Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Final Implementation Report, Fiscal Year 2023 Work Plan and Budget, Fiscal Year 2021 Accomplishment Report

June 2022

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

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

Lower Colorado River Multi-Species Conservation Program

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

June 2022

ACRONYMS AND ABBREVIATIONS

AKN	Avian Knowledge Network
ALS	aerial laser scanning
AMM2	Avoidance and Minimization Measure 2
AMP	Adaptive Management Program
ARCC	Aquatic Research Conservation Center
AZGFD	Arizona Game and Fish Department
BBCA	Big Bend Conservation Area
Bill Williams River NWR	Bill Williams River National Wildlife Refuge
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
cfs	cubic foot/feet per second
CI	confidence interval
Cibola NWR	Cibola National Wildlife Refuge
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
DNA	deoxyribonucleic acid
eDNA	environmental DNA
ESA	Endangered Species Act
FMA	Funding and Management Agreement
FMC	Freeport Minerals Corporation
FY	fiscal year
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
LUA	Land Use Agreement
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
MRM	Monitoring and Research Measure
MVCA	Mohave Valley Conservation Area
N/A	not applicable
NDOW	Nevada Department of Wildlife
NDVI	normalized difference vegetation index
NPS	National Park Service
O&M	operation and maintenance
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
RMF	Remedial Measures Fund

SDCWA	San Diego County Water Authority
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
USFWS	U.S. Fish and Wildlife Service
WET	Water Education for Teachers
Willow Beach NFH	Willow Beach National Fish Hatchery
YEW	Yuma East Wetlands
YMCA	Yuma Meadows Conservation Area
1997 BO	1997 Biological and Conference Opinion on Lower Colorado River Operations and Maintenance Activities

Symbols

>	greater than
≥	greater than or equal to
<	less than
%	percent

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*
Palo verde	*Parkinsonia* spp.
Phragmites	*Phragmites australis*
Quailbush	*Atriplex lentiformis*
Saguaro	*Carnegiea gigantea*
Sahara mustard	*Brassica tournefortii*
Saltcedar	*Tamarix* spp.
Saltgrass	*Distichlis spicata*
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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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 invertebrates, mammals, plants, and reptiles.

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. These documents included 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 56 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 FY21, Seth Shanahan, Southern Nevada Water Authority, served as Chair of the Steering Committee, and Chuck Cullom, Central Arizona Project, 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 FY21, a summary of work underway during FY22, and proposed work to be performed during FY23. It also documents research and monitoring activities undertaken in support of the LCR MSCP and incidental take for covered actions implemented during FY21. 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

FY	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
2022	$19,982,000	1.565	2020	$31,271,830	$15,635,915	$15,635,915
2023	$19,982,000	1.743	2021	$34,828,626	$17,414,313	$17,414,313

[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.

FY23 Contributions and Adjustments

As outlined in table 1-1, the annual funding commitment for FY23 is $19,982,000, based on the 2003 estimate, and $34,828,626 after the composite inflation index of 1.743 is applied. In accordance with Section 8.3 of the FMA, the Federal share of the cost for FY23 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 FY23 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.—FY23 Contribution Schedule

Funding Entity	FY23 Contributions	FY23 Adjusted Contributions
Federal	$17,414,313.00	$17,414,313.00
Non-Federal	$17,414,313.00	$17,414,313.00
California	*$8,707,156.50*	*$8,248,331.36*
Arizona	*$4,353,578.25*	*$5,271,228.53*
Nevada	*$4,353,578.25*	*$3,894,753.11*
Total	**$34,828,626.00**	**$34,828,626.00**

2001 Biological Opinion Account

A total of $6 million, plus interest, was available to Reclamation through the 2001 BO funding agreement. This funding is part of LCR MSCP contributions from the San Diego County Water Authority (SDCWA) and The Metropolitan Water District of Southern California (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 SDCWA

and the Metropolitan started using their funding credits to meet their LCR MSCP contributions. The Metropolitan used their remaining credits in FY13, and the SDCWA will use their remaining credits in FY22.

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 FY21 is $35,998,419.76. 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 FY21 contributions, total funds contributed through FY21 with interest, FY22 contributions, and FY23 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	FY21 Contribution	Cumulative through FY21[1]	FY22 Contribution	FY23 Projected Contribution
California	$604,164.00	$5,940,903.62	$622,870.00	$693,714.00
Arizona	$302,082.00	$2,467,157.83	$311,435.00	$346,857.00
Nevada	$302,082.00	$3,114,770.71	$311,435.00	$346,857.00
	$1,208,328.00	$11,522,832.16	$1,245,740.00	$1,387,428.00

[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 FY21. No additional funds were contributed in FY21 or FY22, and no additional funds are projected to be contributed in FY23. 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	FY21 Contribution	Cumulative through FY21	FY22 Contribution	F23 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 FY21.

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 (PVID) 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 FY23 Program Activities and FY21 Accomplishments

The minimum funding required in the LCR MSCP documents for FY23 is $34,828,626: $17,414,313 Federal and $17,414,313 non-Federal. Reclamation is proposing an annual program budget of $23,951,802 (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 FY23 accomplishment report.

Table 1-5.—FY23 Proposed Program Funding

Program Area	FY23 Funding
Program Administration	$1,774,374
Fish Augmentation	$1,580,000
Species Research	$189,000
System Monitoring	$2,405,000
Conservation Area Development and Management	$12,821,000
Post-Development Monitoring	$2,655,000
Adaptive Management Program	$1,090,000
Funding Accounts – Remedial Measures	$1,387,428
Public Outreach	$50,000
Subtotal	$23,951,802
Land and Water Fund Contribution	$0
Total	**$23,951,802**

Table 1-6 shows the following by work task: FY21 approved estimates and actual accomplishment, cumulative program expenditures (FY04–21), FY22 approved program funding, FY23 proposed program funding, and out-year funding for FY24 and FY25. 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 FY. 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	FY21 Approved Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Projected Estimate[1]	FY25 Projected Estimate[1]
A	**Program Administration**							
A1	Program Administration	$1,545,324.00	$1,322,129.24	$18,441,920.29	$1,593,170.00	$1,774,374.00	$1,774,374.00	$1,774,374.00
Closed[2]	Work Tasks Pre-FY21		$0.00	$130,535.22				
		$1,545,324.00	**$1,322,129.24**	**$18,572,455.51**	**$1,593,170.00**	**$1,774,374.00**	**$1,774,374.00**	**$1,774,374.00**
B	**Fish Augmentation**							
B1	Lake Mohave Razorback Sucker Larvae Collections	$215,000.00	$218,481.80	$3,358,386.23	$215,000.00	$215,000.00	$215,000.00	$215,000.00
B2	Willow Beach National Fish Hatchery	$325,000.00	$620,968.81	$5,141,196.82	$325,000.00	$325,000.00	$325,000.00	$325,000.00
B3	Achii Hanyo Native Fish Rearing Facility	$170,000.00	$187,778.10	$2,181,559.75	$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	$275,538.95	$3,681,085.75	$260,000.00	$260,000.00	$260,000.00	$260,000.00
B5	Bubbling Ponds Fish Hatchery	$150,000.00	$152,995.78	$5,079,936.63	$0.00	$0.00	$0.00	$0.00
B6	Lake Mead Fish Hatchery	$585,000.00	$605,254.96	$2,721,936.44	$775,000.00	$250,000.00	$1,000.00	$1,000.00
B7	Lakeside Rearing Ponds	$150,000.00	$155,162.63	$3,010,372.41	$150,000.00	$150,000.00	$150,000.00	$150,000.00
B8	Fish Tagging Equipment	$135,000.00	$21,585.07	$1,715,206.86	$135,000.00	$135,000.00	$135,000.00	$135,000.00
B12	Maintenance of Alternate Bonytail Broodstock	$70,000.00	$78,527.29	$397,421.52	$75,000.00	$75,000.00	$75,000.00	$80,000.00
Closed[2]	Work Tasks Pre-FY21		$0.00	$987,445.58				
		$2,060,000.00	**$2,316,293.39**	**$28,274,547.99**	**$2,105,000.00**	**$1,580,000.00**	**$1,331,000.00**	**$1,336,000.00**

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY21 Approved Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Projected Estimate[1]	FY25 Projected Estimate[1]
C	**Species Research**							
C2	Sticky Buckwheat and Threecorner Milkvetch Conservation	$11,000.00	$12,337.13	$178,248.74	$11,000.00	$13,000.00	$13,000.00	$13,000.00
C14	Humpback Chub Program Support	$60,000.00	$0.00	$288,955.36	$1,000.00	$1,000.00	$1,000.00	$1,000.00
C59	Selenium Monitoring in Created Backwater and Marsh Habitats	$60,000.00	$10,167.92	$739,172.04	$0.00	$0.00	$0.00	$0.00
C60	Habitat Manipulation	$175,000.00	$165,932.83	$1,017,860.81	$225,000.00	$175,000.00	$175,000.00	$175,000.00
C61	Evaluation of Alternative Stocking Methods for Fish Augmentation	$10,000.00	$3,421.37	$706,413.65	$7,500.00	$0.00	$0.00	$0.00
C64	Post-Stocking Movement, Distribution, and Habitat Use of Razorback Suckers and Bonytail	$450,000.00	$474,730.77	$3,247,518.91	$450,000.00	$0.00	$0.00	$0.00
Closed[2]	Work Tasks Pre-FY21			$28,319,213.98				
		$766,000.00	**$666,590.02**	**$34,497,383.49**	**$694,500.00**	**$189,000.00**	**$189,000.00**	**$189,000.00**
D	**System Monitoring**							
D1	Marsh Bird Surveys	$40,000.00	$43,779.61	$520,087.30	$40,000.00	$40,000.00	$40,000.00	$40,000.00
D2	Southwestern Willow Flycatcher Presence/ Absence Surveys	$420,000.00	$430,713.56	$11,154,122.92	$340,000.00	$340,000.00	$360,000.00	$360,000.00
D5	Monitoring Avian Productivity and Survivorship	$250,000.00	$202,872.97	$4,248,050.68	$250,000.00	$0.00	$0.00	$0.00
D6	System Monitoring of Riparian Obligate Avian Species	$530,000.00	$474,485.94	$3,939,316.88	$450,000.00	$75,000.00	$60,000.00	$60,00.00
D7	Yellow-billed Cuckoo System-Wide Monitoring	$50,000.00	$61,146.32	$7,143,230.78	$0.00	$0.00	$0.00	$0.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY21 Approved Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Projected Estimate[1]	FY25 Projected Estimate[1]
D8	Razorback Sucker and Bonytail Stock Assessment	$1,125,000.00	$1,204,857.53	$12,054,499.76	$1,125,000.00	$1,350,000.00	$1,350,000.00	$1,350,000.00
D9	System Monitoring of Covered Bat Species	$100,000.00	$89,994.14	$2,682,133.68	$100,000.00	$100,000.00	$100,000.00	$15,000.00
D14	System-Wide Monitoring of MacNeill's Sootywing Skippers	$20,000.00	$13,155.83	$39,877.08	$0.00	$0.00	$0.00	$0.00
D15	Genetic Monitoring and Management of Native Fish Populations	$600,000.00	$509,651.81	$397,760.76	$500,000.00	$500,000.00	$500,000.00	$500,000.00
Closed[2]	Work Tasks Pre-FY21			$2,136,472.08				
		$3,135,000.00	**$3,030,657.71**	**$44,315,551.92**	**$2,805,000.00**	**$2,405,000.00**	**$2,410,000.00**	**$2,325,000.00**
E	**Conservation Area Development and Management**							
E1	Beal Lake Conservation Area	$500,000.00	$855,285.15	$7,479,516.61	$450,000.00	$650,000.00	$650,000.00	$750,000.00
E4	Palo Verde Ecological Reserve	$850,000.00	$1,046,340.90	$12,913,527.78	$900,000.00	$900,000.00	$1,000,000.00	$1,000,000.00
E5	Cibola Valley Conservation Area	$350,000.00	$518,424.23	$14,538,099.08	$350,000.00	$520,000.00	$520,000.00	$520,000.00
E9	Hart Mine Marsh	$1,150,000.00	$737,069.16	$8,609,806.65	$150,000.00	$150,000.00	$150,000.00	$150,000.00
E13	McAllister Lake	$100,000.00	$46,684.37	$307,478.00	$400,000.00	$60,000.00	$60,000.00	$60,000.00
E14	Imperial Ponds Conservation Area	$500,000.00	$522,726.25	$12,360,908.24	$350,000.00	$350,000.00	$350,000.00	$400,000.00
E16	Conservation Area Site Selection	$60,000.00	$153,662.56	$8,856,211.78	$60,000.00	$60,000.00	$60,000.00	$60,000.00
E17	Topock Marsh Pumping	$1,000.00	$0.00	$1,759,612.65	$1,000.00	$1,000.00	$1,000.00	$1,000.00
E18	Law Enforcement and Wildland Fire Support	$250,000.00	$194,614.85	$2,794,847.91	$215,000.00	$215,000.00	$215,000.00	$215,000.00
E21	Planet Ranch	$1,000,000.00	$1,548,340.64	$22,592,603.54	$750,000.00	$750,000.00	$750,000.00	$1,000,000.00

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY21 Approved Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Projected Estimate[1]	FY25 Projected Estimate[1]
E24	Cibola National Wildlife Refuge Unit #1 Conservation Area	$2,000,000.00	$1,302,182.98	$9,194,426.83	$1,600,000.00	$5,000,000.00	$5,000,000.00	$3,000,000.00
E25	Big Bend Conservation Area	$60,000.00	$17,318.58	$1,315,032.50*	$50,000.00	$30,000.00	$30,000.00	$500,000.00
E27	Laguna Division Conservation Area	$100,000.00	$173,665.85	$27,993,055.33	$100,000.00	$100,000.00	$100,000.00	$100,000.00
E28	Yuma East Wetlands	$275,000.00	$202,970.50	$3,404,482.53	$275,000.00	$275,000.00	$275,000.00	$275,000.00
E31	Hunters Hole	$30,000.00	$36,977.87	$630,975.54	$30,000.00	$160,000.00	$40,000.00	$40,000.00
E33	Pretty Water Conservation Area	$20,000.00	$8,094.25	$1,839,619.67	$20,000.00	$20,000.00	$20,000.00	$20,000.00
E35	Mohave Valley Conservation Area	$300,000.00	$125,170.92	$10,609,848.05	$100,000.00	$50,000.00	$50,000.00	$50,000.00
E36	Parker Dam Camp	$5,000.00	$5,386.23	$39,223.53	$10,000.00	$20,000.00	$10,000.00	$10,000.00
E38	Three Fingers Lake	$10,000.00	$5,480.20	$350,764.25	$10,000.00	$10,000.00	$10,000.00	$10,000.00
E39	Dennis Underwood Conservation Area	$1,500,000.00	$1,539,051.45	$14,347,443.03	$750,000.00	$750,000.00	$450,000.00	$450,000.00
E40	Yuma Meadows Conservation Area	$1,500,000.00	$568,674.42	$3,676,045.49	$4,000,000.00	$750,000.00	$2,500,000.00	$4,000,000.00
E41	Section 26 Conservation Area	$3,000,000.00	$750,756.07	$363,829.94	$2,500,000.00	$2,000,000.00	$2,000,000.00	$500,000.00
Closed[2]	Work Tasks Pre-FY21		$1,072.08	$6,894,473.45				
		$13,561,000.00	**$10,359,949.51**	**$171,999,832.38**	**$13,071,000.00**	**$12,821,000.00**	**$14,241,000.00**	**$13,111,000.00**

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY21 Approved Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Projected Estimate[1]	FY25 Projected Estimate[1]
F	**Post-Development Monitoring**							
F1	Habitat Monitoring at Conservation Areas	$600,000.00	$602,741.41	$8,031,430.83	$600,000.00	$600,000.00	$600,000.00	$600,000.00
F2	Avian Monitoring at Conservation Areas	$475,000.00	$432,732.94	$3,985,711.43	$445,000.00	$600,000.00	$400,000.00	$400,000.00
F3	Rodent Monitoring at Conservation Areas	$65,000.00	$58,264.96	$793,455.48	$65,000.00	$65,000.00	$65,000.00	$65,000.00
F4	Bat Species Monitoring at Conservation Areas	$90,000.00	$93,405.85	$1,582,241.26	$90,000.00	$90,000.00	$90,000.00	$90,000.00
F5	Post-Development Monitoring of Fishes at Conservation Areas	$400,000.00	$402,431.42	$3,730,856.35	$400,000.00	$400,000.00	$400,000.00	$400,000.00
F6	Post-Development Monitoring of MacNeill's Sootywing Skippers at Conservation Areas	$20,000.00	$16,780.81	$607,224.28	$20,000.00	$20,000.00	$20,000.00	$20,000.00
F7	Marsh Bird Monitoring at Conservation Areas	$10,000.00	$7,751.71	$223,931.74	$10,000.00	$13,000.00	$10,000.00	$10,000.00
F8	Reptile and Amphibian Monitoring at Conservation Areas	$25,000.00	$5,774.47	$18,013.22	$1,000.00	$7,000.00	$1,000.00	$1,000.00
F9	Southwestern Willow Flycatcher Monitoring at Conservation Areas	$360,000.00	$337,494.58	$1,054,243.59	$360,000.00	$360,000.00	$360,000.00	$360,000.00
F10	Yellow-billed Cuckoo Monitoring at Conservation Areas	$650,000.00	$664,003.61	$2,418,608.94	$620,000.00	$500,000.00	$400,000.00	$400,000.00
		$2,695,000.00	**$2,621,381.76**	**$22,445,717.12**	**$2,611,000.00**	**$2,655,000.00**	**$2,346,000.00**	**$2,346,000.00**

Table 1-6.—Annual Funding Matrix

Work Task	Name	FY21 Approved Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Projected Estimate[1]	FY25 Projected Estimate[1]
G	**Adaptive Management Program**							
G1	Data Management	$850,000.00	$1,071,735.77	$10,711,859.36	$750,000.00	$750,000.00	$750,000.00	$750,000.00
G3	Adaptive Management Research Projects	$100,000.00	$20,015.09	$2,899,553.92	$100,000.00	$0.00	$0.00	$0.00
G4	Science/Adaptive Management Strategy	$400,000.00	$172,221.62	$3,353,507.71	$300,000.00	$300,000.00	$300,000.00	$300,000.00
G6	Conceptual Ecological Models	$40,000.00	$25,404.07	$244,291.42	$40,000.00	$40,000.00	$40,000.00	$40,000.00
		$1,390,000.00	**$1,289,376.55**	**$17,209,212.41**	**$1,190,000.00**	**$1,090,000.00**	**$1,090,000.00**	**$1,090,000.00**
H	**Funding Accounts**							
H1[3]	Habitat Maintenance Fund	$0.00	$0.00	$32,466,770.00	$0.00	$0.00	$0.00	$0.00
H2[3]	Remedial Measures Fund	$1,208,328.00	$1,208,328.00	$10,880,791.38	$1,245,740.00	$1,387,428.00	$1,387,428.00	$1,387,428.00
		$1,208,328.00	**$1,208,328.00**	**$43,347,561.38**	**$1,245,740.00**	**$1,387,428.00**	**$1,387,428.00**	**$1,387,428.00**
I	**Public Outreach**							
I1	Public Outreach	$125,000.00	$118,884.54	$1,214,868.60	$125,000.00	$50,000.00	$50,000.00	$50,000.00
Closed	Work Tasks Pre-FY19			$61,059.68				
		$125,000.00	**$118,884.54**	**$1,275,928.28**	**$125,000.00**	**$50,000.00**	**$50,000.00**	**$50,000.00**
	Program Total:	**$26,485,652.00**	**$22,933,590.72**	**$381,938,190.48**	**$25,440,410.00**	**$23,951,802.00**	**$24,818,802.00**	**$23,608,802.00**

[1] FY24 and FY25 numbers are not adjusted for inflation.
[2] Closed work tasks are shown in attachment D-4.
[3] 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 FY23, 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 FY24 or FY25, (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 FY21, Reclamation estimated work tasks totaling $26,485,652.00. Actual LCR MSCP accomplishment (obligations) for FY21 was $22,933,593.72. Actual accomplishment was lower than the estimated amount because of construction delays at several conservation areas, including the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1) and Yuma Meadows Conservation Area (YMCA), due to COVID-19 related issues such as difficulty obtaining materials and equipment. In accordance with the FMA, Reclamation incurred a funding credit of $235,409.47 for FY21 (attachment D-2e). Cumulative program accomplishment (expenditures) through FY21 was $381,938,190.48 (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 FY21 was 6,840 acres.

Table 1-7.—Conservation Area Land Cover Type

Land Cover Type	Management Unit	Established Acres, FY21	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)	0	848
	E27 Laguna Division Conservation Area (California and Arizona)	0	1,130
	E28 Yuma East Wetlands (Arizona)	0	183
	E31 Hunters Hole (Arizona)	0	43
	E39 Dennis Underwood Conservation Area (California)	152	152
Total		**152**	**4,274**
Honey Mesquite	E4 Palo Verde Ecological Reserve (California)	145	324
	E5 Cibola Valley Conservation Area (Arizona)	0	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)	0	122
Total		**145**	**2,046**
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
	E35 Mohave Valley Conservation Area (California)	0	63
Total		**0**	**158**
	TOTAL	**297**	**6,840**

[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 FY21.

