0.00	$0.00	$0.00			$269,097.12
D12	$7,468.38	$7,468.38	$0.00	$0.00			$493,724.42
D13	$0.00	$0.00	$0.00	$0.00			$29,381.98
D14	$0.00	$0.00	$14,109.52	$14,109.52			$14,109.52
Total D	**$2,384,354.44**	**$2,402,973.81**	**$2,395,308.66**	**$2,280,282.45**			**$39,023,151.01**

Work Task	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	FY04 – FY19 Expenditures
E1	$220,524.14	$268,287.99	$1,314,564.68	$1,314,510.93			$5,942,122.03
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	$644,951.71	$482,078.16	$671,772.91	$636,283.80			$11,348,421.66
E5	$839,589.33	$783,052.64	$582,260.92	$451,510.05			$13,692,484.08
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	$116,905.59	$111,841.79	$181,125.19	$196,330.04			$7,621,151.63
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	$28,776.19	$28,776.19	$7,409.61	$7,409.61			$188,232.31
E14	$515,675.14	$295,963.75	$407,789.63	$775,184.93			$11,583,200.74
E15	$0.00	$0.00	$0.00	$0.00			$1,693,981.04
E16	$1,077,161.04	$1,860,421.61	$690,397.37	$747,013.53			$8,011,282.03
E17	$0.00	$1,308.70	$0.00	$76,958.63			$554,091.96
E18	$402,885.33	$238,744.70	$204,434.32	$198,706.09			$2,314,191.57
E19	$0.00	$0.00	$0.00	$0.00			$0.00
E20	$0.00	$0.00	$0.00	$0.00			$35,000.00
E21	$1,151,199.48	$1,328,663.86	$4,244,489.40	$3,579,085.84			$15,934,258.33
E22	$0.00	$0.00	$0.00	$0.00			$4,028.00
E23	$0.00	$0.00	$0.00	$0.00			$0.00
E24	$1,131,907.15	$1,188,160.29	$945,231.23	$828,228.97			$7,934,779.88
E25	($6,534.23)	($6,534.23)	$32,089.41	$32,089.41			$384,918.33
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	$156,319.43	$155,226.43	$61,353.64	$44,858.18			$27,715,209.41
E28	$373,739.17	$288,594.40	$225,864.96	$289,071.34			$2,950,228.89
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	$40,847.96	$41,055.54	$24,621.46	$20,596.11			$559,343.83
E32	$0.00	$0.00	$0.00	$0.00			$0.00
E33	$24,647.30	$68,915.32	$33,951.14	$29,480.99			$1,823,282.55
E34	$0.00	$0.00	$0.00	$0.00			$256,843.49

Work Task	FY18 Obligations	FY18 Expenditures	FY19 Obligations	FY19 Expenditures	FY20 Obligations	FY20 Expenditures	FY04 – FY19 Expenditures
E35	$4,240,523.35	$5,425,446.82	$1,263,978.39	$1,368,982.43			$10,326,731.83
E36	$1,167.13	$1,167.13	$8,000.00	$0.00			$17,591.82
E37	$0.00	$0.00	$68,295.77	$68,295.77			$78,323.06
E38	$173,347.70	$173,347.70	$53,795.06	$53,795.06			$342,885.39
E39	$213,860.00	$122,675.06	$11,325,356.98	$11,215,825.22			$11,338,500.28
E40	$26,478.64	$11,625.60	$399,228.48	$414,081.52			$425,707.12
Total E	**$11,373,971.55**	**$12,868,819.45**	**$22,746,010.55**	**$22,348,298.45**			**$147,490,574.15**
F1	$966,385.23	$808,611.58	$447,229.73	$352,215,11			$6,491,228.00
F2	$360,204.59	$494,428.39	$411,774.03	$373,715.87			$3,120,797.09
F3	$64,748.87	$64,748.87	$80,097.23	$80,097.23			$676,237.21
F4	$88,410.11	$74,419.41	$68,278.84	$126,896.37			$1,354,029.11
F5	$381,622.26	$443,117.81	$395,696.03	$426,139.80			$2,898,559.24
F6	$41,121.18	$41,121.18	$15,943.78	$15,943.78			$581,620.11
F7	$38,104.37	$38,104.37	$38,311.68	$38,311.68			$208,641.22
F8	$9,699.58	$9,699.58	$1,211.89	$1,211.89			$10,911.47
F9	$53,502.65	$53,502.65	$352,596.64	$305,664.88			$359,167.53
F10	$618,393.95	$424,700.22	$652,369.99	$766,442.84			$1,191,143.06
Total F	**$2,622,192.79**	**$2,452,454.06**	**$2,463,509.84**	**$2,486,639.45**			**$16,892,334.04**
G1	$1,081,315.25	$1,137,871.71	$892,299.95	$973,219.71			$8,620,497.02
G3	$5,386.62	$66,036.46	$59,455.02	$59,455.02			$2,877,655.71
G4	$654,991.70	$562,462.32	$302,803.39	$441,367.17			$2,800,159.04
G6	$15,162.76	$68,290.13	$40,488.91	$52,599.01			$145,280.59
Total G	**$1,756,856.33**	**$1,834,660.62**	**$1,295,047.27**	**$1,526,640.91**			**$14,443,592.36**
H1	$0.00	$0.00	$0.00	$0.00			$32,466,770.00
H2	$1,122,360.00	$1,122,360.00	$1,147,832.00	$1,147,832.00			$8,477,667.38
Total H	**$1,122,360.00**	**$1,122,360.00**	**$1,147,832.00**	**$1,147,832.00**			**$40,944,437.38**
I1	$141,757.83	$141,757.83	$112,752.67	$112,752.67			$1,003,571.49
G5	$0.00	$0.00	$0.00	$0.00			$61,059.68
Total I	**$141,757.83**	**$141,757.83**	**$112,752.67**	**$112,752.67**			**$1,064,631.17**
GRAND Totals	**$24,858,154.65**	**$26,193,386.75**	**$34,470,241.30**	**$34,375,316.37**			**$332,433,005.08**