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

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres, FY21[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	13	
	E28 Yuma East Wetlands	0	94	
Total		**0**	**362**	**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	
	E35 Mohave Valley Conservation Area	0	63	
Total		**0**	**158**	**44%**
RASU2 (360 acres)	E14 Imperial Ponds Conservation Area	0	80	
	E25 Big Bend Conservation Area	0	15	
	E35 Mohave Valley Conservation Area	0	63	
Total		**0**	**158**	**44%**
WRBA2 (765 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	1,023	
	E5 Cibola Valley Conservation Area	0	687	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	272	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,182[3]**	**> 100%**
WYBA3 (765 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	1,023	
	E5 Cibola Valley Conservation Area	0	687	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	272	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,182[3]**	**> 100%**
CRCR2 (125 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	1,023	
	E5 Cibola Valley Conservation Area	0	687	
	E9 Hart Mine Marsh	0	255	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	367	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,532[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, FY21[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	13	
	E28 Yuma East Wetlands	0	94	
Total		**0**	**362**	**71%**
BLRA1 (130 acres)	E9 Hart Mine Marsh	0[4]	0	
	E14 Imperial Ponds Conservation Area	0	13	
	E28 Yuma East Wetlands	0	94	
Total		**0**	**107**	**82%**
YBCU1 (4,050 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	111	457	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	158	848	
	E28 Yuma East Wetlands	0	183	
Total		**269**	**2,553**	**63%**
ELOW1 (1,784 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	983	
	E5 Cibola Valley Conservation Area	0	686	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	272	
	E28 Yuma East Wetlands	0	286	
	E36 Parker Dam Camp	0	80	
Total		**0**	**2,427[3]**	**> 100%**
GIFL1 (4,050 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	111	457	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	158	848	
	E28 Yuma East Wetlands	0	183	
Total		**269**	**2,553**	**63%**
GIWO1 (1,702 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	269	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	367	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,884[3]**	**> 100%**

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

Species Habitat Creation Conservation Measures (Required Acres)	Management Unit	Creditable Acres, FY21[1]	Creditable Acres, Total	Percent of Acres Creditable by Species Conservation Measure
VEFL1 (5,208 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	985	
	E5 Cibola Valley Conservation Area	111	947	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	848	
	E28 Yuma East Wetlands	0	286	
	E36 Parker Dam Camp	0	80	
Total		**111**	**3,266**	**63%**
BEVI1 (2,983 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	1,023	
	E5 Cibola Valley Conservation Area	0	836	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	848	
	E28 Yuma East Wetlands	0	286	
	E36 Parker Dam Camp	0	80	
Total		**0**	**3,193[3]**	**> 100%**
YWAR1 (4,050 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	111	457	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	848	
	E28 Yuma East Wetlands	0	183	
Total		**111**	**2,553**	**63%**
SUTA1 (602 acres)	E1 Beal Lake Conservation Area	0	120	
	E4 Palo Verde Ecological Reserve	0	945	
	E5 Cibola Valley Conservation Area	0	269	
	E24 Cibola National Wildlife Refuge Unit #1 Conservation Area	0	272	
	E28 Yuma East Wetlands	0	183	
Total		**0**	**1,789[3]**	**> 100%**
FLSU1 (85 acres)	E25 Big Bend Conservation Area	0	15	
	E35 Mohave Valley Conservation Area	0	63	
Total		**0**	**78**	**92%**
MNSW2 (222 acres)	E4 Palo Verde Ecological Reserve	0	38	
	E5 Cibola Valley Conservation Area	0	417	
Total		**0**	**455[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 performed using lidar data from FY21.

[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 black rail marsh habitat. 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 FY21.

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 FY21 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 FY21. 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, FY21	Total Number of Razorback Suckers
2	10,732	150,323
Total	**10,732**	**150,323**

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

Reach	Number of Razorback Suckers, FY21	Total Number of Razorback Suckers
3	13,285	117,353
4 and 5	18,682	141,759
Total	**31,967**	**259,112**

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

Reach	Number of Bonytail, FY21	Bonytail Program
2	400	2,730[1]
3	3,026	64,107
4 and 5	8,059	59,134
Total	**11,485**	**125,971**

[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	FY21 Approved	FY22 Approved	FY23 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 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 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	FY21 Approved	FY22 Approved	FY23 Proposed
Bonytail	BONY1	Coordinate conservation efforts with the USFWS and recovery programs	A1	A1	A1
	BONY2	Create 360 acres of bonytail habitat	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	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 D15 G1 G4 H2	B2 B3 B4 B6 B7 B8 B12 C61 C64 D15 G1 G4 H2	B2 B3 B4 B6 B7 B8 B12 D15 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 E40 G1 G4
	BONY5	Monitor, research, and adaptively manage augmentations and created habitat	B7 B8 C59 C60 C61 C64 D8 D15 F5 G1 G4 G6	B7 B8 C59 C60 C61 C64 D8 D15 F5 G1 G4 G6	B7 B8 C60 D8 D15 F5 G1 G4 G6
	MRM5	Monitor selenium levels in backwater	C59 G1 G4	C59 G1 G4	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	FY21 Approved	FY22 Approved	FY23 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 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	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 D15 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 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 E40 G1 G4
	RASU5	Support ongoing Lake Mohave conservation efforts	B1 B2 B7 B8 C61 D15 G1 G4	B1 B2 B7 B8 C61 D15 G1 G4	B1 B2 B7 B8 D15 G1 G4
	RASU6	Monitor, research, and adaptively manage augmentations and created habitat	B7 B8 C59 C60 C61 C64 D8 D15 F5 G1 G4 G6	B7 B8 C59 C60 C61 C64 D8 D15 F5 G1 G4 G6	B7 B8 C60 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	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY21 Approved	FY22 Approved	FY23 Proposed
Western Red Bat	WRBA1	Conduct surveys for species distribution	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 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E33 E36 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 E39 F1 G1 G4 G6 H2	E1 E4 E5 E14 E16 E21 E24 E33 E36 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	F3 G1 G4 G6	F3 G1 G4 G6	F3 G1 G4 G6
	MRM1	Define habitat characteristics	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	FY21 Approved	FY22 Approved	FY23 Proposed
Colorado River Cotton Rat	CRCR1	Status/habitat surveys – define habitat first 5 years	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 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	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 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	FY21 Approved	FY22 Approved	FY23 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 E39 F1 G1 G4 G6 H2	E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 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 F10 G1 G4 G6	F10 G1 G4 G6
	MRM2	Monitor and adaptively manage created habitat	C60 D5 D7 F1 F10 G1 G4 G6	C60 D5 F1 F10 G1 G4 G6	C60 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	FY21 Approved	FY22 Approved	FY23 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 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E33 E36 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	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 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 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 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	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 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	FY21 Approved	FY22 Approved	FY23 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 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 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	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 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 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	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	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 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	FY21 Approved	FY22 Approved	FY23 Proposed
Arizona Bell's Vireo	BEVI1	**Create 2,983 acres – Creditable acres established exceed requirements**	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 E33 E36 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	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	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 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 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E31 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	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 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	FY21 Approved	FY22 Approved	FY23 Proposed
Summer Tanager	**SUTA1**	**Create 602 acres – Creditable acres established exceed requirement**	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 E39 F1 G1 G4 G6 H2	C60 E1 E4 E5 E14 E16 E21 E24 E27 E28 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	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 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 E41 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	C60 G1 G4 G6
	MRM5	Monitor selenium levels in backwaters	C59 G1 G4	C59 G1 G4	G1 G4

Table 1-10.—Status of Conservation Measures

Species/Habitat/Action	Code	Description	FY21 Approved	FY22 Approved	FY23 Proposed
MacNeill's Sootywing Skipper	MNSW1	Status surveys/habitat – define habitat first 5 years	D14 F6 G1 G4 G6	F6 G1 G4 G6	F6 G1 G4 G6
	MNSW2	**Create 222 acres – Creditable acres established exceed requirement**	C60 E1 E4 E5 E16 E39 G1 G4 G6	C60 E1 E4 E5 E16 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 F1 F6 G1 G4 G6	C60 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	FY21 Approved	FY22 Approved	FY23 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 3, 2021, letter from the USFWS, *Acceptance of Lower Colorado River Multi-Species Conservation Program Consistency Review for Final Implementation Report, Fiscal Year 2022 Work Plan and Budget, Fiscal Year 2020 Accomplishment Report* are 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 FY21.

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 FY21, CESA program requirements were also met for FY21.

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 FY21, 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 FY21, 63 acres of backwater replacement habitat at the Mohave Valley Conservation Area (MVCA) met all requirements for backwater replacement habitat under the CESA permit.

In fulfillment of item 11:

- Through FY21, 141,759 razorback suckers and 59,134 bonytail (305 mm TL or greater) have been stocked into Reaches 4 and 5 (see tables 1-9b–c.). Since the start of the LCR MSCP, 200,893 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 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 LCR MSCP 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 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 LCR MSCP will provide a level of funding to support implementation of a stocking/augmentation program providing for the stocking of up to

660,000 subadult razorback suckers and up to 620,000 subadult bonytail for reintroduction into the Colorado River over a 50-year term. Since 2005, 385,083 native fishes have been stocked toward this goal. This includes 259,112 razorback suckers that have been stocked into Reaches 3–5 (RASU3) and 125,971 bonytail that have been stocked into Reaches 2–5 (BONY3). In addition, 150,323 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 LCR MSCP Fish 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) 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. 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 (Mora NFH) 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.

FY21 Accomplishments

A total of 54,184 native fishes were stocked into the LCR, which included 10,732 razorback suckers and 400 bonytail stocked into Reach 2; 13,285 razorback suckers and 3,026 bonytail stocked into Reach 3; and 18,682 razorback suckers and 8,059 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 36,000 larvae was established 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 38,218 wild razorback sucker larvae were collected from 4 zones 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 6,213 razorback suckers were stocked, which included 4,543 razorback suckers stocked into Reach 2 and 1,670 razorback suckers stocked into Reach 3. The Willow Beach NFH received 29,147 razorback sucker larvae and 4,000 bonytail larvae for further grow-out. These bonytail will remain on station to evaluate the rearing capabilities for this species at the Willow Beach NFH.

- *Work Task B3 – Achii Hanyo Native Fish Rearing Facility*: A total of 6,134 native fishes were stocked. This included 3,118 razorback suckers stocked into Reach 3, and 2,539 razorback suckers and 477 bonytail stocked into Reach 4. The Achii Hanyo Native Fish Rearing Facility received approximately 5,300 fingerling razorback suckers from the Willow Beach NFH for future augmentation.

- *Work Task B4 – Southwestern Native Aquatic Resources and Recovery Center in Dexter, New Mexico*: A total of 3,457 bonytail were stocked, which included 3,026 bonytail stocked into Reach 3 and 431 bonytail stocked into Reach 4. The Center maintained broodstocks of razorback suckers and bonytail and transferred approximately 38,000 native fishes to other facilities for research and for further grow-out.

- *Work Task B5 – Bubbling Ponds Fish Hatchery*: A total of 20,163 razorback suckers were stocked, which included 4,049 razorback suckers stocked into Reach 3 and 16,114 razorback suckers into Reach 4. The Bubbling Ponds Fish Hatchery concluded rearing razorback suckers for the LCR MSCP in FY21. All razorback suckers that were not of stocking size were transferred to other LCR MSCP partner hatcheries.

- *Work Task B6 – Lake Mead Fish Hatchery*: A total of 17,868 native fishes were stocked, which included 5,840 razorback suckers and 400 bonytail stocked into Reach 2, 4,448 razorback suckers stocked into Reach 3, and 29 razorback suckers and 7,151 bonytail stocked into Reach 4. Larval fish rearing capabilities were also upgraded to allow for increased larval capacity and improved larval health and survival. The Lake Mead Fish Hatchery received approximately 31,000 razorback suckers and 7,800 fingerling bonytail from other facilities.

- *Work Task B7 – Lakeside Rearing Ponds*: A total of 349 razorback suckers were stocked into lakeside rearing ponds. Spring and fall pond harvests resulted in 75 razorback suckers captured and repatriated into Lake Mohave. Harvested fish ranged from 396–526 mm TL and had a mean TL of 472 mm.

- *Work Task B12 – Maintenance of Alternate Bonytail Broodstock*: Funding was provided to maintain the alternate bonytail broodstock (refuge population) at the Mora NFH. Broodstock survival was 95.3% through the end of the fiscal year.

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 low, native fish augmentation efforts will continue to focus on improving post-stocking survival. Research and monitoring efforts evaluating improvements in augmentation effectiveness were also continued under work tasks described in "Species Research (Section C)" and "System Monitoring (Section D)" below.

FY22 Activities

Fish augmentation activities will continue to focus on maximizing production, increasing the size (TL) of stocked fishes, augmenting current hatchery stocks, and safeguarding these stocks against unforeseen events. The LCR MSCP will also meet with the USFWS to discuss these topics and the future of the LCR MSCP Fish Augmentation Program. Additional details for planned activities are provided below.

Approximately 14,000 razorback sucker larvae will be captured from Lake Mohave and delivered to the Willow Beach NFH. The Willow Beach NFH will transfer approximately 10,000 fingerling razorback suckers to the Achii Hanyo Native Fish Rearing Facility for further grow-out. The Willow Beach NFH will continue working toward meeting the current rearing goal of 9,000 razorback suckers per year with an average TL > 400 mm. The Willow Beach NFH will also continue to rear bonytail on station to evaluate the effectiveness of raceway rearing versus pond rearing at the Achii Hanyo Native Fish Rearing Facility.

Production numbers at the Center are expected to be approximately 8,000 bonytail. The Center will continue to supply fingerling bonytail to the Willow Beach NFH and Achii Hanyo Native Fish Rearing Facility.

A total of 12,487 razorback suckers and 2,937 bonytail > 305 mm TL were stocked into the LCR from the Lake Mead Fish Hatchery. This included 2,287 razorback suckers stocked into Lake Mohave (Reach 2), 5,925 razorback suckers and 9 bonytail stocked into Reach 3, and 4,275 razorback suckers and 2,928 bonytail stocked below Parker Dam (Reach 4).

In FY22, the projected Lake Mead water elevation will decrease below the water delivery intake that supplies the Lake Mead Fish Hatchery. As a result, native fish production at the Lake Mead Fish Hatchery will be suspended, and approximately 20,000 razorback suckers will be transferred to the Willow Beach NFH. The Nevada Department of Wildlife (NDOW) is evaluating options for securing long-term water delivery to the hatchery.

Proposed FY23 Activities

With the temporary closure of the Lake Mead Fish Hatchery, native fish production and augmentation will be reduced for the next few years. Fish augmentation activities will continue to focus on maximizing production at other facilities to meet augmentation goals and on 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).

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) develop methods to 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 the razorback sucker, bonytail, and flannelmouth sucker (under Work Tasks G4 and G6) and will further assist in identifying these data gaps and in helping to prioritize and redefine research topics.

FY21 Accomplishments

Research on covered fish species and their habitats was largely completed during the first 15 years of program implementation. In FY21, research efforts were primarily focused on evaluating post-stocking movement, distribution, habitat use, and the population status of razorback suckers and bonytail downstream from Palo Verde Diversion Dam (Reach 4).

Acoustic tracking in Reach 4 continued to provide habitat use data for fishes implanted with acoustic telemetry tags in previous years. An additional 20 subadult razorback suckers and 20 subadult bonytail were implanted with short-term (3-month) tags to examine dispersal patterns immediately following release. Ten adult razorback suckers captured from a spawning aggregation near McIntyre Park were also implanted with long-term (36-month) tags to examine dispersal over multiple years.

Habitat use data were recorded for 69 fishes that were implanted with acoustic telemetry tags during the current and previous study years. Individual fish tended to show a preference for either backwater or river habitat, and only a few fish (< 15%) were contacted in both habitat types during the study year. Bonytail were only contacted in backwater habitat, whereas subadult and adult razorback sucker contacts were both evenly distributed between backwater and river habitat.

FY22 Activities

Research will continue to focus on evaluating post-stocking survival and habitat use of native fishes. Research activities 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 fishes to mature and incorporate with spawning aggregations so that survival and the effects of stocking treatments can be adequately assessed.

Predator avoidance trials will resume at the Arizona Game and Fish Department's (AZGFD) Aquatic Research Conservation Center (ARCC) located at the Bubbling Ponds Fish Hatchery. Trials will evaluate the efficacy of predator conditioning in the presence of physical cover and turbidity as they relate to survival of native fishes. FY22 will be the final year predator avoidance trials are conducted, and information gleaned from these trials may be used to implement alternative rearing and stocking practices to improve native fish survival.

Research evaluating movement, distribution, and habitat use of native fishes will continue under Work Task C64. This work will include sonic telemetry and remote passive integrated transponder (PIT) scanning in coordination with research-specific or general augmentation stockings in Reaches 3 and 4. It is anticipated that FY22 will be the final year this research is conducted. A portion of the surveys initiated under this work task will transition to system monitoring and will be conducted under Work Task D8 in future years.

No new Species Research (Section C) work tasks are beginning in FY22.

Proposed FY23 Activities

Research on covered fish species and their habitats has been completed, and information gathered through those efforts may be used to direct future native fish augmentation and monitoring of native fishes in the LCR. Funding support for humpback chub conservation efforts remains available and will be used in coordination with the USFWS and the Glen Canyon Dam AMP. These funds will be used as research needs are identified and as agreed to among all cooperating agencies.

No new Species Research (Section C) work tasks have been identified for FY23.

System Monitoring (Section D)

System-wide monitoring is conducted on existing populations of covered fish species to determine their population status, distribution, and genetic composition. System-wide monitoring for razorback suckers and bonytail is completed under Work Task D8. Monitoring data for flannelmouth suckers was 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 work completed under Work Tasks D8 and F5. The genetic composition of native fish populations in the mainstem LCR and conservation area backwaters will be monitored under Work Task D15.

FY21 Accomplishments

Work Task D8 – Razorback Sucker and Bonytail Stock Assessment: 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 FY20 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 FY20

Reach	Mark-Recapture Period	Razorback Sucker Population Estimate
Reach 1 (Lake Mead)	07/01/2019 to 06/30/2021	450
Reach 2 (Lake Mohave)	01/01/2020 to 04/30/2021	5,100
Reach 3	01/01/2020 to 04/30/2021	5,422
Reaches 4 and 5	01/01/2020 to 04/30/2021	935

Routine monitoring of the Reach 1 razorback sucker population was conducted. Trammel netting during the spawning season resulted in the capture of 104 razorback suckers: 2 from Las Vegas Bay, 27 from Echo Bay, 36 from the Muddy River/Virgin River inflow area, 5 from Bonelli Bay, and 34 from the Colorado River inflow area. Of the 104 razorback suckers captured, 53 were recaptured fish. The remaining fish were untagged, presumed to be wild-spawned individuals. The ages of wild razorback suckers captured from all monitoring

areas ranged from 4 to 15 years old. The razorback sucker population in Lake Mead was estimated at 450 individuals (95% CI from 358 to 586) for the 2019–2021 data collection period. Larval collections were also conducted in Reach 1 to monitor spawning success, estimate larval abundance, and collect samples for genetic analyses. A total of 516 larvae were captured throughout the spawning season, with the majority being returned to the lake following each sampling period.

Annual razorback sucker roundups were conducted in Reach 2 in November and March. During these efforts, a combined 276 razorback suckers were captured using trammel nets. An additional 45 razorback suckers were captured during October gill net surveys, and electrofishing surveys conducted in June and July resulted in the capture of 30 razorback suckers.

Remote PIT scanning recorded 111,185 contacts throughout Lake Mohave. Duplicate PIT tags contacted in multiple lake sections were removed from analyses, resulting in 4,604 unique razorback suckers and 2 bonytail being contacted. One of the bonytail had been at large for 2 years and 9 months prior to being contacted in February 2021. Based on 2020–2021 remote PIT scanning, the lake-wide Lake Mohave razorback sucker repatriate population was estimated at 5,100 individuals (95% CI from 4,944 to 5,255). This is the largest estimate for the Lake Mohave razorback sucker population since the late 1990s.

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. Remote PIT scanning resulted in the contact of 9,106 unique razorback suckers, 29 bonytail, and 19 flannelmouth suckers. Only six of the bonytail contacts were from fish at large for more than 6 months, and only one was at large for more than 1 year. Electrofishing and trammel netting surveys resulted in the capture of 281 unique razorback suckers, 4 bonytail, and 44 flannelmouth suckers. The Reach 3 razorback sucker population was estimated at 5,422 individuals (95% CI from 5,207 to 5,637). Due to the limited number of bonytail recontacts, no population estimate could be generated.

Capture and contact data for Reaches 4 and 5 were primarily obtained through work being conducted under Work Task C64. Supplemental PIT scanning and electrofishing were conducted under Work Task D8 to increase contacts and locate potential spawning aggregates. Remote PIT scanning resulted in the contact of 5,090 unique razorback suckers and 299 unique bonytail . Focused electrofishing efforts were conducted around the spawning aggregation site above McIntyre Park and resulted in the capture of 33 individual razorback suckers. Data from FY20 and FY21 were used to generate a razorback sucker population estimate of 935 individuals (95% CI from 905 to 964). Due to the limited number of bonytail recontacts, no population estimate could be generated.

Work Task D15 – Genetic Monitoring and Management of Native Fish Populations: Under this work task, new genotyping methods are being developed, a central repository for tissue samples has been established and maintained, and a widely accessible genetic database will be created. These methods and tools will be used to assess the effectiveness of native fish augmentation efforts in the LCR and provide information on populations developing in newly created habitats within the LCR MSCP planning area. Information gleaned from genetic analyses over the next few years will be used to develop a genetic management plan for native fish populations.

In FY21, the genetic structure of native fish communities in hatcheries, reservoirs, river reaches, and off-channel habitats was monitored throughout the year. Tissue samples were collected for genetic analyses to characterize these various stocks, compare them to source or founder populations, and to evaluate if these stocks would need additional management through augmentation. The development of new analytical methods, the genetic database, and the online database application also continued.

FY22 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 scanning of PIT-tagged fishes, active and passive tracking of sonic-tagged fishes, and collection of tissue samples for genetic analysis.

The development of an adaptive management plan for system monitoring of native fishes will also be initiated in FY22. The plan will formally document monitoring questions, identify data to be collected and how those data will be used to answer monitoring questions, develop adaptive management thresholds for monitoring efforts, and identify potential adaptive management actions.

Proposed FY23 Activities

Monitoring will be conducted in Reaches 1–5, 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. Monitoring data will also be summarized to provide up-to-date, system-wide stock and genetic assessments of razorback suckers and bonytail.

It is anticipated that the adaptive management plan for system monitoring of native fishes will be completed. Monitoring data will be evaluated through the adaptive management process on an annual basis, and changes to monitoring priorities or efforts in future years will be implemented as needed. System

monitoring data will continue to be used for assessing native fish population responses to previous augmentations and for periodically evaluating the native fish augmentation strategy through the adaptive management process.

Post-Development Monitoring (Section F)

Post-development monitoring will be conducted at each conservation area following completion of habitat creation activities 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 Beal Lake, the Big Bend Conservation Area (BBCA), the MVCA, the Imperial Ponds Conservation Area (IPCA), and Planet Ranch.

FY21 Accomplishments

BBCA: Larval sampling was conducted from January through May and resulted in the capture of 8 razorback sucker larvae and 30 flannelmouth sucker larvae. Mobile remote PIT scanners deployed once per month during this same period contacted 49 razorback suckers. These fish were all stocked less than 2 miles upstream in Laughlin Lagoon and were contacted 1 week after release. Water quality monitoring was also completed in three of the four FY quarters, and all recorded parameters (i.e., temperature, dissolved oxygen, conductivity, pH) were within suitable ranges for native fishes.

MVCA: The two permanent PIT scanners installed at the inflow and outflow structures ran continuously throughout the year. The inflow scanner contacted 3,113 razorback suckers and 1 flannelmouth sucker, and the outflow scanner contacted 2,576 razorback suckers, 2 bonytail, and 1 flannelmouth sucker. Razorback sucker larvae were abundant near the inflow during multiple surveys, suggesting that larvae are being entrained as they drift down river from upstream spawning sites. Two netting events conducted in conjunction with the Reach 3 roundups resulted in the capture of 36 razorback suckers.

IPCA: 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 175 to 216 individuals in Ponds 1, 3, and 4 and from 0 to 74 individuals for bonytail in Ponds 2, 5, and 6. Recruitment of bonytail was again observed in Ponds 2 and 6. The majority of captured fish were untagged, suggesting the actual populations may be larger than estimated. No bonytail have been contacted in Pond 5 since August 2020. Water quality data and the lack of scanning contacts suggest a fishkill occurred at that time. Larval razorback suckers and multiple size classes of untagged juveniles

were captured in Pond 1, indicating that multiple recruitment events have occurred. Limited recruitment has been detected in Pond 3, and Pond 4 did not show any signs of razorback sucker recruitment in FY21.

Planet Ranch: Backwater productivity and water quality monitoring were not initiated as planned due to uncontrolled cattail growth, which limited access, and higher than expected seepage rates from the backwaters. This work will be postponed until these issues have been addressed.

FY22 Activities

Beal Lake Conservation Area (*BLCA*): Dredging activities have been completed. Beal Lake will be stocked with native fishes, and native fish populations and water quality will be monitored throughout the year.

BBCA: Native fish monitoring and water quality sampling will be postponed until the dredging of the backwater is completed.

MVCA: 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.

IPCA: 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. Pond 5 will be stocked with 300 bonytail in an even ratio of males to females.

Planet Ranch: Fisheries related work will be postponed until issues with the backwaters have been addressed.

Proposed FY23 Activities

Native fish monitoring at completed conservation areas will continue at levels similar to previous years.

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 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.

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.

Fisheries Program activities implemented by 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 AMP) through annual participation in meetings and presentations to research and management groups. These groups include local chapters of the American Fisheries Society, Colorado River Aquatic Biologists, Lake Mead Work Group, Lake Mohave Native Fish Work Group, and Lower Colorado River Native Fish Work Group.

FY21 Accomplishments

The native fish databases continued to be maintained in their current formats (G1). These included the Lower Colorado River 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.

During FY21, fisheries field data collection was migrated to the field data collection platform for digitally collecting data for deployment and retrieval of mobile remote PIT scanners.

Scientific peer reviews were conducted for four fisheries reports that were subsequently posted on the LCR MSCP website. These reviews ensured that all research and monitoring complied with program, bureau, and departmental scientific integrity policies. This process also ensured that research and monitoring met 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 included 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.

Development of an adaptive management information management system to work in conjunction with the adaptive management projects/plans began in FY21. This system will be used to provide an interactive experience for populating and using the adaptive management plans and to allow managers to easily access and update individual components of adaptive management projects/plans and generate reports.

Funding was provided to complete a viability analysis of the Lake Mead razorback sucker population. This work was completed in coordination with the USFWS and included modeling the future of this population under various scenarios (e.g., no management action, augmentation, other possible management strategies, etc.).

FY22 Activities

During FY22, additional fisheries field data collection projects will be migrated to the new platform selected in FY17. Maintenance of the native fish databases will continue.

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

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

Proposed FY23 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.

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

Conservation measures for 23 covered and 5 evaluation wildlife and plant 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 summary of completed work, 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. This approach involves the development and management of new habitat as well as the 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) and the environmental conditions needed 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 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 analyses 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. The priorities are outlined 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. The

information gathered 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 conducted on covered wildlife species and their habitats to (1) inform the selection and application of conservation techniques, (2) document successful implementation of conservation measures, and (3) develop alternatives to conservation actions that prove ineffective. This strategy will allow for quantification of existing knowledge and the identification of data gaps. Species research projects will be designed to fill data gaps that will inform implementation of the conservation measures.

The LCR MSCP conservation measures direct that habitat characteristics should be characterized for 22 species either under Conservation Measure MRM1, species-specific conservation measures requiring distribution and/or habitat surveys (CRCR1, YHCR1, MNSW1, CRTO1, and LLFR1), or species-specific conservation measures requiring the creation and management of covered species habitat. These species include:

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

FY21 Accomplishments

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). These funds were used to assess whether invasive species control treatment needed to be conducted and if threecorner milkvetch emerged at Sandy Cove and could be surveyed. No treatments were needed, as no Sahara

mustard was found. A site visit was conducted in April to monitor threecorner milkvetch at Sandy Cove. No threecorner milkvetch plants had emerged, so surveys were not conducted.

FY22 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.

Proposed FY23 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.

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 monitoring results on conservation areas.

System-wide monitoring for terrestrial and marsh species was planned to occur 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 cover 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 [closed] and F3) was focused to document presence and, when appropriate, breeding. In FY18, monitoring for southwestern willow flycatchers (D2) followed suit, and efforts were focused to document 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 ongoing program-level analysis of system-wide monitoring will ensure monitoring focuses on collecting information needed to maintain functional habitats over the 50-year term of the LCR MSCP.

FY21 Accomplishments

System-wide monitoring continued for marsh birds, southwestern willow flycatchers, yellow-billed cuckoos, riparian birds, and bats 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 2021 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. Two covered species were encountered (table 1-12).

Table 1-12.—Marsh Bird Detections in Topock Gorge, FY21

Species	Number of detections per month		
	March	April	May
California black rail	0	0	0
Western least bittern	1	5	22
Yuma clapper rail	15	26	51

System-wide surveys for southwestern willow flycatchers (D2) were conducted at Alamo Lake, the Bill Williams River, and Topock Marsh. Sixty southwestern willow flycatchers were detected and 39 territories were documented. One nest was monitored at the Bill Williams River, and two nests were monitored at Topock Marsh; two of the three nests fledged flycatcher young.

Bird banding (D5) was conducted at the BLCA and Cibola NWR Unit #1 to monitor migrating and breeding birds along the LCR from May through August. Nine banding sessions were completed in FY21; the tenth session was not conducted due to COVID-19 travel restrictions. There were 228 captures at the BLCA and 81 captures at Cibola NWR Unit #1. Three LCR MSCP species were captured and banded during the Monitoring Avian Productivity and Survivorship (MAPS) season. At the BLCA, 1 Bell's vireo, two yellow warblers, and three summer tanagers were captured and color banded. Two summer tanagers and two yellow warblers were captured and color banded at Cibola NWR Unit #1. One color-banded summer tanager was recaptured at the BLCA; its initial capture was in 2011. One color-banded summer tanager, which was initially banded in 2019, was recaptured at Cibola NWR Unit #1.

Area search surveys for Arizona Bell's vireos, Gila woodpeckers, gilded flickers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers were conducted under Work Task D6 in system-wide habitat along the LCR and Bill Williams River. Ninety pairs of Sonoran yellow warblers, 47 pairs of Arizona Bell's vireos, 66 pairs of Gila woodpeckers, 22 pairs of summer tanagers, 6 pairs of gilded flickers, and 2 pairs of vermilion flycatchers were confirmed

breeding at the plots sampled. A power analysis of the double sampling area search survey protocol and point-count survey method was finalized. Future management goals were also finalized and will be used in the adaptive management plans in Work Task G4. Other potential analysis and survey methods continued to be analyzed for suitability and cost efficiency. In addition, a report documenting gilded flicker populations and high-potential habitat within 10 kilometers of LCR MSCP conservation areas was finalized. Biologists from other agencies detected a gilded flicker near Rankin and Lincoln Ranch along the Bill Williams River east of the Bill Williams River National Wildlife Refuge (Bill Williams River NWR).

System-wide monitoring for yellow-billed cuckoos (D7) involved conducting followup visits to find cuckoos that were tagged with geolocator devices in FY14–15. No cuckoos tagged with geolocator devices were found. Surveys were conducted in the Middle Bill Williams River NWR, and there were nine cuckoo detections, with three possible breeding territories. No nests were incidentally detected. Surveys were discontinued at the Sandy Wash site mid-June after the riparian habitat was lost in the Planet Ranch fire. This work task closed in FY21, as the population of yellow-billed cuckoos on the LCR is predominately found on LCR MSCP conservation areas and is large enough to provide the monitoring data needed.

Under Work Task D9, acoustic monitoring stations were operated from June to August to detect bat presence at Havasu National Wildlife Refuge (Havasu NWR)-Pintail Slough, the Bill Williams River NWR, the ‘Ahakhav Tribal Preserve, the Cibola National Wildlife Refuge (Cibola NWR)-Island Unit, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, Yuma East Wetlands (YEW), and Hunters Hole. Western red bats were detected at all eight stations. Western yellow bats were detected at the Bill Williams River NWR, the Cibola NWR-Island Unit, the Mittry Lake Wildlife Area, and Hunters Hole. California leaf-nosed bats were detected at Havasu NWR-Pintail Slough, the ‘Ahakhav Tribal Preserve, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, and YEW. Pale Townsend’s big-eared bats were only detected at the Bill Williams River NWR.

A final report was prepared for the system-wide monitoring of sootywings (D14), and this work task closed in FY21. The results will be used to refine the survey methodology for use under Work Task F6 and to inform management of land cover on conservation areas.

FY22 Activities

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

A final report will be prepared for the system-wide monitoring of avian species using the Monitoring Avian Productivity and Survivorship Program protocol (D5). This work task will close in FY22, and all monitoring for riparian birds will be conducted under Work Tasks F1, F2, F9, and F10.

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 NWR-Pintail Slough, the Bill Williams River NWR, the ‘Ahakhav Tribal Preserve, the Cibola NWR-Island Unit, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, YEW, and Hunters Hole.

Proposed FY23 Activities

System-wide monitoring of marsh birds, southwestern willow flycatchers, and bats 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.

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 NWR-Pintail Slough, the Bill Williams River NWR, the ‘Ahakhav Tribal Preserve, the Cibola NWR-Island Unit, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, YEW, and Hunters Hole.

Post-Development Monitoring (Section F)

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. Future monitoring will focus on collecting information needed to maintain habitats over the 50-year term of the LCR MSCP and to complete species-specific conservation measures.

FY21 Accomplishments

Long-term vegetation monitoring (F1) 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 was evaluated to ensure that the habitat is meeting species' requirements. This evaluation described vegetation structure throughout the canopy, including structural diversity and successional growth stages.

Monitoring for LCR MSCP covered species use was conducted at 12 conservation areas (table 1-13). Post-development monitoring was conducted for the following covered species:

- *Work Task F2 – Avian Monitoring at Conservation Areas:* Arizona Bell's vireo, elf owl, Gila woodpecker, gilded flicker, Sonoran yellow warbler, summer tanager, and vermillion flycatcher

- *Work Task F3 – Rodent Monitoring at Conservation Areas:* Colorado River cotton rat, Yuma hispid cotton rat, and desert pocket mouse

- *Work Task F4 – Bat Species Monitoring at Conservation Areas:* western red bat, western yellow bat, California leaf-nosed bat, and pale Townsend's big-eared bat

- *Work Task F6 – Post-Development Monitoring of MacNeill's Sootywing Skippers at Conservation Areas:* sootywings

- *Work Task F7 – Marsh Bird Monitoring at Conservation Areas:* California black rail, western least bittern, and Yuma clapper rail

- *Work Task F9 – Southwestern Willow Flycatcher Monitoring at Conservation Areas:* southwestern willow flycatcher

- *Work Task F10 – Yellow-billed Cuckoo Monitoring at Conservation Areas:* yellow-billed cuckoo

Table 1-13.—LCR MSCP Covered Species Post-Development Monitoring Conducted in FY21

Conservation Area	Beal Lake Conservation Area	Big Bend Conservation Area	Cibola National Wildlife Refuge Unit #1 Conservation Area	Cibola Valley Conservation Area	Dennis Underwood Conservation Area	Hart Mine Marsh	Hunters Hole	Imperial National Wildlife Refuge	Laguna Division Conservation Area	Mohave Valley Conservation Area	Palo Verde Ecological Reserve	Parker Dam Camp	Planet Ranch	Pretty Water Conservation Area	Section 26 Conservation Area	Three Fingers Lake	Yuma East Wetlands	Yuma Meadows Conservation Area
California black rail	-	-	-	-	-	N	-	N	-	-	-	-	-	-	-	-	N	-
Western least bittern	-	-	-	-	-	D	-	N	-	-	-	-	-	-	-	-	D	-
Yuma clapper rail	-	-	-	-	-	D	-	D	-	-	-	-	-	-	-	-	D	-
Southwestern willow flycatcher	N	-	N	N	-	-	-	-	N	-	D	N	-	-	-	-	N	-
Yellow-billed cuckoo	D	-	D	D	-	-	N	-	D	-	D	-	-	-	-	-	D	-
Arizona bell's vireo	D	-	N	D	-	-	N	-	D	-	N	D	-	N	-	-	N	-
Elf owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gila woodpecker	N	-	D	N	-	-	N	-	D	-	N	D	-	N	-	-	D	-
Gilded flicker	N	-	N	N	-	-	N	-	N	-	N	N	-	N	-	-	N	-
Sonoran yellow warbler	D	-	D	D	-	-	N	-	N	-	D	N	-	N	-	-	N	-
Summer tanager	D	-	D	D	-	-	N	-	N	-	D	N	-	N	-	-	N	-
Vermilion flycatcher	N	-	N	N	-	-	N	-	N	-	N	N	-	N	-	-	N	-
California leaf-nosed bat	W	-	W	W	-	-	N	-	-	-	W	-	-	-	-	-	D	-
Pale Townsend's big-eared bat	W	-	W	W	-	-	N	-	-	-	W	-	-	-	-	-	N	-
Western red bat	W	-	W	W	-	-	D	-	-	-	W	-	-	-	-	-	D	-
Western yellow bat	W	-	W	W	-	-	D	-	-	-	W	-	-	-	-	-	N	-
Colorado river cotton rat	D	-	D	N	-	N	-	-	-	-	D	-	-	-	-	-	-	-
Desert pocket mouse	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yuma hispid cotton rat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-
MacNeill's sootywing skipper	-	-	-	D	-	-	-	-	-	-	D	-	-	N	-	-	-	-
Colorado river toad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lowland leopard frog	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Mexican gartersnake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: D = surveyed and detected; N = surveyed and not detected; W = waiting for data analysis; - = not surveyed; black cell = not surveyed as outside the range of the species/ subspecies or the site does not contain their habitat.

[1] Only two surveys were conducted due to safety concerns at Hunters Hole.

[2] Surveyed but reported under system-wide monitoring Work Task D9, as Hunters Hole and YEW are outside the creditable reaches for the western red and western yellow bat.

BLCA: Arizona Bell's vireos, Sonoran yellow warblers, and summer tanagers were confirmed breeding. Yellow-billed cuckoos were detected and possibly breeding at the site, and a Colorado River cotton rat was detected near the willow marsh. No resident or breeding southwestern willow flycatcher were detected. Bat monitoring results will be reported when the analysis is completed.

Cibola NWR Unit #1: Gila woodpeckers and summer tanagers were confirmed breeding (F2), and Sonoran yellow warblers were also detected (under D5). Yellow-billed cuckoos were detected and confirmed breeding at the site, and Colorado River cotton rats were captured. No resident or breeding southwestern willow flycatcher were detected. Bat monitoring results will be reported when the analysis is completed.

Cibola Valley Conservation Area (*CVCA*): Arizona Bell's vireos, summer tanagers, and Sonoran yellow warblers were confirmed breeding. Yellow-billed cuckoos were detected and possibly breeding, and sootywings were detected. No resident or breeding southwestern willow flycatcher were detected. Bat monitoring results will be reported when the analysis is completed.

Hart Mine Marsh (*HMM*)*:* Western least bitterns and Yuma clapper rails were detected and are possibly breeding at the site.

Hunters Hole: Five riparian bird species were detected breeding at the site, but no covered species were detected. Bat monitoring results will be reported when the analysis is completed. Only two of four yellow-billed cuckoo surveys were conducted; the last two surveys were cancelled due to security concerns associated with illegal border crossings at the U.S.-Mexico border. Rodent trapping was scheduled but not conducted due to COVID-19 travel restrictions.

IPCA: Surveys for marsh birds were conducted in the ponds and Field 18, and Yuma clapper rails were detected in Field 18.

Laguna Division Conservation Area (*LDCA*): Arizona Bell's vireos and Gila woodpeckers were detected breeding. Yellow-billed cuckoos were detected, and there was probable breeding. No resident or breeding southwestern willow flycatcher were detected.

PVER: Sonoran yellow warblers and summer tanagers were confirmed breeding. An unpaired adult southwestern willow flycatcher was detected but it did not establish a territory. Yellow-billed cuckoos were detected and confirmed breeding, Colorado River cotton rats were captured, and sootywings were detected. Bat monitoring results will be reported when the analysis is completed.

Parker Dam Camp: Arizona Bell's vireos and Gila woodpeckers were confirmed breeding.

Pretty Water Conservation Area (*PWCA*)*:* Thirteen riparian bird species were detected breeding at the site, but no covered bird species or sootywings were detected.

YEW: Western least bitterns, Yuma clapper rails, and Gila woodpeckers were detected breeding at the site. Yellow-billed cuckoos were detected and confirmed breeding, and Yuma hispid cotton rats were captured. No resident or breeding southwestern willow flycatcher were detected. Bat monitoring results will be reported when the analysis is completed.

In addition, surveys for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos were conducted at the Middle Bill Williams River NWR. Arizona Bell's vireos, Gila woodpeckers, Sonoran yellow warblers, and summer tanagers were found breeding at the site. Yellow-billed cuckoos were detected and were possibly breeding, and a territorial pair of southwestern willow flycatchers was detected.

Under Work Task F8, the monitoring and management objectives for the northern Mexican gartersnake were refined, and the draft CEM (G6) was reviewed. Comments were submitted on the draft environmental assessment for establishing critical habitat for the northern Mexican gartersnake. No northern Mexican garternsnakes were encountered during LCR MSCP activities.

FY22 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 riparian birds (F2), rodents (F3), bats (F4), insects (F6), marsh birds (F7), southwestern willow flycatchers (F9), and yellow-billed cuckoos (F10). Pre-development surveys will be conducted for any new conservation areas. In addition, the 10-year monitoring plan for riparian birds (F2) will be finalized. Long-term vegetation monitoring will continue 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.

Proposed FY23 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

riparian birds (F2), rodents (F3), bats (F4), insects (F6), marsh birds (F7), southwestern willow flycatchers (F9), and yellow-billed cuckoos (F10). Frequency of monitoring will be reduced beginning in FY23, and suitable land cover for rodents (F3), insects (F6), southwestern willow flycatchers (F9), and yellow-billed cuckoos (F10) will be surveyed every 3 years. A 10-year monitoring plan will be finalized that will outline monitoring objectives and frequency for elf owls and gilded flicker (F2) and northern Mexican gartersnakes, lowland leopard frogs, and Colorado River toads (F8). Pre-development surveys will be conducted for any new conservation areas.

Long-term vegetation monitoring will continue in FY22 using lidar technology (F1). Data will be processed and analyzed to provide metrics for vegetation structure analyses.

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.

FY21 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 second-generation mobile electronic field form (MEFF) platform.

Scientific peer reviews were conducted for 14 wildlife reports that were subsequently posted on the LCR MSCP website. These reviews ensured that all research and monitoring complied with program, bureau, and departmental

scientific integrity policies. This process also ensured that research and monitoring met 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 the purpose of the monitoring, a 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.

Development of an adaptive management information management system to work in conjunction with the adaptive management projects/plans began in FY21. This system will be used to provide an interactive experience for populating and using the adaptive management plans and to allow managers to easily access and update individual components of adaptive management projects/plans and generate reports.

CEMs were finalized and posted for the remaining evaluation species (Colorado River toad and desert pocket mouse) and the northern Mexican gartersnake. CEM updates for the Colorado River cotton rat, Arizona Bell's vireo, Yuma clapper rail, elf owl, gilded flicker, Gila woodpecker, western least bittern, relict leopard frog, summer tanager, vermilion flycatcher, southwestern willow flycatcher, western yellow bat, yellow-billed cuckoo, Yuma hispid cotton rat, and Sonoran yellow warbler were finalized and posted on the LCR MSCP website in FY21.

FY22 Activities

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

Monitoring continues to be reviewed and evaluated internally as well as through independent, external reviewers.

Development of adaptive management plans for each monitoring effort continues. Development of the adaptive management information management system continues.

Proposed FY23 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 effort. Information from these analyses and tools will be used to develop additional conservation area management plans and to refine existing plans.

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 the terrestrial and marsh land cover types, trees, shrubs, and ground cover are typically planted or seeded to create the desired type. For the 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* report. 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 they 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.

FY21 Accomplishments

Coordination with resource agencies continued. Efforts to integrate long-term maintenance and inspection of LCR MSCP conservation areas into Reclamation's existing programs were implemented. Significant effort was expended to inventory capitalized assets. Costs associated with the pickup, transport, and complete preventive maintenance was completed for a backhoe stored at Planet Ranch. The backhoe was an asset purchased under a previous service agreement and, therefore, was identified for use at Planet Ranch at no acquisition cost to the program.

FY22 Activities

Coordination efforts with resource agencies will be reduced because sufficient lands to meet the minimum of 8,132 acres have been identified.

Proposed FY23 Activities

Coordination efforts with resource agencies will continue although sufficient lands to meet the minimum of 8,132 acres have been identified.

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.

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

to overcome. 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. Habitat creation does not 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 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.

The HCP provides development schedules for 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 most of the habitat creation would be completed. To accomplish the habitat creation conservation measures within the HCP development schedule, long-term planning has been conducted and is presented under the “Planned Conservation Development section.

Figure 1-1 depicts the geographical distribution of 18 established conservation areas at the end of FY21. Figures 1-2 through 1-19 depict each existing conservation area.