Attachment E – Reports Published in Fiscal Year 2019

Except where otherwise noted for journal articles, these reports are available on the Lower Colorado River Multi-Species Conservation Program website at: http://www.lcrmscp.gov/steer_committee/technical_reports.html

Work Task	Report Title
C2	Surveys of Threecorner Milkvetch and Sticky Buckwheat in Fiscal Year 2018
C24	Elf Owl, 2016 Annual Report
C40	Development of SNP Markers for Sex Determination, Parentage Assessment, and Population Genetics of Razorback Suckers, 2018 Annual Report
C43	Population Demographics and Habitat Use of the California Leaf-Nosed Bat, 2016 Final Report
C64	Population Status and Distribution of Razorback Suckers and Bonytail Downstream from Palo Verde Diversion Dam, 2018 Interim Report
C66	California Black Rail Documented Use of Water Depths, 2019
D1	Marsh Bird Surveys in Topock Gorge, 2018
D1	Marsh Bird Surveys in Topock Gorge, 2019
D2	Southwestern Willow Flycatcher Presence/Absence Surveys, 2013 – 2017 Summary Report
D2	Southwestern Willow Flycatcher Presence/Absence Surveys, 2018 Annual Report
D5	Monitoring Avian Productivity and Survivorship, 2016-2017
D7	Yellow-billed Cuckoo Surveys on the Lower Colorado River, 2014–2018 Summary Report
D8	Demographics and Monitoring of Repatriated Razorback Suckers in Lake Mohave, 2016
D8	Demographics and Monitoring of Repatriated Razorback Suckers in Lake Mohave, 2017
D8	Demographics and Monitoring of Repatriated Razorback Suckers in Lake Mohave, 2018
D8	Native Fish Monitoring in Reach 3 of the lower Colorado River, 2016–2017
D9	System-Wide Acoustic Monitoring of LCR MSCP Bat Species, 2017
D9	System-Wide Acoustic Monitoring of LCR MSCP Bat Species, 2018

Work Task	Report Title
D10/F3	Post-Development and System-Wide Monitoring of Rodent Populations, Fiscal Year 2018
E9	Hart Mine Marsh, 2016 Annual Report
E9	Hart Mine Marsh, 2017 Annual Report
E9	Hart Mine Marsh, 2018 Annual Report
E21	Planet Ranch Restoration, Development, and Monitoring Plan
E24	Cibola NWR Unit #1, 2016 Annual Report
E24	Cibola NWR Unit #1, 2017 Annual Report
E25	Big Bend Conservation Area, 2016 Annual Report
E25	Big Bend Conservation Area, 2017 Annual Report
E25	Big Bend Conservation Area, 2018 Annual Report
E27	Laguna Division Conservation Area, 2017 Annual Report
E27	Laguna Division Conservation Area, 2018 Annual Report
E31	Hunters Hole, 2017 Annual Report
E31	Hunters Hole, 2018 Annual Report
E33	Pretty Water Conservation Area, 2017 Annual Report
E33	Pretty Water Conservation Area, 2018 Annual Report
E36	Parker Dam Camp, 2017 Annual Report
E36	Parker Dam Camp, 2018 Annual Report
E25	Big Bend Conservation Area, 2014 Annual Report
E39	Dennis Underwood Conservation Area Restoration, Development, and Monitoring Plan
F2	Lower Colorado River Riparian Bird Surveys, 2018 Annual Report
F4	Post-Development Acoustic Monitoring of LCR MSCP Bat Species, 2016 Annual Report
F4	Post Development Acoustic Monitoring of LCR MSCP Bat Species, 2017 Annual Report
F4	Post Development Acoustic Monitoring of LCR MSCP Bat Species, 2018 Annual Report
F6	Monitoring of the MacNeill's Sootywing Skipper and its Habitats, 2018 Annual Report

Work Task	Report Title
G4	LCR MSCP Five-Year Monitoring and Research Priorities: 2018–2022
G6	MacNeill's Sootywing Skipper (*Pholisora gracielae* = *Hesperopsis gracielae*) (MacNeill) (MNSW) Basic Conceptual Ecological Model for the Lower Colorado River, 2018 Updates
G6	Flannelmouth Sucker (*Catostomus latipinnis*) (FLSU) Basic Conceptual Ecological Model for the lower Colorado River, 2018 Updates
G6	Bonytail (*Gila elegans*) (BONY) Basic Conceptual Ecological Model for the Lower Colorado River, 2018 Updates
I1	Fiscal Year 2017 Outreach Activities
I1	Fiscal Year 2018 Outreach Activities