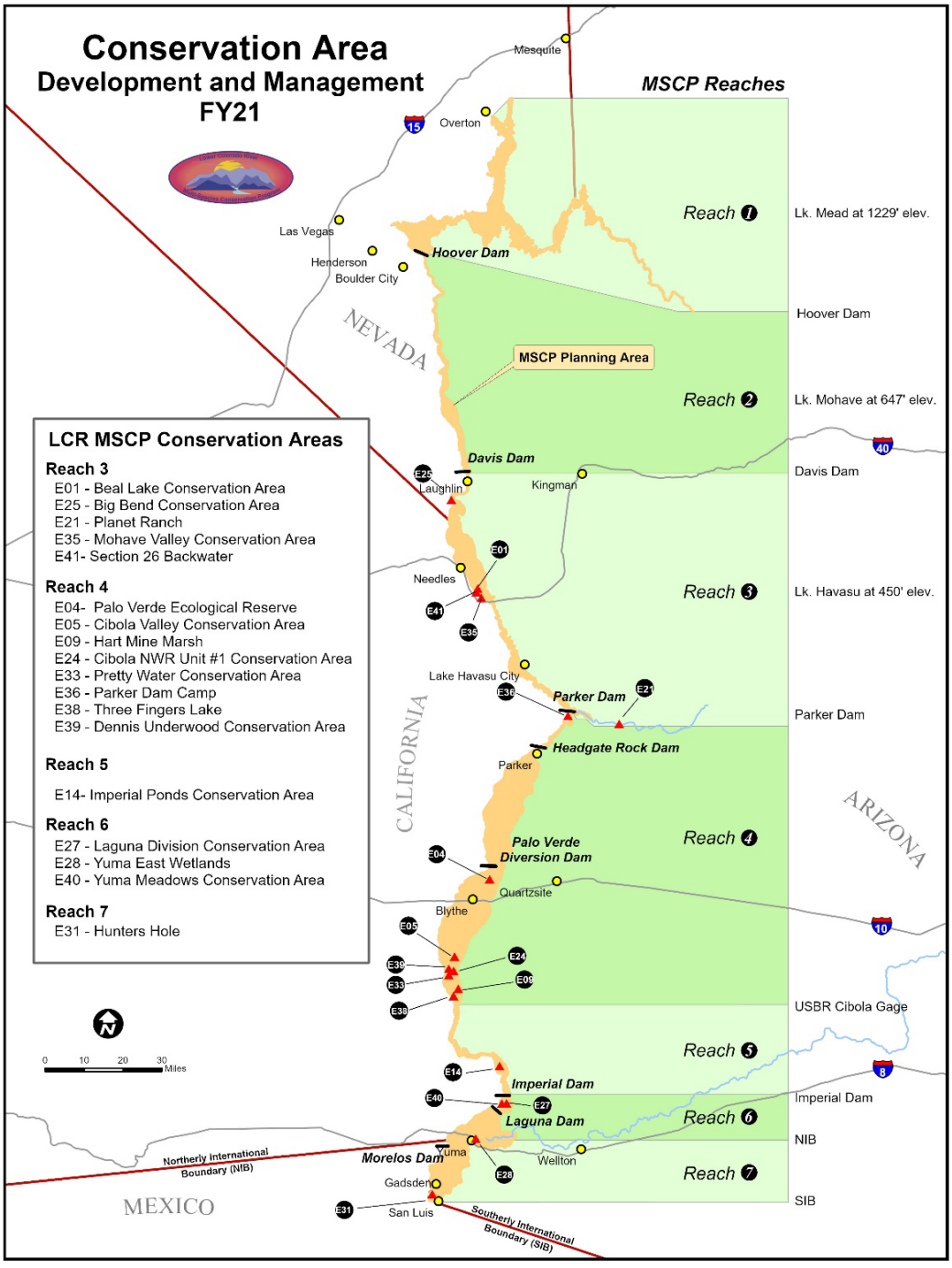

Figure 1-1.—Conservation area development and management, FY21.

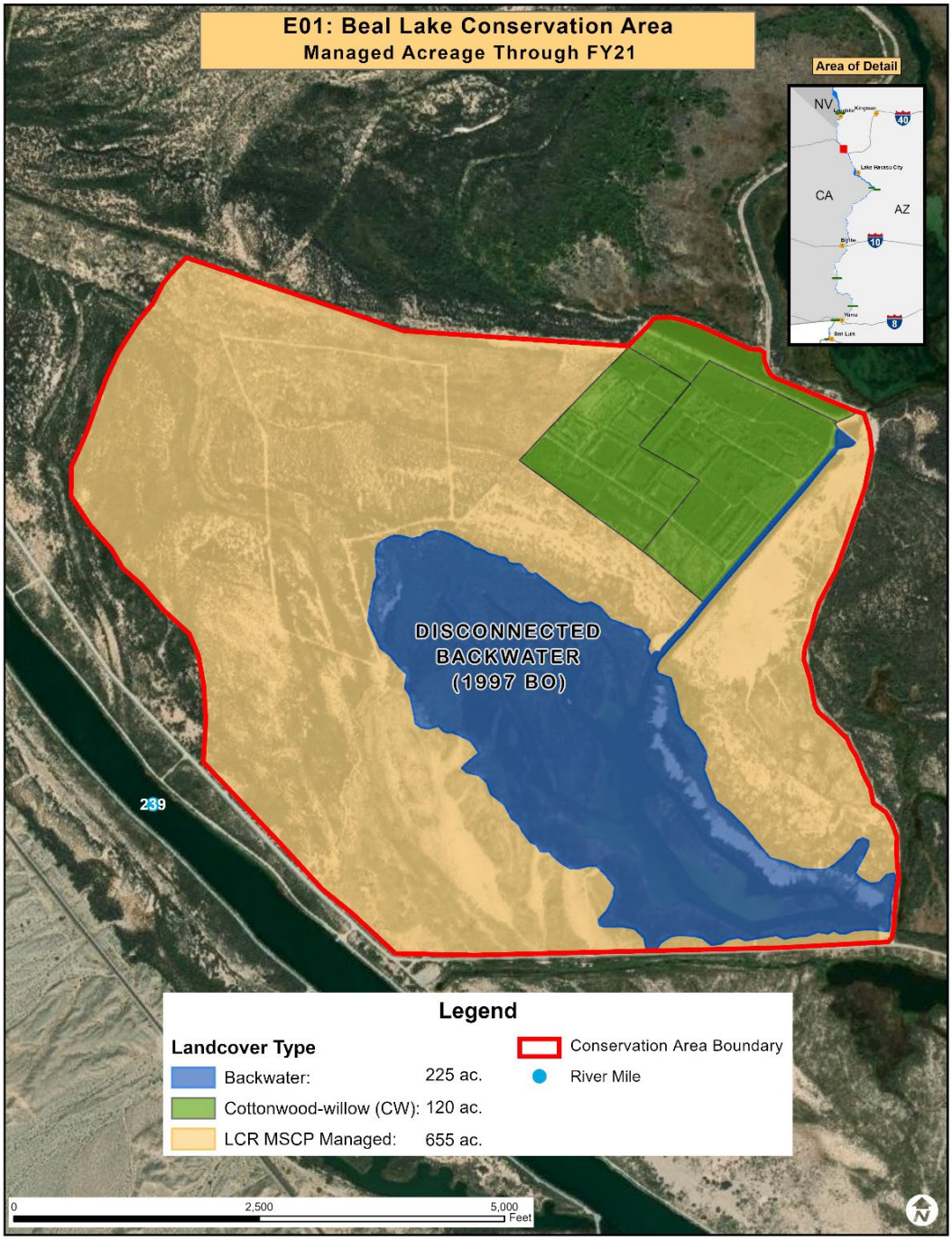

Figure 1-2.—E1 – Beal Lake Conservation Area managed acreage through FY21.

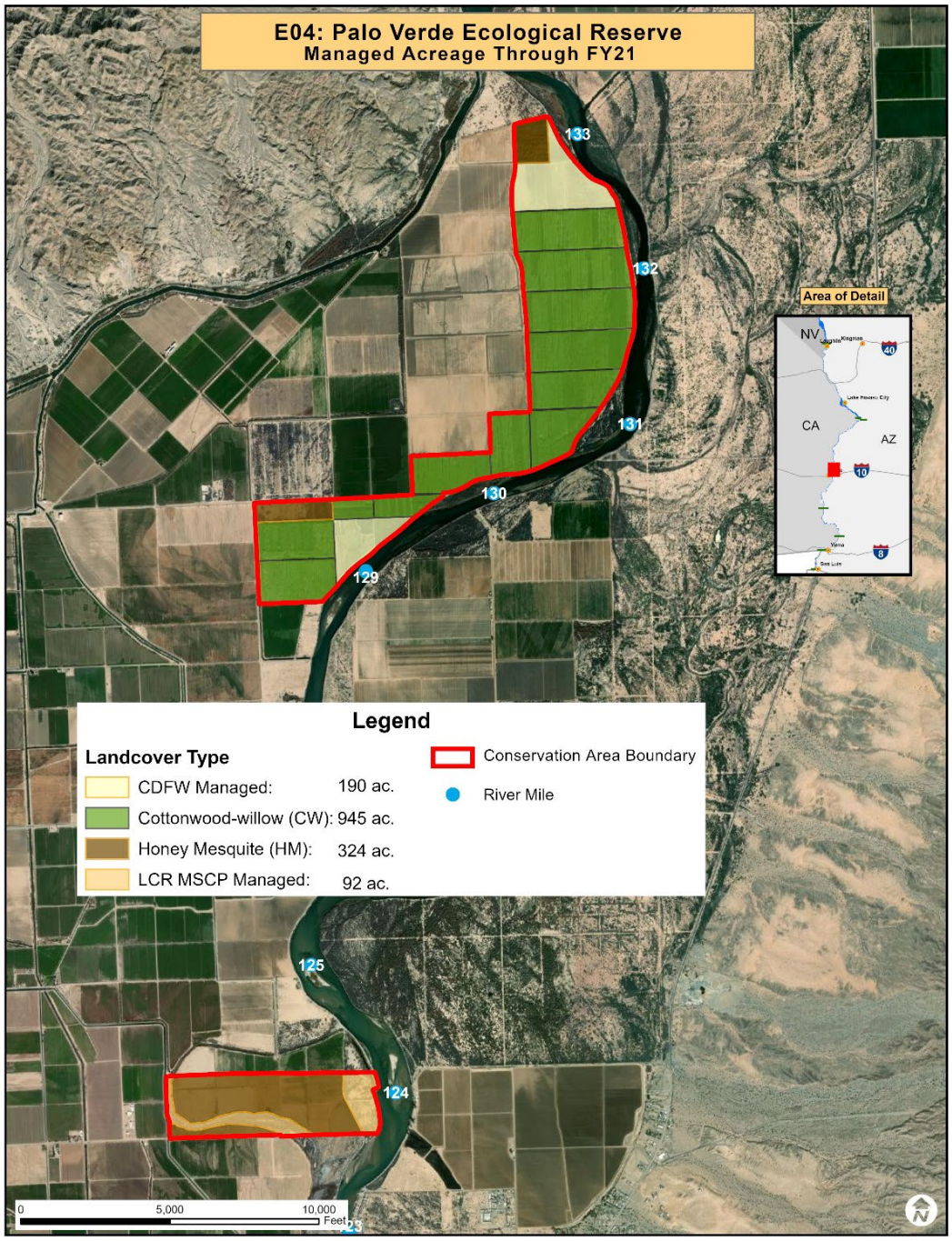

Figure 1-3.—E4 – Palo Verde Ecological Reserve managed acreage through FY21.

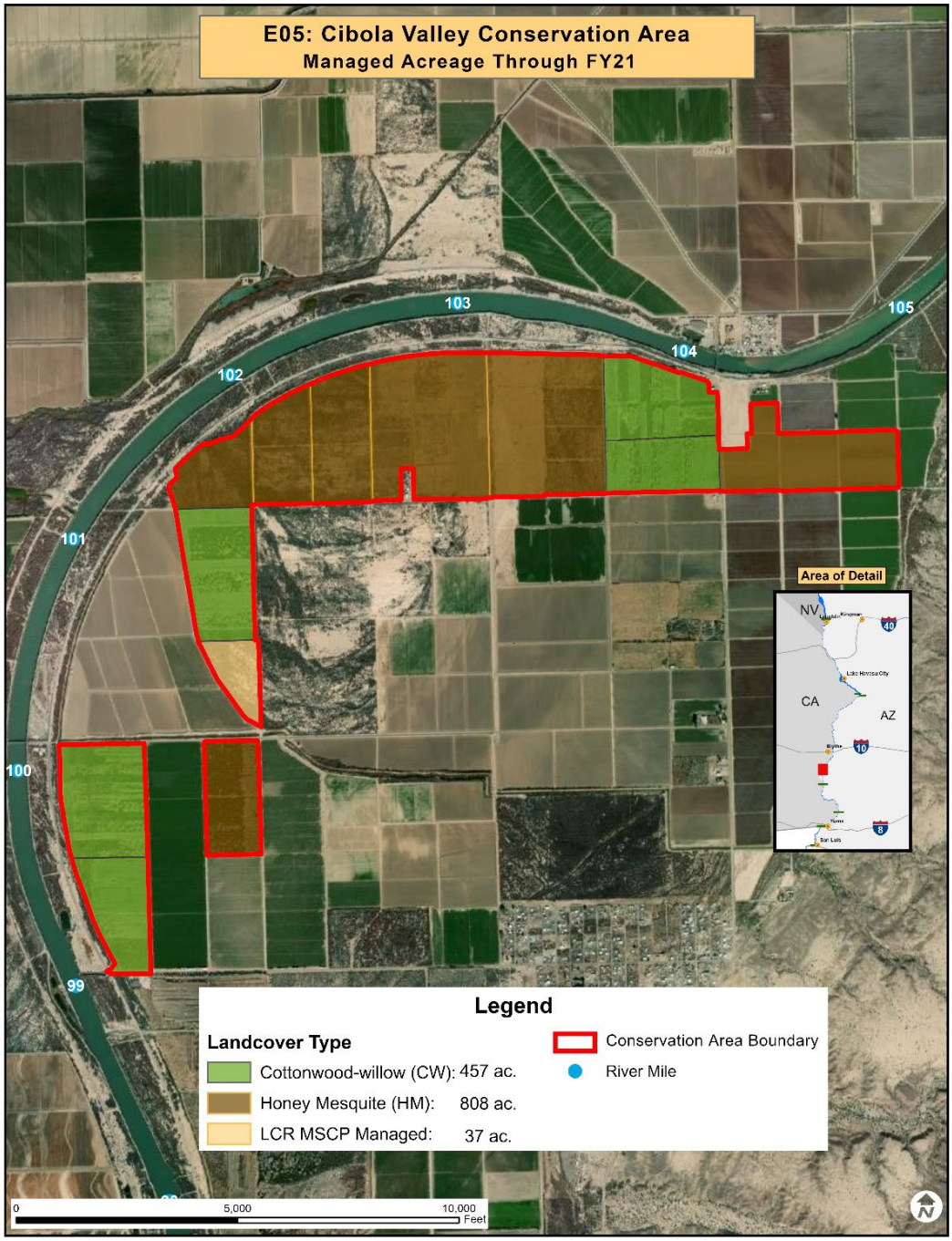

Figure 1-4.—E5 – Cibola Valley Conservation Area managed acreage through FY21.

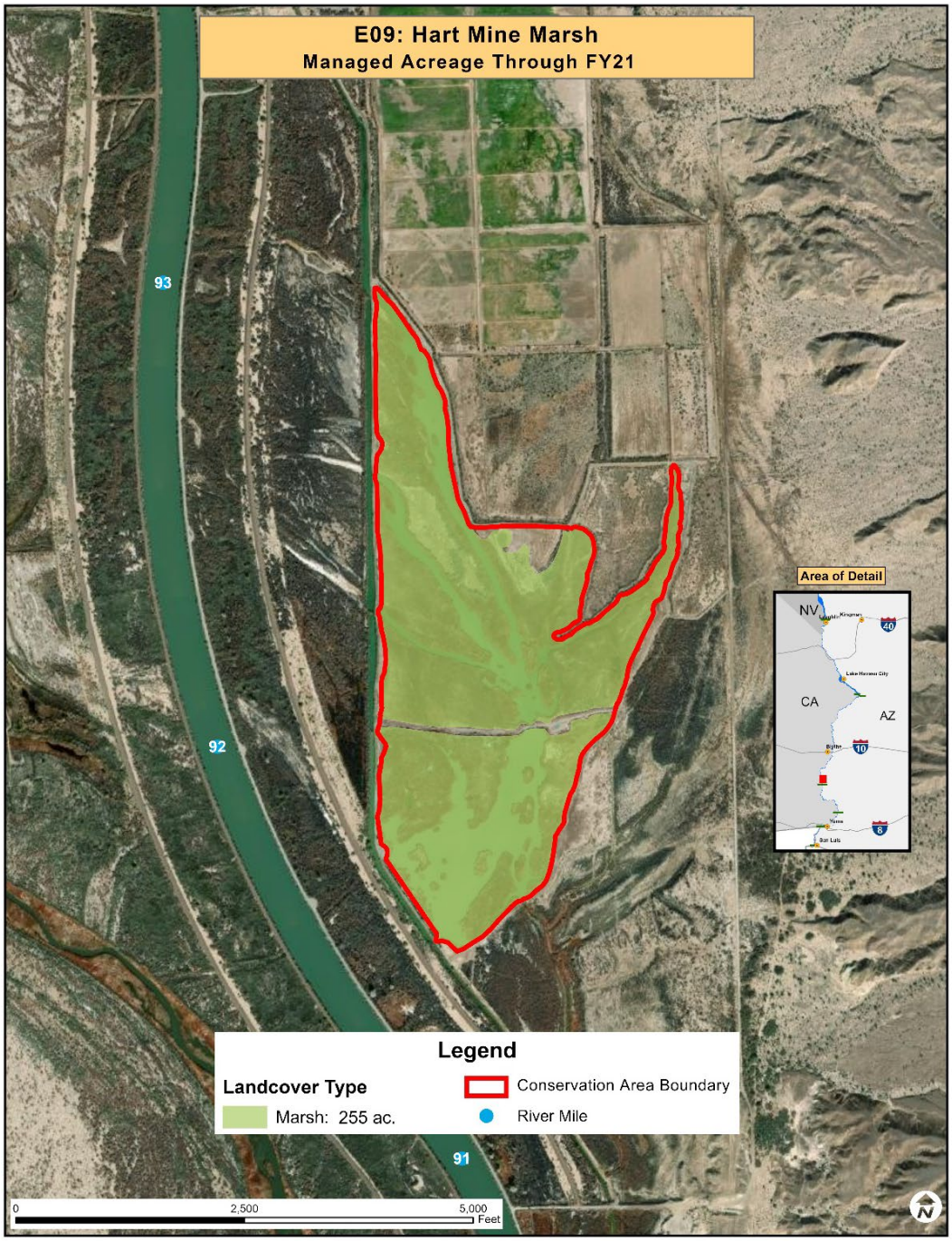

Figure 1-5.—E9 – Hart Mine Marsh managed acreage through FY21.

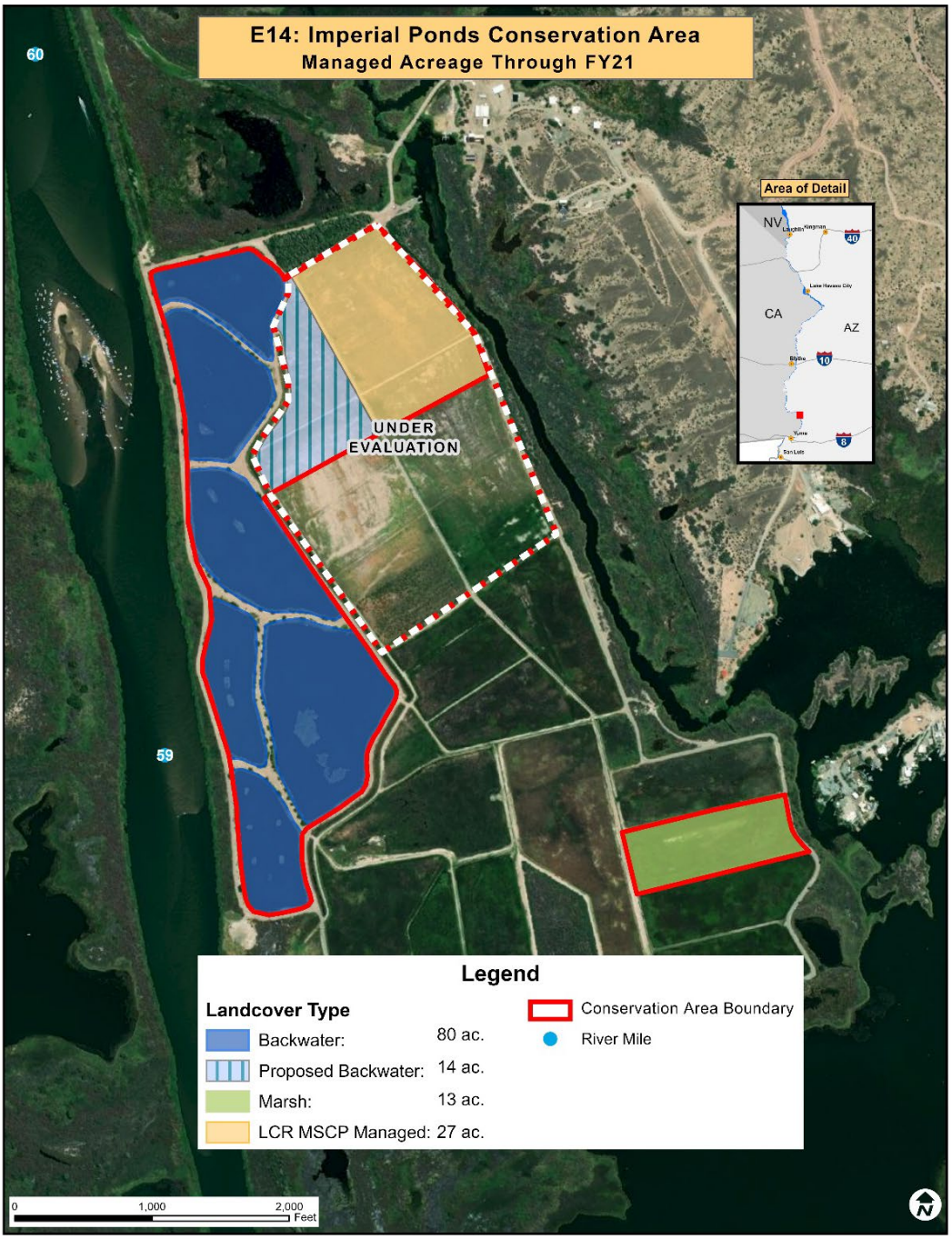

Figure 1-6.—E14 – Imperial Ponds Conservation Area managed acreage through FY21.

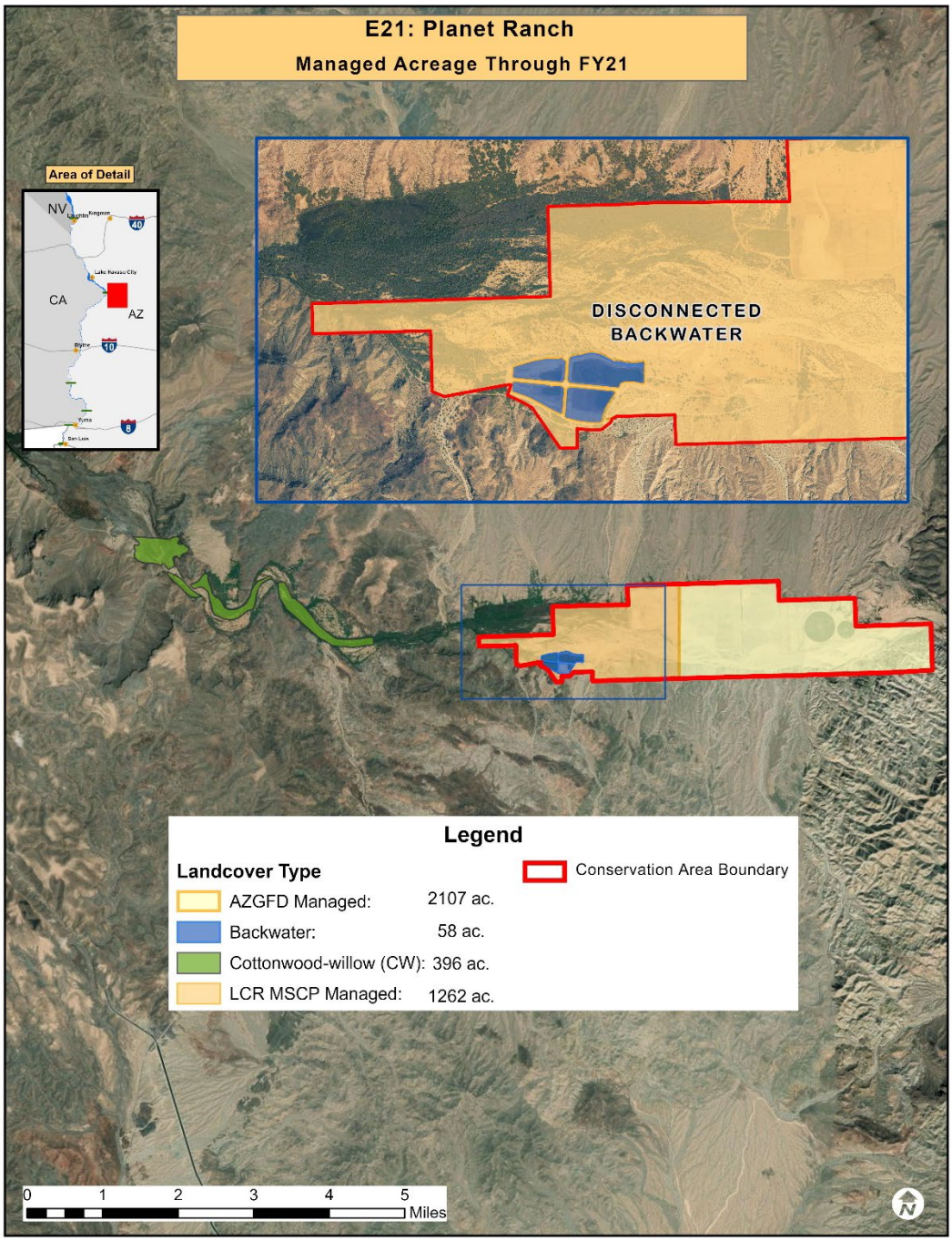

Figure 1-7.—E21 – Planet Ranch managed acreage through FY21.

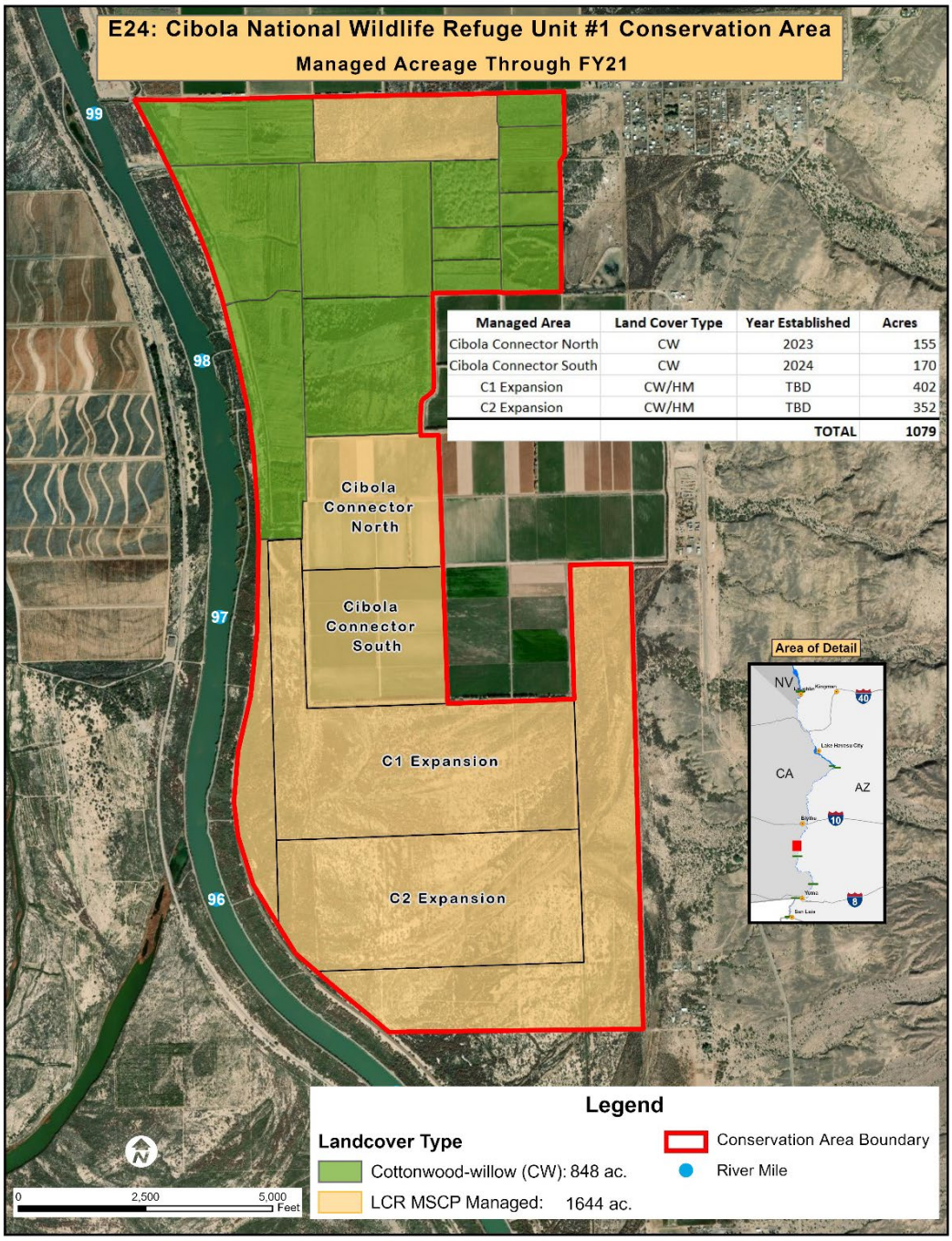

Figure 1-8.—E24 – Cibola National Wildlife Refuge Unit #1 Conservation Area managed acreage through FY21.

Figure 1-9.—E25 – Big Bend Conservation Area managed acreage through FY21.

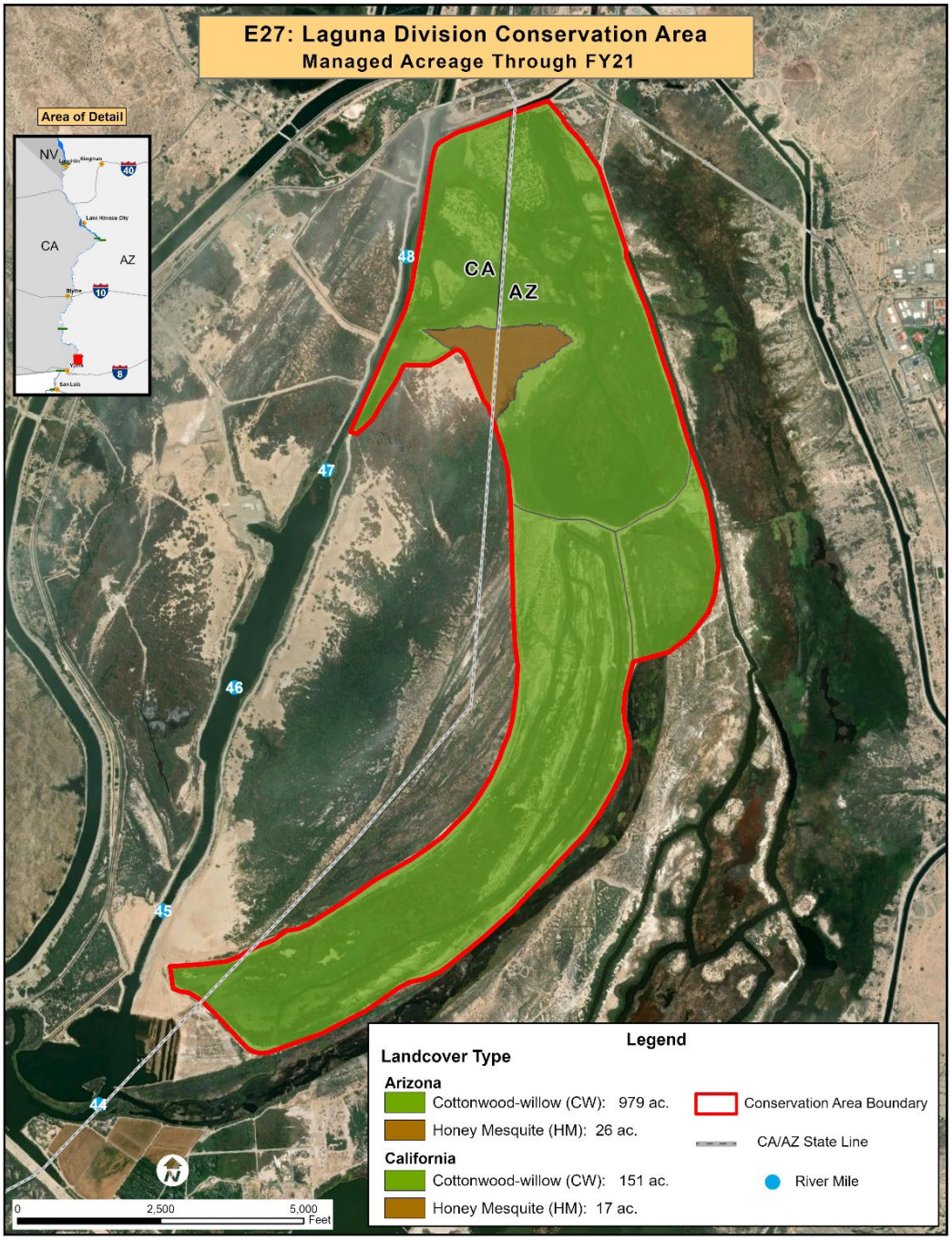

Figure 1-10.—E27 – Laguna Division Conservation Area managed acreage through FY21.

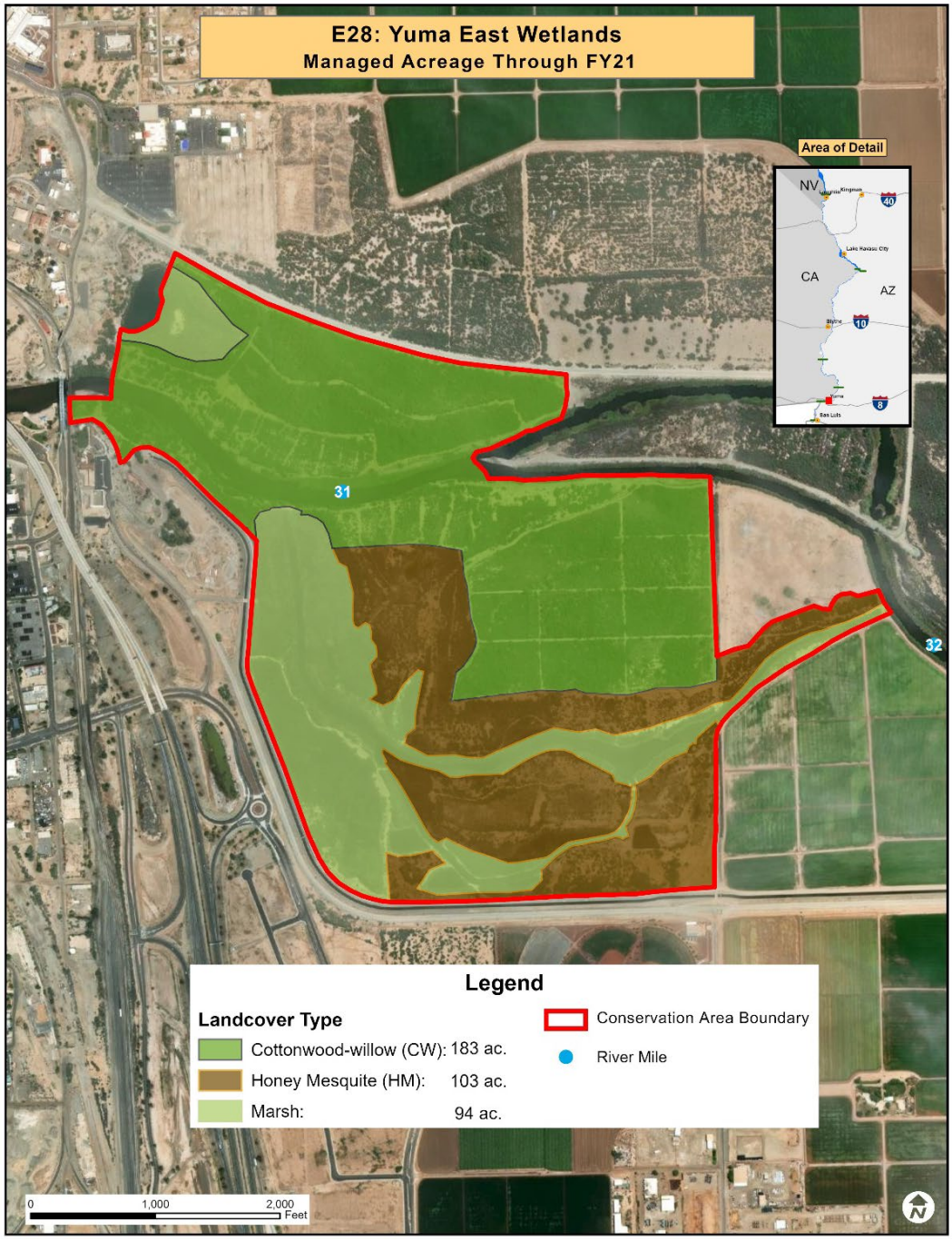

Figure 1-11.—E28 – Yuma East Wetlands managed acreage through FY21.

Figure 1-12.—E31 – Hunters Hole managed acreage through FY21.

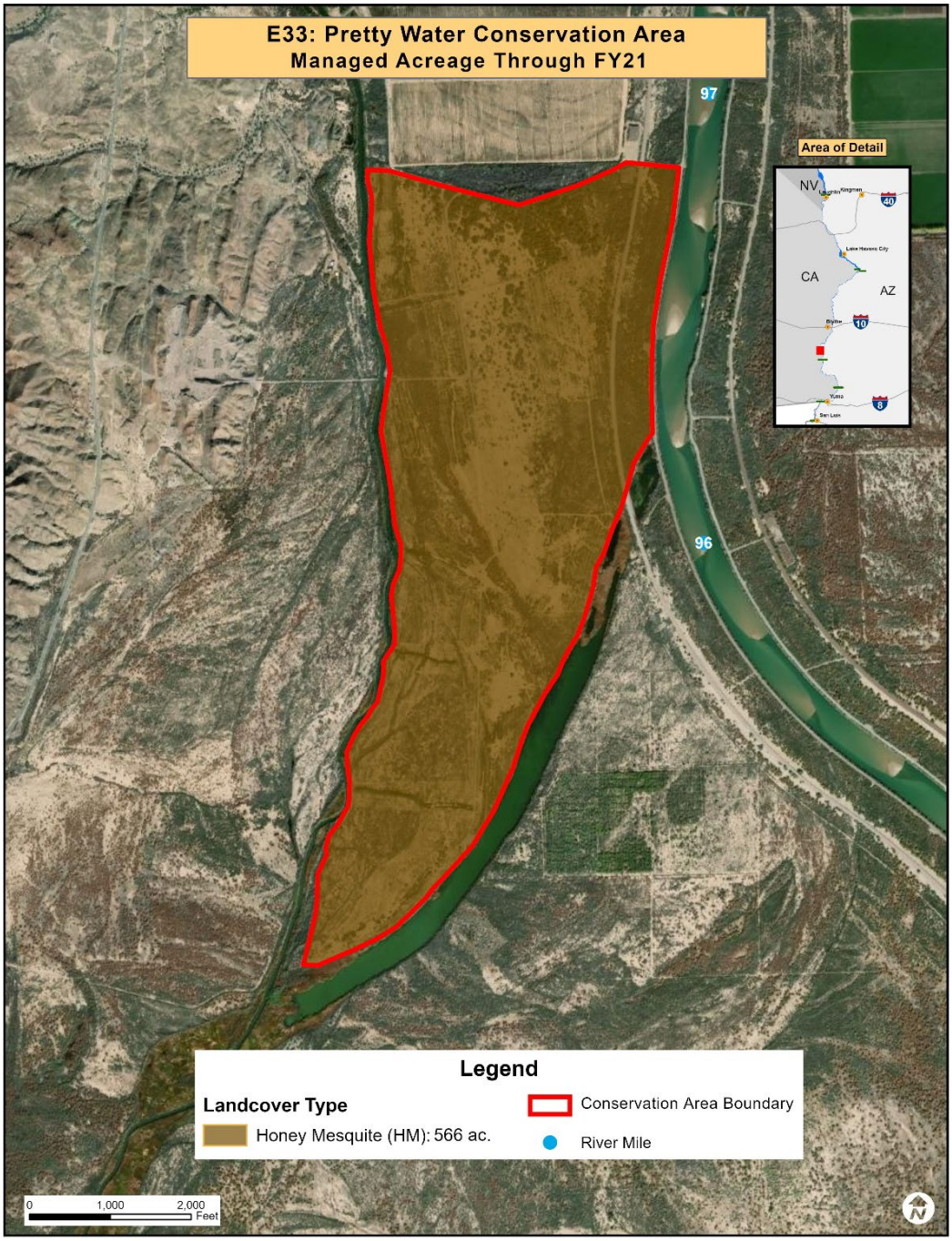

Figure 1-13.—E33 – Pretty Water Conservation Area managed acreage through FY21.

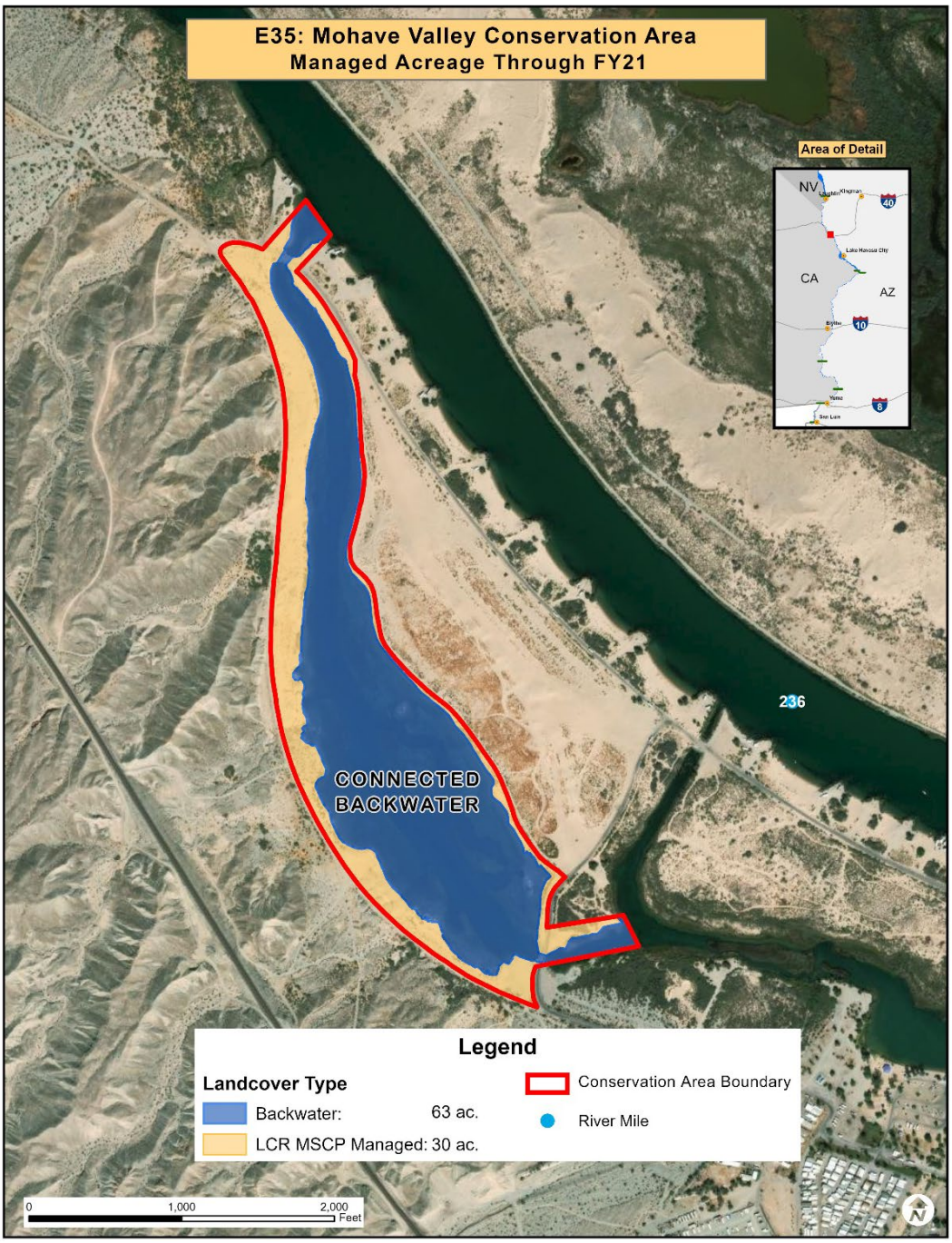

Figure 1-14.—E35 – Mohave Valley Conservation Area managed acreage through FY21.

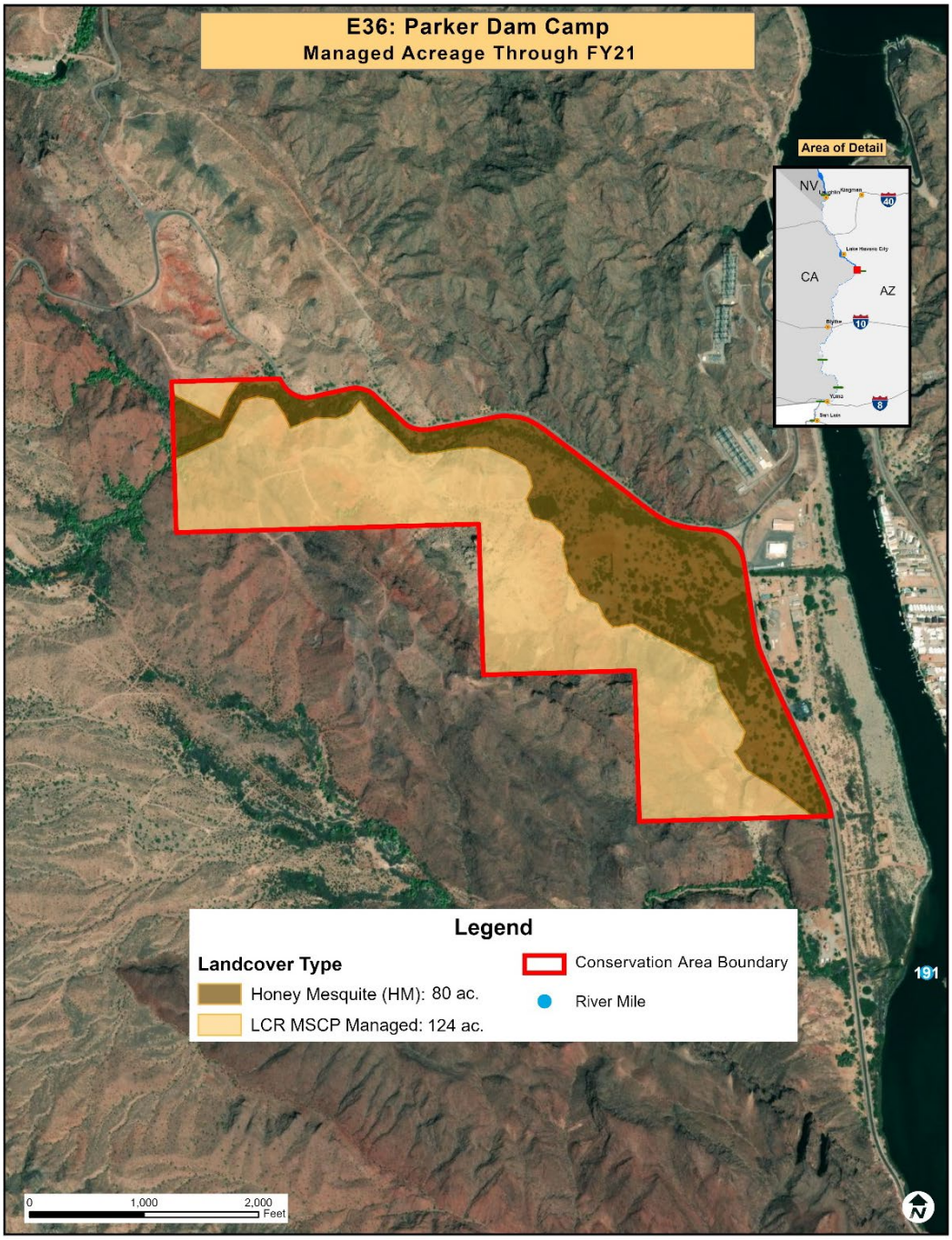

Figure 1-15.—E36 – Parker Dam Camp managed acreage through FY21.

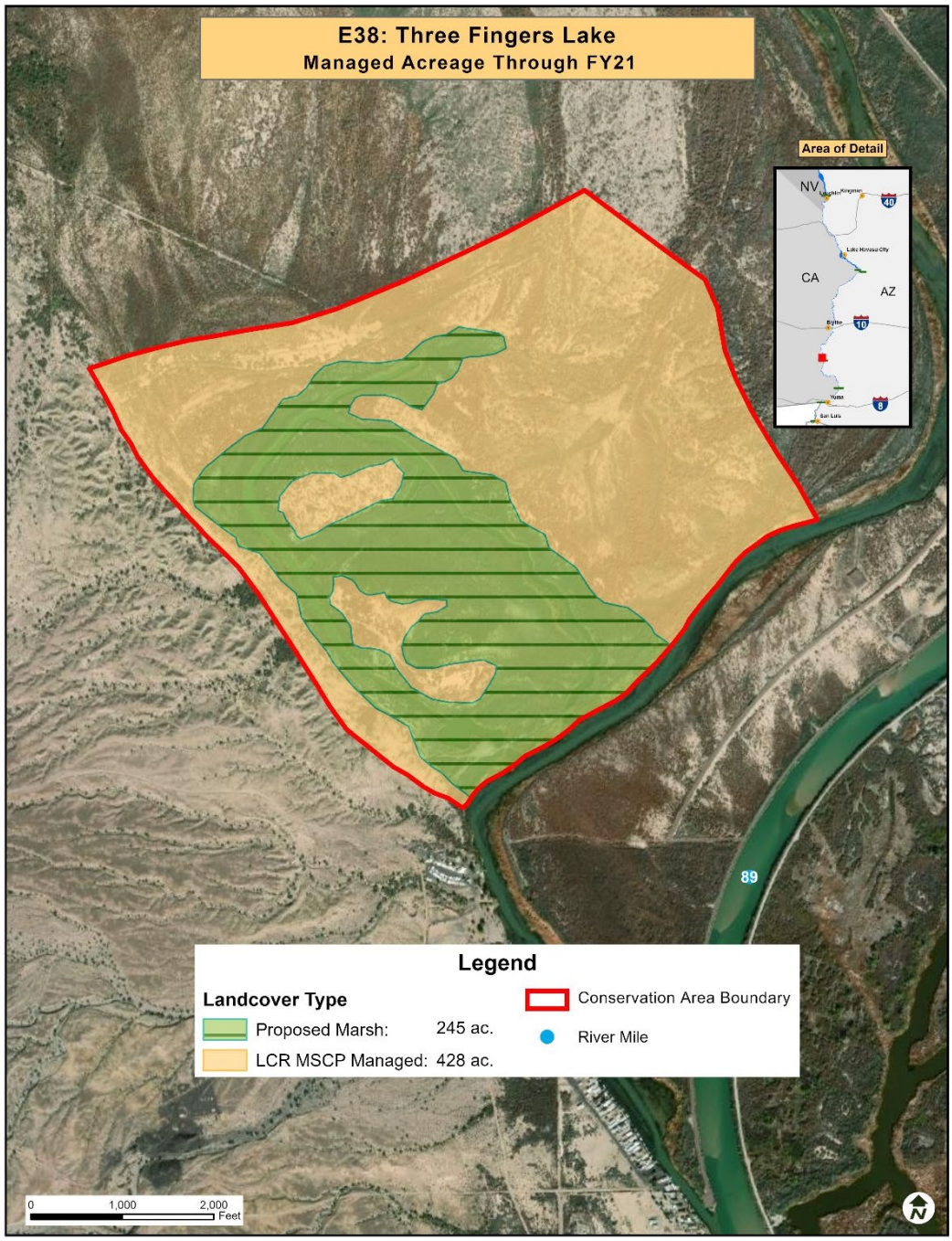

Figure 1-16.—E38 – Three Fingers Lake managed acreage through FY21.

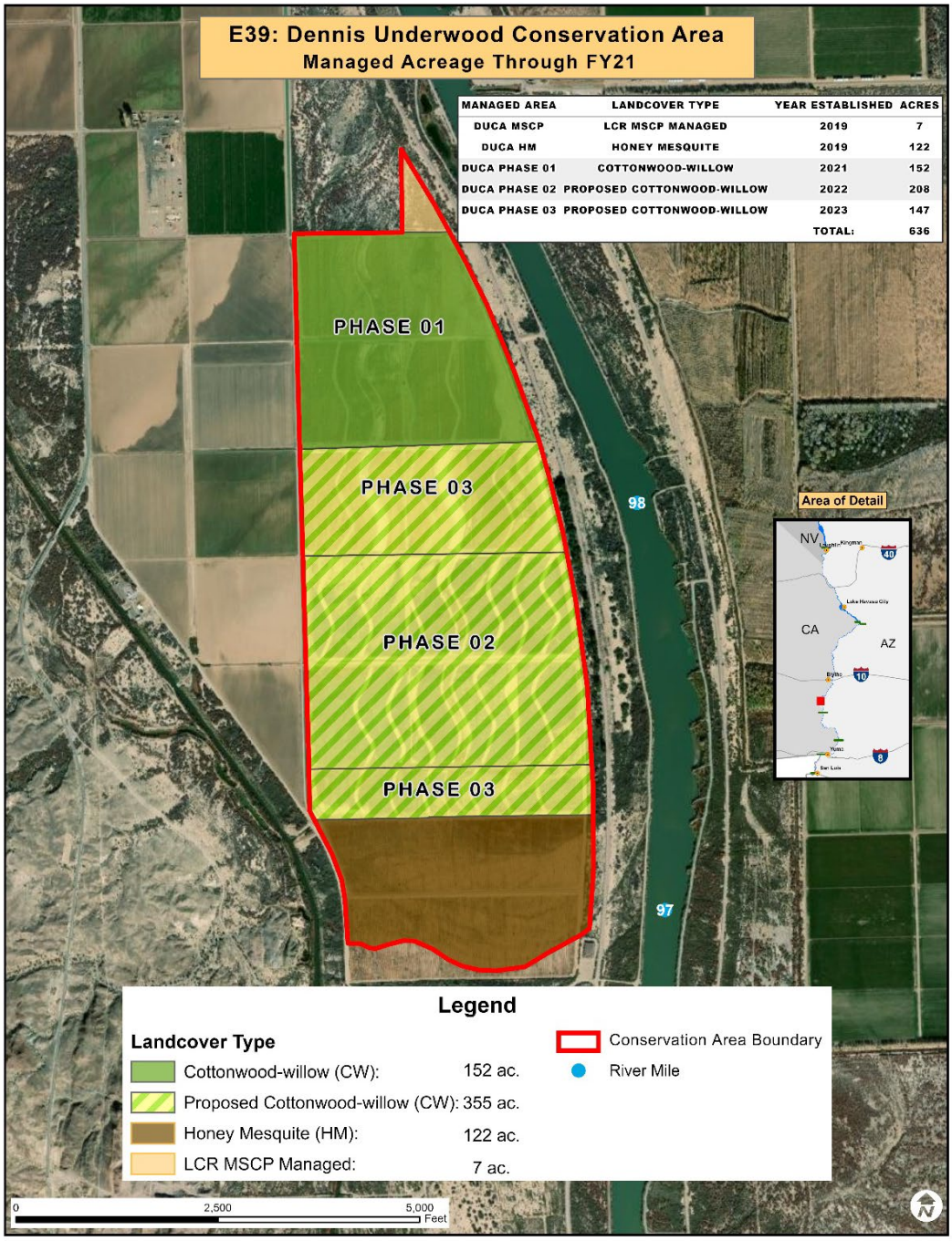

Figure 1-17.—E39 – Dennis Underwood Conservation Area managed acreage through FY21.

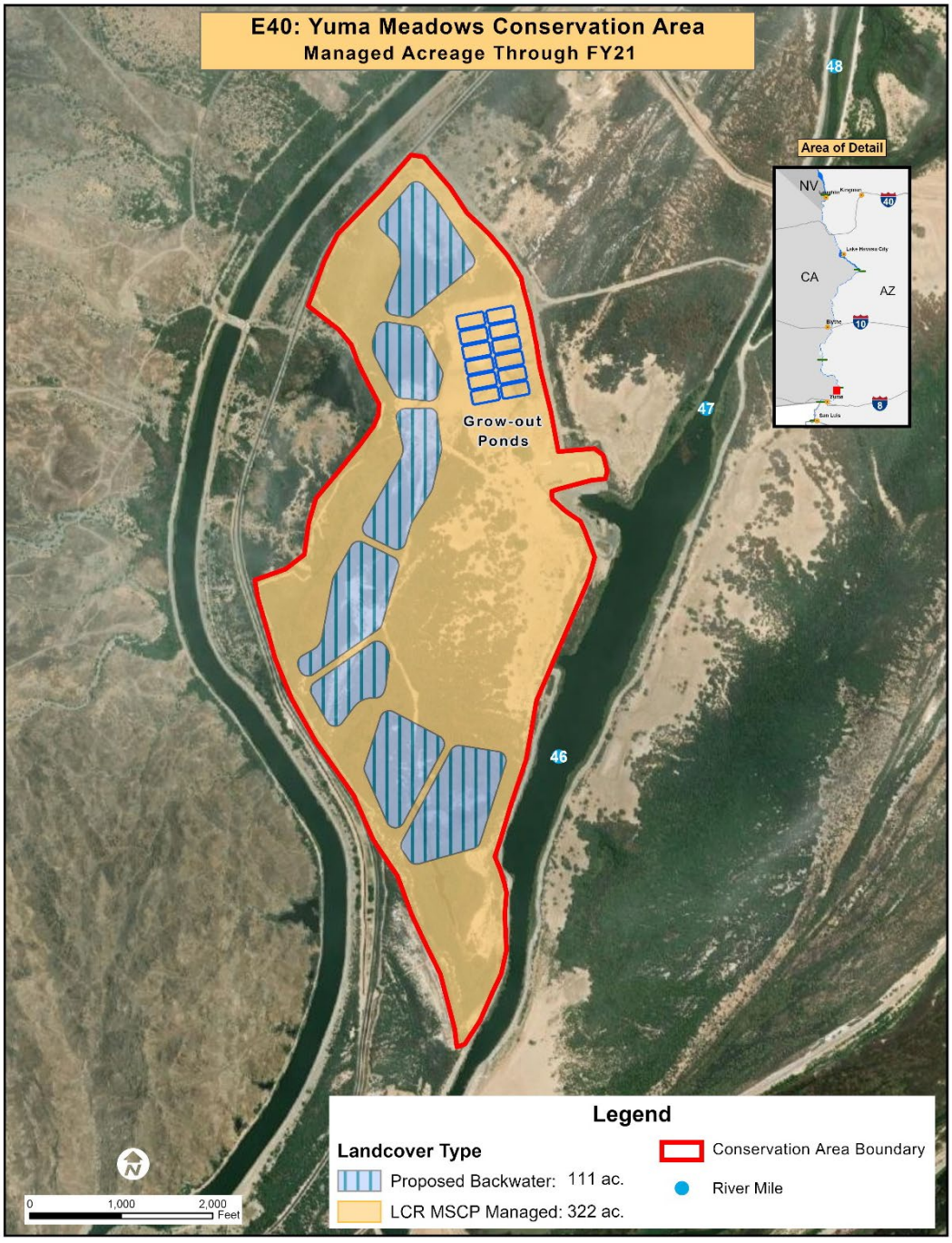

Figure 1-18.—E40 – Yuma Meadows Conservation Area managed acreage through FY21.

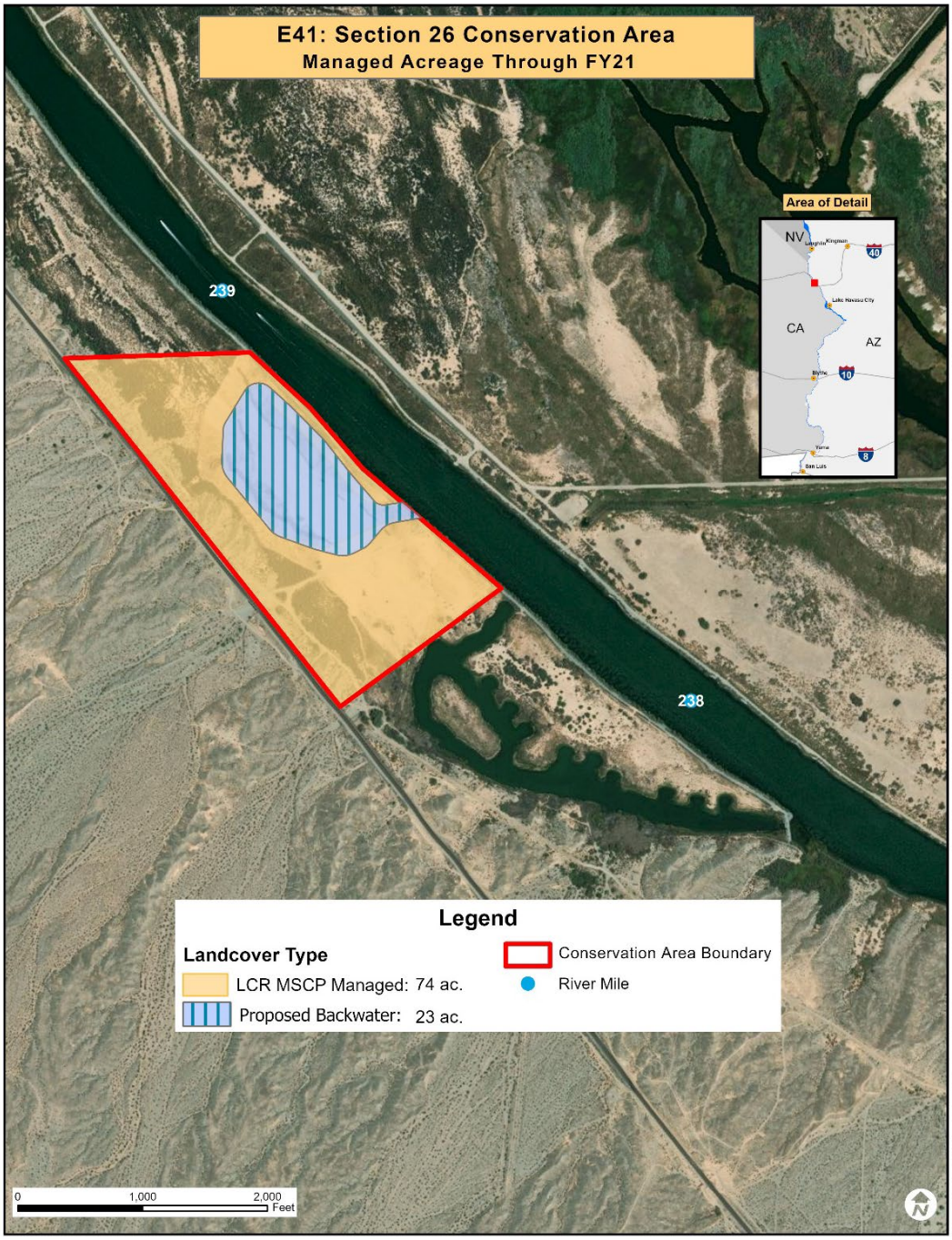

Figure 1-19.—Section 26 Conservation Area proposed managed acreage through FY21.

FY21 Accomplishments

Conservation Area development activities accomplished included planting at the Dennis Underwood Conservation Area, PVER, dredging at Beal Lake, final construction activities for disconnected backwaters at Planet Ranch, and clearing and construction of an access road at the YMCA, final planning for development of the expansion area at Cibola NWR Unit #1, and clearing of vegetation at the Section 26 Conservation Area (Section 26) in preparation for dredging. Maintaining this aggressive development schedule was challenging due to COVID-19 restrictions.

Dennis Underwood Conservation Area

The cottonwood-willow land cover type was planted on approximately 152 acres in Phase 1. The cottonwood-willow habitat is irrigated twice per month following planting through October.

PVER

Approximately 145 acres of the honey mesquite land cover type were planted on lands acquired by the CDFW that have been added to the PVER (formally known as PVER-South) in accordance with the approved development plan. This will complete all planned planting at the conservation area.

BLCA

Dredging resumed in January 2021 and was completed in August 2021. Approximately 392,000 cubic yards of material was dredged from the lake.

Planet Ranch

Construction activities were completed in FY21. This included the installation of groundwater pumps, pond discharge lines, electrical panels, mechanical controls, over 7,000 linear feet of five-rail fencing, and planting of marsh within the ponds and honey mesquite in fill areas from materials excavated in FY20. Starting in the spring of FY21, the ponds were filled and drained to evaluate the water delivery, drainage systems, and pond seepage rates.

YMCA

Clearing and grubbing of the grow-out pond pad was completed. Construction of the north alignment of the lower access road and the pump pad was completed in anticipation of drilling the groundwater wells. The layout for a covered 80-foot x 100-foot fish sorting facility, which includes four above ground raceways, was completed.

Cibola NWR Unit #1

The Restoration Development and Monitoring Plan was completed for the 325 acres in agricultural production and the 1,200-acre expansion area. A conceptual design and preliminary construction plan, including irrigation and drainage features, was prepared for the expansion area.

Section 26

A Value Engineering Study was completed. Clearing of vegetation from the area to be dredged for the backwater, partially cleared by a fire in December, was completed.

Acreage by Conservation Area Through FY21

The total number of acres managed by land cover type and by reach and State on established conservation areas is shown in tables 1-14 and 1-15. Through FY21, the LCR MSCP actively manages 12,091 acres, with 9,179 acres available for habitat creation (table 1-14). 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. The four land cover types have been established on 6,840 acres. All conservation areas that have a signed agreement are included in tables 1-14 and 1-15.

FY22 Activities

Development included planting at the Dennis Underwood Conservation Area, building infrastructure at the YMCA, initiating development of Cibola NWR Unit #1, and starting land-based excavation and dredging of Section 26.

Dennis Underwood Conservation Area

Cottonwood-willow habitat will be planted on approximately 208 acres in Phase 2.

YMCA

Efforts to build the infrastructure necessary to operate the rearing ponds and sorting facility were initiated and include drilling of the groundwater wells constructing the metal building for the sorting facility are planned. Efforts to build the infrastructure necessary to operate the rearing ponds and sorting facility were initiated, including drilling of the groundwater wells and constructing the fish sorting facility.

Table 1-14.—Acreage by Conservation Area Through FY21

Conservation Area	Established Land Cover Through FY21[1] (acres)	Total Planned Land Cover[2] (acres)	Total 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)	848	2,000	2,492	2,492
Cibola Valley Conservation Area (Arizona)	1,265	1,265	1,302	1,302
Dennis Underwood Conservation Area (California)	274	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	134	134
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)	1,269	1,269	1,361	1,551
Parker Dam Camp (California)	80	80	204	204
Planet Ranch (Arizona)	396[5]	458[5]	1,320	3,427
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	**6,840**	**9,179**	**12,091**	**14,403**

[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, including established/planned land cover and land not targeted for establishment.
[4] Total acreage of the conservation area, including land managed by the LCR MSCP and land within the conservation area managed by the landowner.
[5] Includes protection of 396 acres of cottonwood-willow at the Middle Bill Williams River NWR.

Table 1-15.—Land Cover Type by Reach and State Through FY21

	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	1,305	808	255	0	2,368
Reach 5	0	0	13	80	93
Reach 6	1,162	129	94	0	1,385
Reach 7	43	0	0	0	43
Total	**3,026**	**937**	**362**	**80**	**4,405**
California					
Reaches 1 and 2	0	0	0	0	0
Reach 3	0	0	0	63	63
Reach 4	1,097	1,092	0	0	2,189
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	**1,248**	**1,109**	**0**	**63**	**2,420**
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	**4,274**	**2,046**	**362**	**158**	**6,840**

With COVID-19 on the rise, the decision was made to scale back the development schedule slightly by delaying the start of excavation of the rearing ponds at the YMCA. The delay reduced the risk of increased costs from higher than normal prices, availability of heavy equipment, and lack of materials due to supply chain issues while not effecting the end date for development of all conservation areas.

Cibola NWR Unit #1

Cibola Connector: Preparation for planting and procurement of cottonwood-willow for the Cibola North Connector, part of the 325 acres of active agriculture, is anticipated.

Expansion Area: Selective clearing of vegetation along the proposed canals, meanders, and swales is underway. The meander and swales are used as sources of fill for building the canal embankments and access roads, which has also started.

Section 26

Land-based excavation will remove approximately 100,000 cubic yards. The excavation will provide access for the dredge and sufficient depth in the backwater to float it. Dredging is scheduled to start.

Proposed FY23 Activities

Development includes planting at the Dennis Underwood Conservation Area continued development of Cibola NWR Unit #1, and continued land-based excavation and dredging of Section 26.

Dennis Underwood Conservation Area

Cottonwood-willow habitat will be planted on approximately 147 acres in Phase 3.

YMCA

Drilling of a new domestic well is planned. Testing of the groundwater wells for the rearing ponds and fish sorting facility is scheduled.

Cibola NWR Unit #1

Cibola Connector: Preparation for planting and procurement of cottonwood-willow for the Cibola North Connector, part of the 325 acres of active agriculture, is anticipated.

Expansion Area: Continued development of the expansion area is also planned and includes clearing of vegetation, excavation of depressions or swales, and placement of fill to build roads and canal embankments. Over 3 miles of concrete-lined canals are planned to irrigate the cottonwood-willow land cover type.

Section 26

Land-based excavation will remove the remaining dry overburden and place it adjacent to the site in California. The remaining material will be dredged and placed in Arizona.

Planned Conservation Area Development

Conservation areas are scheduled to be developed and adaptively managed from FY24 to FY34 to meet the minimum required land cover type creation as described in the HCP. The following is the anticipated work:

(1) Completion of a 23-acre disconnected backwater at Section 26 is scheduled for FY24.

(2) Completion of infrastructure for the development of cottonwood-willow at the Cibola NWR Unit #1 expansion area is scheduled for FY24.

(3) Construction of rearing ponds at the YMCA is scheduled for FY 24–26.

(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 YMCA is scheduled for FY29–34.

(7) Development of a marsh complex at Three Fingers Lake 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.

FY21 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. The soil moisture data collected during FY21 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. Data were used for refining the vegetation structure models, the habitat suitability models, and for updating the LCR MSCP planning area vegetation classification. Preliminary analyses were conducted to determine the vegetation and soil moisture suitability of created habitat.

Data from various remote sensing platforms were processed and analyzed for the pilot habitat manipulation study at HMM. Based on results from these data, portions of HMM were identified as having low normalized difference vegetation index (NDVI) values and would benefit from being reset using habitat manipulation techniques. This information was provided to the USFWS, who then conducted a prescribed burn in the northern cell of the marsh to improve the habitat. Pre- and post-burn vegetation data were collected.

Vegetation health was monitored at established conservation areas. Satellite imagery was used to generate monthly rasters of NDVI values and change rasters between monthly time steps. The change rasters are used to identify areas that have experienced negative changes in NDVI values, indicative of a decline in vegetation health, and warranting additional monitoring.

Baseline data were collected for the irrigation management study at 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. Irrigation reduction began in June 2021.

FY22 Activities

Salinity and Soil Moisture Monitoring Network

The salinity and soil moisture monitoring network was expanded to include monitoring at newly planted areas of the Dennis Underwood Conservation Area. The network will continue to operate at all existing locations. Data continue to be analyzed and will be used to refine irrigation schedules at conservation areas that are actively irrigated.

Habitat Manipulation

LCR MSCP conservation areas are being evaluated against the suitability ranges for vegetation structure and soil moisture. Based on the results of these evaluations, recommendations will be made on whether some level of habitat manipulation is warranted or not.

Using the information from the marsh habitat manipulation report and the response after the FY21 prescribed burn, 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.

Vegetation health will be monitored at established conservation areas to identify areas that have experienced negative changes in NDVI values, indicative of a decline in vegetation health, and warranting additional monitoring. Data (soil, groundwater, vegetation, and wildlife) will continue to be collected in Phase 8 of the PVER as part of the irrigation management study. Irrigation volumes will be decreased again according to the study design.

Planning will be conducted for a pilot study to determine the feasibility of using small dredging equipment to control emergent vegetation encroachment and to remove accumulated sediment to maintain deep channels in created marsh habitat.

Proposed FY23 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 and soil moisture data will be acquired in FY23. 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.

Vegetation health monitoring will continue in order 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 continue to be decreased, and soil, groundwater, and vegetation monitoring will continue.

A small pilot study will be conducted to determine the feasibility of using small dredging equipment to control emergent vegetation encroachment and to remove accumulated sediment to maintain deep channels in created marsh habitat.

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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$1,545,324	$1,322,129.24	$18,441,920.29	$1,593,170	$1,774,374	$1,774,374	$1,774,374

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 administrative staff receive support to manage implementation of the LCR MSCP. The Program Manager directs functions and activities associated with implementation of the HCP to ensure completion of activities in accordance with the program documents.

Previous Activities: The LCR MSCP Office was established in 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.

FY21 Accomplishments: Ongoing administrative activities included financial, human resources, and other support for the program. The Steering Committee met via conference call on October 28, 2020, April 28, 2021, and June 23, 2021.

During the June 23, 2021, Steering Committee meeting, the Steering Committee approved Resolution 20-005, approving the *Final Implementation Report, Fiscal Year 2022 Work Plan and Budget, Fiscal Year 2020 Accomplishment Report*. Financial tracking of the program continued, and the annual financial work group meeting was held via a conference call on February 18, 2021.

FY22 Activities: Ongoing administrative 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 *Draft Implementation Report, Fiscal Year 2023 Work Plan and Budget, Fiscal Year 2021 Accomplishment Report* was prepared. Financial tracking for the program will continue, and the annual financial work group meeting was held.

Proposed FY23 Activities: 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 2024 Work Plan and Budget, Fiscal Year 2022 Accomplishment Report* will be prepared. Financial tracking of the program will continue, and the annual financial work group meeting will be held.

Pertinent Reports: The *Final Implementation Report, Fiscal Year 2022 Work Plan and Budget, Fiscal Year 2020 Accomplishment Report* is posted on the LCR MSCP website. The *Final Implementation Report, Fiscal Year 2023 Work Plan and Budget, Fiscal Year 2021 Accomplishment Report* will be posted upon completion.

WORK TASKS – SECTION B

Fish Augmentation

Work Task B1: Lake Mohave Razorback Sucker Larvae Collections

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$215,000	$218,481.80	$3,358,386.23	$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 larvae. Genetic analyses of razorback sucker larvae are currently completed under Work Task D15. 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 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, boat maintenance, and maintaining the 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 project. This work occurs for up to 4 nights per week during the spawning season. Captured larvae are delivered to partner hatcheries, 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 are distributed temporally throughout the spawning season and spatially among identified Lake Mohave spawning areas. Reports summarizing Lake Mohave larvae collections will be completed every 5 years.

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 into Lake Mohave to maintain the existing broodstock and its genetic diversity or (2) released into Reaches 3–5 to accomplish program augmentation goals.

FY21 Accomplishments: A collection goal of 36,000 larvae was established in coordination with LCR MSCP partner agencies, and a total of 38,218 larvae were collected from 4 zones of the lake. Larvae collections were split between the basin area of the lake (i.e., the Nine Mile, Tequila, and Yuma zones) and the riverine portion of the lake (the Willow Beach zone) to better represent the lake-wide genetic composition of the adult population in hatchery stocks. Of the larvae collected, the Willow Beach NFH received 29,147 larvae, and the remaining 9,071 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*

Zone	January	February	March	April	May	Total
Nine Mile	0	1,021	1,005	0	0	2,026
Tequila	0	507	2,469	85	0	3,061
Yuma	0	3,086	3,404	0	0	6,490
Willow Beach	606	5,268	8,745	12,022	0	26,641
Total	**606**	**9,882**	**15,623**	**12,107**	**0**	**38,218**

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

FY22 Activities: A collection goal of 14,000 larvae has been established in coordination with LCR MSCP partner agencies. All larvae will be delivered to the Willow Beach NFH for rearing. The Achii Hanyo Native Fish Rearing Facility will not receive larvae this year to provide room for approximately 10,000 2021 year class razorback suckers that will be transferred from the Willow Beach NFH. The Lake Mead Fish Hatchery will not receive larvae or fingerlings until the new hatchery pipeline is in place.

Proposed FY23 Activities: Razorback sucker larvae collections will continue. The collection goal will be established in coordination with LCR MSCP partner agencies.

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

Work Task B2: Willow Beach National Fish Hatchery

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$325,000	$620,968.81	$5,141,196.82	$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 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 research actions described in Species Research (Section C) have occurred at the Willow Beach NFH under Work Tasks C10 (closed) and C30 (closed).

Project Description: The Willow Beach NFH is managed by the USFWS. 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 receives wild razorback sucker larvae collected from Lake Mohave and fingerling bonytail (25–75 mm TL) from the Center (B4).

2. **Provide fishes to other hatcheries.** The Willow Beach NFH will provide fingerling bonytail to the Achii Hanyo Native Fish Rearing Facility and will distribute 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 LCR.** The Willow Beach NFH will rear subadult razorback suckers for stocking into Reaches 2–5. 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 USFWS and Reclamation cooperatively added solar heating systems to the hatchery, converting 50% of its rearing capacity to warm-water fish production. Razorback suckers and bonytail are warm-water fish species, and this system allows for accelerated growth during rearing. Each year since 1996, the hatchery has received wild razorback sucker larvae, reared juvenile razorback suckers, and repatriated fishes back into Lake Mohave.

FY21 Accomplishments:

On Station: Approximately 21,685 razorback suckers were on station at the beginning of FY21 (table 1).

Table 1.—Year Class and Approximate Number of Razorback Suckers on Station in Early FY21

Year Class	Approximate Number
2017	4,913
2019	6,661
2020	10,111
Total	**21,685**

Received: Willow Beach NFH received 29,147 razorback sucker larvae from Lake Mohave. Approximately 4,000 bonytail chub year-class 2021 were received from the Center.

Stocked: Lakeside rearing ponds were stocked with 349 razorback sucker juveniles (B7), 4,543 razorback suckers were repatriated into Lake Mohave (Reach 2), and 1,670 razorback suckers were repatriated into Reach 3.

Transferred: A total of 8,784 razorback suckers were transferred to other facilities. This included 2,818 young-of-the-year razorback suckers transferred to the Lake Mead Fish Hatchery, 5,316 year-class 2020 razorback suckers transferred to the Achii Hanyo Native Fish Rearing Facility, and 150 year-class 2019, 250 year-class 2020, and 250 year-class 2021 razorback suckers transferred to the Center for incorporation into the existing broodstock.

Improvements: Six 6-foot circular tanks were installed in the larval room for rearing bonytail. These tanks were plumbed into the well water line and connected to a sump, with the goal of heating water to 78 degrees Fahrenheit (°F). Survival of bonytail larvae was close to 100% through the end of the fiscal year.

Two new tank systems were installed on top of outside concrete raceways for rearing either razorback suckers or bonytail. Each system consists of four 8-foot circular tanks and one 10-foot circular tank. These are partial recirculation systems that receive 10 gallons of well water per minute, house a bio filter, and are connected to solar heaters to increase the water temperature to 75–80 degrees Fahrenheit in summer.

In early FY21, the USFWS completed the design for a new hatchery building to enhance annual production of native fishes at the Willow Beach NFH. The design included removing a portion of the outdoor raceways and replacing them with the new building that would be dedicated to rearing native fishes using a groundwater supply. This change in production strategy was identified as an alternative after an outbreak of *Ichthyophthirius multifiliis* ("ich") occurred in the outdoor raceway system in 2017. The LCR MSCP contributed $290,000 toward the final design and construction of the new hatchery building, resulting in FY21 obligations exceeding the approved estimate.

FY22 Activities:

On Station: At the start of FY22, the Willow Beach NFH had approximately 26,214 razorback suckers on station (2,679 year-class 2019, 1,244 year-class 2020, and 22,291 year-class 2021). Approximately 6,506 year-class 2021 bonytail were also on station at the beginning of FY22.

Received: The Willow Beach NFH received 22,223 year-class 2021 razorback suckers from the Lake Mead Fish Hatchery in January 2022. Willow Beach NFH will also receive approximately 14,000 razorback sucker larvae from Lake Mohave to rear and distribute for the LCR MSCP Fish Augmentation Program.

Stocked: Approximately 2,000 razorback suckers will be stocked into Lake Mohave to augment the existing population. An additional 200 subadult razorback suckers will stocked into the lakeside rearing ponds (B7) and grown to target size before being stocked into the lake.

Transferred: Approximately 10,000 year-class 2021 razorback suckers will be transferred to the Achii Hanyo Native Fish Rearing Facility. Bonytail received from the Center may be temporarily housed at the Willow Beach NFH before transfer to other facilities.

Improvements: Due to unforeseen increases in construction costs, the USFWS will be unable to proceed with construction of the new hatchery building as planned. As an alternative, the USFWS will install three new tank systems, dedicated to rearing bonytail or razorback suckers, using non-LCR MSCP funds. Funding provided in FY21 for the new hatchery building will be returned to the LCR MSCP.

Proposed FY23 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 will continue to be reared on station, and additional 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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$170,000	$187,778.10	$2,181,559.75	$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 Tribes Reservation, Parker, Arizona

Purpose: To support operation and maintenance (O&M) 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 NFH and Center may be transferred to the Achii Hanyo Native Fish Rearing Facility. This project is also related to Work Task B6, as fishes 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 of 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 O&M, fish feed and chemicals, and fish distribution.

This facility is located on the Colorado River Indian Tribes 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 delivered from the Center in winter and are

generally held at the Willow Beach NFH before being transferred to the Achii Hanyo Native Fish Rearing Facility. Razorback suckers are delivered from the Willow Beach NFH in early spring. These fish are fed through spring and summer. In fall, the ponds are drained, and fishes are harvested, tagged, and stocked. Fishes under target size (< 305 mm TL) are returned to a pond for continued rearing. New fishes are then brought on station, and the process is repeated.

Previous Activities: In cooperation with the USFWS, 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 has contributed both species to the LCR MSCP Fish Augmentation Program on a near-annual basis.

FY21 Accomplishments:

On Station: Approximately 18,000 native fishes were on station at the beginning of FY21 (table 1).

Table 1.—Year Class and Approximate Number of Native Fishes on Station in Early FY21

Year Class	Species	Approximate Number
2018	Razorback suckers	7,000
2019	Razorback suckers	4,000
2018	Bonytail	7,000
	Total	**18,000**

Received: The Achii Hanyo Native Fish Rearing Facility received approximately 5,300 razorback suckers from the Willow Beach NFH.

Stocked: A total of 3,118 razorback suckers were stocked into Reach 3, and a total of 2,539 razorback suckers and 477 bonytail were stocked into Reach 4.

Transferred: No fishes were transferred to other facilities in FY21.

Improvements: No large-scale improvement projects were identified. Minor maintenance work was completed as needed.

FY22 Activities:

On Station: At the start of FY22, approximately 6,800 razorback suckers from year-classes 2019 and 2020 and 6,800 bonytail from year-class 2018 were on station.

Received: The Achii Hanyo Native Fish Rearing Facility will receive approximately 10,000 razorback suckers and 2,000 bonytail from the Willow Beach NFH to support production goals.

Stocked: A total of 4,364 razorback suckers and 1,043 bonytail were stocked into Reach 4.

Transferred: No fishes will be transferred off station in FY22.

Improvements: Rearing ponds will be dried and graded to repair badly eroded banks and to allow for better draining at harvest. New air lines will also be installed to improve aeration in raceway holding tanks.

Proposed FY23 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 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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$260,000	$275,538.95	$3,681,085.75	$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 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 may be delivered to the Willow Beach NFH, Achii Hanyo Native Fish Rearing Facility, Bubbling Ponds Fish Hatchery, and 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 USFWS. 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 razorback suckers and bonytail for distribution to other hatcheries, and to annually rear bonytail for distribution within Reaches 2–5. The Center targets a 305-mm TL for all bonytail stocked; however, fishes with TLs of ≥ 300 mm may be stocked into Reaches 2 and 3. Fishes stocked into Reaches 4 and 5 will be ≥ 305 mm TL.

Previous Activities: Prior to FY14, the Center raised and stocked subadult razorback suckers and bonytail into the LCR 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 has contributed both species to the LCR MSCP Fish Augmentation Program on an annual basis.

FY21 Accomplishments:

On Station:

Bonytail – The Center maintained an adult broodstock of approximately 2,070 bonytail comprising seven year classes of Lake Mohave origin fish (1,070 older broodstock [year-classes 2000–2004] and 1,000 future broodstock [year-classes 2012–2014]). Approximately 50,000 bonytail were on station at the beginning of FY21 (table 1).

Table 1.—Year Class and Approximate Number of Bonytail on Station in Early FY21

Year Class	Approximate Number
2018	20,000
2020	10,000
2021	20,000
Total	**50,000**

Razorback Suckers – The Center maintained a broodstock of 1,313 adult razorback suckers that comprised nine year classes of Lake Mohave origin fish.

Tissue samples were collected from all razorback sucker and bonytail broodstock for genetic analyses. The samples will be used under Work Task D15 to develop and use Next Generation DNA markers that characterize single nucleotide polymorphisms to monitor genetic variation in captive and wild populations. All tissue samples will be archived at the University of New Mexico's Museum of Southwestern Biology (Albuquerque, New Mexico).

Produced: The Center produced approximately 50,000 year-class 2021 bonytail for grow-out and future stocking into the upper and LCR.

Stocked: The Center harvested, PIT tagged, transported, and stocked 3,026 sub-adult bonytail into Reach 3 and 431 subadult bonytail into Reach 4.

Transferred: The Center transferred approximately 4,000 young-of-the-year bonytail to the Willow Beach NFH (B2) and 7,805 juvenile bonytail and 16,000 young-of-the-year razorback suckers to the Lake Mead Fish Hatchery (B6). The Center also supplied approximately 5,000 bonytail larvae and 5,000 razorback sucker larvae for research being conducted under Work Task C61.

FY22 Activities:

On Station: Razorback sucker and bonytail broodstocks will be maintained. At the start of FY22, the Center had approximately 50,000 bonytail on station from multiple year classes.

Produced: The Center will produce up to 75,000 year-class 2022 bonytail for on station grow-out and future stocking into the LCR.

Stocked: The Center will rear 7,000–8,000 bonytail to 305 mm TL in FY22 for distribution within the LCR. In October 2021, the Center stocked 1,345 bonytail into Reach 3.

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

Proposed FY23 Activities: Razorback sucker and bonytail broodstocks will be maintained. If requested, razorback sucker larvae will be produced and delivered to program partners 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 7,000–8,000 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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$150,000	$152,995.78	$5,079,936.63	$0	$0	$0	$0

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

Start Date: FY05

Expected Duration: FY21

Long-Term Goal: Fish augmentation

Conservation Measures: RASU3 and RASU4

Location: Cornville, Arizona

Purpose: To support operation of the Bubbling Ponds Fish Hatchery 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 (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 ARCC.

Project Description: The Bubbling Ponds Fish Hatchery is managed and operated by the 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 have provided for salaries, fish feed and supplies, hatchery O&M, and delivery of fish.

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.

FY21 Accomplishments:

On Station: The Bubbling Ponds Fish Hatchery began FY21 with approximately 24,030 razorback suckers on station (table 1). All razorback suckers were previously supplied by the Center as fry or fingerlings.

Table 1.—Year Class and Number of Razorback Suckers on Station in Early FY21

Year Class	Approximate Number
2017	2,458
2018	14,721
2019	6,851
Total	**24,030**

Received: No razorback suckers were received from the Center in FY21.

Stocked: A total of 4,049 razorback suckers were harvested, PIT tagged, and stocked into the LCR below Davis Dam (Reach 3). A total of 16,114 razorback suckers were harvested, tagged and stocked into the LCR below Parker Dam (Reach 4).

Transferred: Approximately 3,867 year-class 2019 razorback suckers < 305 mm in total length were transferred to the Lake Mead Fish Hatchery. No razorback suckers designated for the LCR MSCP remained at the Bubbling Ponds Fish Hatchery at the end of FY21.

Maintenance: Equipment maintenance and minor repair activities were completed in support of pond harvests and stocking of razorback suckers.

FY22 Activities: This work task was closed in FY21.

Proposed FY23 Activities: This work task was closed in FY21.

Pertinent Reports: Prior annual administrative reports are available upon request.

Work Task B6: Lake Mead Fish Hatchery

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$585,000	$605,254.96	$2,721,936.44	$775,000	$250,000	$1,000	$1,000

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 razorback suckers and bonytail to the LCR MSCP Fish Augmentation Program

Connections with Other Work Tasks (Past and Future): The Lake Mead Fish Hatchery receives larval razorback suckers from Lake Mohave under Work Task B1, fingerling razorback suckers from the Willow Beach NFH under Work Task B2, bonytail from the Achii Hanyo Native Fish Rearing Facility under Work Task B3 and the 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, C53, C57, C63, and ongoing work tasks C61, C64, D8, and F5.

Project Description: The Lake Mead Fish Hatchery is managed and operated by the NDOW. The LCR MSCP and NDOW 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 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 needed in future years.

The LCR MSCP and NDOW 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.

FY21 Accomplishments:

On Station: The Lake Mead Fish Hatchery continued rearing the approximately 21,000 razorback suckers and 16,000 bonytail that were on station from previous years (table 1).

Table 1.—Year Class and Approximate Number of Native Fishes on Station in Early FY21

Year Class	Species	Approximate Number
2013	Bonytail	3,647
2014	Bonytail	171
2015	Bonytail	573
2017	Bonytail	1,077
2018	Bonytail	10,816
2016	Razorback sucker	1,093
2017	Razorback sucker	7,453
2018	Razorback sucker	3,060
2019	Razorback sucker	5,012
2020	Razorback sucker	4,576
	Total	**37,478**

Received: The Lake Mead Fish Hatchery received 9,071 razorback sucker larvae from Lake Mohave, 16,000 larval razorback suckers from the Center, 2,818 fingerling razorback suckers from the Willow Beach NFH, and 7,805 bonytail from the Center. Additionally, the hatchery received 3,867 razorback suckers < 305 mm TL from the Bubbling Ponds Fish Hatchery, as that facility stopped rearing fish for the LCR MSCP.

Stocked: A total of 10,317 razorback suckers and 7,551 bonytail were stocked into the LCR; 5,840 razorback suckers and 400 bonytail were stocked into Lake Mohave (Reach 2), 4,448 razorback suckers were stocked into Lake Havasu (Reach 3), and 29 razorback suckers and 7,151 bonytail were stocked below Parker Dam (Reach 4).

Improvements: Larval fish rearing capabilities were upgraded to allow for increased larval capacity and improved larval health and survival. The new larval systems will allow for the rearing of 12,000 to 15,000 larval fish annually.

FY22 Activities: In FY22, the surface water elevation of Lake Mead is projected to drop below the water delivery intake that supplies the Lake Mead Fish Hatchery. As a result, all fish on station were stocked or transferred to other locations for grow-out. Fish that met the minimum stocking size of 305 mm TL were PIT tagged and released into the LCR. Fish that were near stocking size were released into backwaters managed by the LCR MSCP or its partners for additional grow-out and potential future harvest. Fingerling razorback suckers from the 2020 and 2021 year classes were transferred to the Willow Beach NFH for grow-out and future stocking. Native fish production at the Lake Mead Fish Hatchery will be suspended until long-term water delivery is secured for the hatchery.

On Station: At the start of FY22, approximately 38,000 razorback suckers and 6,500 bonytail were on station, representing five year classes of razorback suckers and three year classes of bonytail.

Received: The Lake Mead Fish Hatchery will not receive any fish in FY22.

Stocked: A total of 12,487 razorback suckers and 2,937 bonytail > 305 mm TL were stocked into the LCR; 2,287 razorback suckers were stocked into Lake Mohave (Reach 2), 5,925 razorback suckers and 9 bonytail were stocked into Reach 3, and 4,275 razorback suckers and 2,928 bonytail were stocked below Parker Dam (Reach 4).

Transferred: Approximately 22,200 razorback suckers were transferred to the Willow Beach NFH.

Improvements: The NDOW is evaluating potential alternatives for water delivery to the hatchery. Several hatchery improvement and maintenance projects that could not be undertaken when fishes were on station will also be evaluated for inclusion in the FY23 work schedule.

Proposed FY23 Activities: Rearing and stocking of native fishes will be suspended until a new water source can be secured for the hatchery. It is anticipated that several hatchery improvement and maintenance projects will be implemented in preparation of rearing fishes in future years.

Pertinent Reports: Annual activities reports are available upon request.

Work Task B7: Lakeside Rearing Ponds

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$150,000	$155,162.63	$3,010,372.41	$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 Task B2, as fish for lakeside rearing ponds come from the Willow Beach NFH. In addition, some of the fish rearing research activities outlined in Work Tasks C34 (closed), C40 (closed), C44 (closed), and C63 (closed) were conducted in these ponds.

Project Description: Lake Mohave is operated by 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. Reclamation and its partners in the Lake Mohave Native Fish Work Group have been using these lakeside ponds since 1992 to rear razorback suckers and bonytail. The ponds are stocked with juvenile fishes each year as the reservoir fills (typically stocked in late January), and 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 using remote sensing technologies, and routine

monitoring of physical, chemical, and biological parameters. The ponds are normally harvested in late spring and again in the 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 34,000 razorback suckers have been reared in these ponds since 1992. Beginning in 2007, management of these ponds shifted toward rearing larger fish for the LCR MSCP. Typically, razorback suckers > 300 mm TL have been stocked into the ponds and then harvested later that year. Since 2012, surplus in-situ spawned fish have been harvested, fin clipped, and marked with a PIT tag and transferred below Davis Dam (Reach 3).

FY21 Accomplishments: Four ponds were stocked at the beginning of the calendar year with 349 subadult razorback suckers (table 1). These fish were originally collected from Lake Mohave as larvae and then reared at the Willow Beach NFH. All fish were stocked at a size of at least 300 mm TL to be consistent with the minimum release target length. The Yuma Cove and Davis Cove backwaters were not stocked this year and contain fish from multiple previous stocking years. The population size in these ponds is unknown, but approximately 240 PIT-tagged razorback suckers were contacted by remote scanning in the Yuma Cove backwater during the year. North Chemehueve no longer completely dries, so there can be holdover fish from previous years. This year, three fish were harvested from a previous year backwater stocking and returned to the lake. Since these fish are not from the 2021 stocking, they are not represented in table 1. All stockings of the lakeside rearing ponds were supported under this work task.

Table 1.—2021 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		75		367		55		472		73
Dandy		75		359		16		476		21
Arizona Juvenile		100		363		2		402		0.02
North Chemehueve		99		366		2		459		0.02
Total or Overall Mean Value	**Total**	**349**	**Mean**	**364**	**Total**	**75**	**Mean**	**470**	**Mean**	**21.5%**

A total of 75 razorback suckers were harvested from the 4 ponds and repatriated into Lake Mohave. The mean TL of repatriated fish was 470mm (table 1), with individual fish ranging in size from 396–526 mm TL. All fish were PIT tagged before being stocked into the ponds. Fish were scanned for PIT tags at the time of

harvest, and a new tag was inserted if the original PIT tag was not detected. Prior to being repatriated into the lake, a tissue sample was collected from each individual for future genetic analyses.

While annual pond harvests can be variable, lake-wide monitoring has consistently shown higher long-term contact rates for pond-reared versus hatchery-reared razorback suckers 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.

FY22 Activities: A total of 310 razorback suckers were captured from the Yuma Cove backwater in late October to collect genetic samples from in-situ spawned fish and to estimate the current population size. Tissue samples were collected from each fish, and 270 unmarked recruits received a PIT tag. All fish were returned to the pond for further grow-out. The October harvest data, and remote PIT scanning data collected in FY21, suggest the razorback sucker population in the Yuma Cove backwater is at least several hundred individuals.

Lakeside rearing ponds will again be used for Lake Mohave razorback sucker broodstock maintenance and development. Approximately 200 fish will be stocked into four lakeside ponds: Willow, Dandy, Arizona Juvenile, and North Chemehueve. The Yuma Cove and Davis Cove backwaters will not be stocked until additional harvests of fish stocked in prior years have been completed. The lake elevation in October will be low enough for North Chemehueve to dry so all holdover fish from previous stockings can be removed.

Pond maintenance, including the removal of surface algal mats and dense submerged vegetation, will be completed as needed to maintain water quality suitable for native fishes. Cattails at the Arizona Juvenile and Willow backwaters were sprayed with an herbicide following the fall pond harvest. Remote PIT tag scanning will be used to monitor razorback suckers from the time of initial stocking until the final harvest. Collected data will be used to address spatial and temporal variability in survival rates and to suggest improvements in pond management.

Proposed FY23 Activities: Lakeside rearing ponds will be maintained for 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.

Pertinent Reports: N/A

Work Task B8: Fish Tagging Equipment

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$135,000	$21,585.07	$1,715,206.86	$135,000	$135,000	$135,000	$135,000

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

Start Date: FY04

Expected Duration: FY55

Long-Term Goal: Acquire and maintain a supply of fish tagging equipment for marking and monitoring 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 LCR for identification purposes and 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: The LCR MSCP will provide a level of funding to support implementation of an augmentation program providing for the stocking of more than 1.2 million native fishes into the LCR. Fishes will be marked to assess distribution and survival and for effective research and decision making. Funds provide for both tagging and detection equipment needed during research and monitoring. The LCR MSCP anticipates the need for tagging and detection equipment throughout the 50-year term of the program.

Previous Activities: Fishes released into the LCR have been tagged with 400-kilohertz (kHz) PIT tags (Lake Mead and Lake Mohave, Reaches 1 and 2), 125-kHz PIT tags (Davis Dam to Parker Dam, Reach 3), and wire tags (Davis Dam to Imperial Dam, Reaches 3, 4, and 5). Recaptured 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 previously used tags (12 versus 2 inches away from fishes) and allow for improved monitoring stations within spawning areas and at other locations throughout the LCR.

FY21 Accomplishments: PIT tags, tagging equipment, and tag readers were purchased as needed to mark fishes for research and monitoring. A total of 42,350 razorback suckers and 11,485 bonytail were PIT tagged and released into the LCR. These numbers represent the total number of fishes implanted with tags and credited under the LCR MSCP Fish Augmentation Program. They include fishes used for research, smaller volunteer spawned fishes that have been translocated into other areas, and fishes that have been retagged due to tag loss or to replace older frequency tags.

Obligations were less than the approved estimate, as tags and equipment needed in FY21 were purchased in FY20.

FY22 Activities: PIT tags, tagging equipment, and tag readers will be purchased as needed to mark fishes for research and monitoring. The budget estimates reflect current stocking goals and the need for equipment to support ongoing tagging and remote monitoring efforts.

Proposed FY23 Activities: PIT tags, tagging equipment, and tag readers will continue to be purchased as needed to mark fishes for research and monitoring.

Pertinent Reports: N/A

Work Task B12: Maintenance of Alternate Bonytail Broodstock

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$70,000	$78,527.29	$397,421.52	$75,000	$75,000	$75,000	$80,000

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 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 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. A second broodstock was developed at the Center and moved to the Mora NFH in March 2016. Budget estimates for this work task will reflect LCR MSCP contributions toward continuing broodstock maintenance activities. 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.

Previous Activities: In 2011, a multi-agency meeting was held to prioritize the creation of new refuge populations of Colorado River fishes to safeguard these 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 a second bonytail broodstock population from FY12 to FY14, which included a total of 1,267 fish from the 2012–2014 year classes.

In FY15, a recommendation was made 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, and the relocation and maintenance of this broodstock was completed through a cost-share agreement with the USFWS. The USFWS has indicated that this new broodstock is not intended to provide additional production fish to any conservation/recovery programs but would function as a "refuge population" to provide redundancy for securing and conserving the genetics of this species.

FY21 Accomplishments: Survival of the second bonytail broodstock was 95.3% through the end of FY21. 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 were fed a daily maintenance diet of 0.5% of total body weight at an average water temperature of 11 degrees Celsius.

FY22 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. Additional supplemental oxygen lines will be added to provide oxygen in emergency situations. Preventive maintenance will be conducted on the UV sterilizer, including the changing of bulbs and ballasts and belt feeders.

Proposed FY23 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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$11,000	$12,337.13	$178,248.74	$11,000	$13,000	$13,000	$13,000

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 to an ongoing conservation program or to another entity approved by the 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 2020, the NPS conducted conservation activities at select populations of sticky buckwheat and threecorner milkvetch within the Lake Mead National Recreation Area. This included presence/absence surveys from 2008 to 2019 and invasive weed removal from 2013 to 2020 at select sites. Conservation activities for these two plant species were supported under the LCR MSCP in accordance with the NPS's *Lake Mead National Recreation Area Resource Stewardship Strategy, November 2014*. 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."

FY21 Accomplishments: A site visit was conducted in February to assess several areas for presence and treatment of Sahara mustard. No treatments were needed, as no Sahara mustard was found. A second site visit was conducted in April to monitor threecorner milkvetch at Sandy Cove. No threecorner milkvetch plants had emerged, so surveys were not conducted.

FY22 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 FY22 on removal of Sahara mustard, native sixweeks fescue, and non-native Mediterranean grass that are stabilizing the dunes at Sandy Cove and degrading threecorner milkvetch habitat. Provided there is sufficient precipitation in winter/spring FY22, sticky buckwheat and threecorner milkvetch will be surveyed as they emerge.

Proposed FY23 Activities: Funds in the amount of $10,000 will be transferred to the NPS to implement conservation activities for sticky buckwheat and threecorner milkvetch.

Pertinent Reports: The *Threecorner Milkvetch and Sticky Buckwheat Conservation in the Lake Mead National Recreation Area, 2021 Annual Report* is posted on the LCR MSCP website.

Work Task C14: Humpback Chub Program Support

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$60,000	$0	$288,955.36	$1,000	$1,000	$1,000	$1,000

Contact: Jim Stolberg, (702) 293-8206, jstolberg@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 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 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 Center from FY09 to FY12. Since FY12, the Center has successfully maintained this refuge population of approximately 1,000 humpback chubs. Funding was also provided in FY19 for the development and validation of environmental DNA (eDNA) markers for the humpback chub.

FY21 Accomplishments: Tissue samples from 13 humpback chubs were provided to the U.S. Forest Service's Rocky Mountain Research Station Genomics Center for development of the humpback chub eDNA assay. The

assay has passed all design and validation steps and will be ready for use following testing against known positive eDNA samples. Funding for this work was provided in FY19, resulting in no obligations in FY21.

FY22 Activities: Funding support is available for humpback chub conservation in coordination with the USFWS and Glen Canyon Dam AMP. Remaining funds will be spent according to research needs as agreed to among all cooperating agencies. At this time, no activities have been identified for the fiscal year. Funding will be maintained at a minimal level until conservation activities are implemented.

Proposed FY23 Activities: Funding support is available for humpback chub conservation in coordination with the USFWS and Glen Canyon Dam AMP. Remaining funds will be spent according to research needs as agreed to among all cooperating agencies.

Pertinent Reports: N/A

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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$60,000	$10,167.92	$739,172.04	$0	$0	$0	$0

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

Start Date: FY13

Expected Duration: FY22

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: BBCA, HMM, 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 HCP

Connections with Other Work Tasks (Past and Future): Monitoring for selenium will be conducted for habitat created through Section E work tasks (E1, E9, E14, E16, E25, E27, and E28) and will be incorporated into Section F work tasks (F1, F3, F5, and F7).

Project Description: As described in the HCP, the LCR MSCP is developing 512 acres of marsh and 360 acres of backwaters as part of its habitat creation goals. These created habitats will be monitored over the 50-year term of the program to ensure they maintain their function for all associated covered species. Monitoring efforts completed under this work task 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 monitoring design may be needed to provide a larger dataset on which management decisions can be made through the adaptive management process. Monitoring in subsequent years may be reduced, as appropriate, and the frequency and volume of sampling are expected to vary from site to site. As new conservation areas are developed, selenium monitoring will be completed under the appropriate Section F work task.

Previous Activities: Sampling sites were identified in FY14 and included the BBCA, HMM, the IPCA, and McAllister Lake. Selenium monitoring was conducted in FY15–19 with the collection of water, sediment, 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.

FY21 Accomplishments: Due to COVID-19 restrictions, samples collected in FY20 could not be analyzed. A project report summarizing results from the FY17–19 sampling years was drafted and will be completed following final sample analyses. To date, average selenium concentrations in water, sediment, invertebrate, and whole-body fish samples from HMM, the IPCA, and McAllister Lake have remained below their respective USFWS thresholds for protecting fish and wildlife. Hazard ratings of these components have ranged from moderate to no hazard. Similar results were reported for water samples collected from the BBCA; however, average selenium concentrations in invertebrate and whole-body fish samples exceeded the USFWS threshold for protecting fish and wildlife during multiple sampling events. Hazard ratings for these components consistently ranged from moderate to high.

FY22 Activities: This work task was reopened in FY22 to accommodate for final sample analyses and project reporting. Funding for this work was provided in a prior fiscal year, resulting in no obligations in FY22. A final project report will be completed and will provide long-term monitoring recommendations for managing current and future conservation areas. This work task will close in FY22.

Proposed FY23 Activities: This work task will close in FY22. Future selenium monitoring will be completed under Section F work tasks as needed.

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

Work Task C60: Habitat Manipulation

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$175,000	$165,932.83	$1,017,860.81	$225,000	$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. Information from this work task will be used under Section E work tasks.

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 to reset portions of these areas to earlier seral stages, and (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 did 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 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 HMM, testing one of the marsh habitat manipulation techniques (mechanical disturbance) identified in the literature review. Mechanical disturbance (mowing and roller-chopper) was performed, and remotely sensed data were collected from unmanned aerial systems, aircraft, and satellites. The data from the sensors was used to create three-dimensional models and other raster products to describe structure, species composition, and vegetation characteristics. The data were analyzed, and the results of this analysis showed that areas with known presence of rails had higher values of NDVI values than areas with no birds detected.

FY21 Accomplishments: Work continued for the cottonwood-willow component of this work task, including collection of additional vegetation structure data (lidar) and soil moisture data. The methods previously developed to process and analyze ALS data to describe vegetation structure were used to process the recently collected lidar data. The data (vegetation and soil moisture) was analyzed to refine suitability ranges for vegetation and soil moisture metrics, and preliminary analyses were conducted to determine the vegetation and soil moisture suitability of created habitat at conservation areas.

Beaver activity (foraging, tree felling) identified at the BLCA continued to be monitored. In cooperation with the USFWS, no interventions were performed to limit their activity, and the herbivory was allowed to continue while its effects on vegetation and wildlife were monitored. The objective is to observe if beaver herbivory is effective in resetting the seral stage and achieving the goals of habitat manipulation.

Remotely sensed data (lidar and multispectral satellite) continued to be collected, processed, and analyzed for habitat manipulation purposes at HMM. Based on previous results from these data, portions of HMM were identified as having low NDVI values and would benefit from being reset using habitat manipulation techniques. In cooperation with the USFWS, habitat manipulation was performed at HMM at one of these identified areas; a prescribed burn was performed in the northern cell of the marsh. Pre- and post-burn vegetation data were collected.

Baseline data (soil moisture, soil salinity, groundwater level, groundwater salinity, and wildlife presence) continued to be collected for an irrigation reduction study in Phase 8 of the PVER. Baseline vegetation data were not collected in FY20, so it was collected prior to irrigation reduction that began in June of FY21. Vegetation data were also collected toward the end of the irrigation season to monitor any effects that might be measurable after one season of reduced irrigation volumes. The objective of the study is to evaluate the effects reduced irrigation will have on volunteer cottonwoods that have established in a stand of planted honey mesquite trees. This study will help to evaluate what the effect of reduced irrigation on cottonwood health and productivity is in areas where moist soils are not necessarily required to meet species' habitat needs.

FY22 Activities: LCR MSCP conservation areas continue to be evaluated against the suitability ranges for vegetation structure and soil moisture. Based on the results of these evaluations, recommendations will be made on whether some level of habitat manipulation is warranted or not.

Beaver activity and its related effects on vegetation and wildlife will continue to be monitored at the BLCA.

Using the information from the marsh habitat manipulation report and the response after the FY21 prescribed burn, additional 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, soil, groundwater, and wildlife monitoring will continue in Phase 8 of the PVER as part of the irrigation management study. Irrigation volumes will be decreased again according to the study design.

Planning will be conducted for a pilot study to determine the feasibility of using small dredging equipment to control emergent vegetation encroachment and to remove accumulated sediment to maintain deep channels in created marsh habitat.

Proposed FY23 Activities: Lidar and soil moisture data will continue to be acquired in FY23 under Work Task F1. The data will be processed and analyzed using techniques developed under this work task. The monitoring under this research work task will help inform the LCR MSCP about the frequency and intensity of active habitat manipulation that is necessary and which would be carried out under Section E work tasks. If habitat manipulation is deemed necessary, the HCP, the literature review conducted under this work task, and other available information 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, with the goal of evaluating techniques for inclusion in the long-term riparian forest habitat manipulation toolbox.

Vegetation response monitoring will continue at HMM. This monitoring will continue not only to inform the LCR MSCP on whether mechanical disturbance and prescribed fire should continue to be included in the long-term marsh habitat manipulation toolbox, but it 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 continue to be decreased, and soil, groundwater, vegetation, and wildlife monitoring will continue.

A small pilot study will be conducted to determine the feasibility of using small dredging equipment to control cattail (and other emergent vegetation) encroachment and to remove accumulated sediment to maintain deep channels (i.e., areas of open water) in created marsh habitat.

Pertinent Reports: The reports 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* are posted on the LCR MSCP website.

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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$10,000	$3,421.37	$706,413.65	$7,500	$0	$0	$0

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

Start Date: FY14

Expected Duration: FY22

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

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

Location: The LCR within the LCR MSCP planning area, including reservoirs and connected channels from Lake Mead downstream to Imperial Dam

Purpose: To evaluate the effects of alternative stocking methods 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 HCP, 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 FY20, 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 the 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 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.

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 FY20, < 2% 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.

Soft release treatments for razorback suckers were conducted in three backwaters within Topock Gorge in FY16–18. These treatments consisted of fish 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 fish were released with each group, and remote PIT tag scanning was conducted to observe immediate dispersal. The relative survival rate will be evaluated after several years of contact data have been collected.

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.

FY21 Accomplishments: Data collected through ongoing monitoring efforts were analyzed to evaluate apparent survival of previous year day/night paired releases of razorback suckers into Lake Mohave. Through FY21, < 3% of FY13, FY14, and FY15 releases had been captured or contacted. Survival rates observed for day and night releases have been similar within years, and current data do not suggest that night releases would lead to improved post-stocking survival.

Capture and contact data were also analyzed for razorback suckers released into Lake Mohave in FY16 that will be used to evaluate the relationship between cohort stocking quantity and survival. Through FY21, < 2% of stocked fish had been captured or contacted, and little difference was observed between contact rates and cohort quantities.

Approximately 7.5% of the razorback suckers stocked as part of the soft release treatments in Topock Gorge had been captured or contacted through FY21. Contact rates have been similar for paired cohorts (i.e., cohorts stocked at the same location during the same year); however, fish that were able to disperse without restriction have had slightly higher contact rates across all years. Future analyses of capture and contact data collected through Work Task D8 may provide additional information regarding survivorship among these treatments as fish mature and integrate with adult aggregations.

Predator avoidance trials were not conducted at the ARCC in FY21. Razorback sucker and bonytail larvae were acquired and grown out in preparation of resuming trials in FY22.

FY22 Activities: The final series of predator avoidance trials will be conducted at the ARCC. Trials will evaluate the efficacy of predator conditioning in the presence of physical cover and turbidity as they relate to survival of native fishes. A final project report will be completed. Funding for this work was obligated in a prior fiscal year. Funding approved for FY22 will cover administrative costs for managing prior year obligations. This work task will close in FY22.

Proposed FY23 Activities: This work task closed in FY22.

Pertinent Reports: Summary reports for predator avoidance experiments are 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

FY21 Estimate	FY21 Actual Obligations	Cumulative Accomplishment Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$450,000	$474,730.77	$3,247,518.91	$450,000	$0	$0	$0

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

Start Date: FY15

Expected Duration: FY22

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 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). Data collected under this work task will be added to the Lower Colorado River Native Fish Database. Information obtained from Work Task C8 (closed) and C61 may be used to inform additional projects under this work task. 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: Tracking and monitoring of stocked razorback suckers and bonytail in specific areas in Reaches 3 and 4 were completed under closed Work Tasks C39, C45, and C49. Collected data documented post-stocking movement and habitat use of native fishes and were used to develop post-stocking survival estimates for razorback suckers and/or bonytail in these reaches.

Reach 2: Sonic telemetry was used to evaluate movements and habitat use of adult razorback suckers in Lake Mohave from FY15 to FY20. 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 was used to evaluate post-stocking survival of bonytail in Lake Mohave from FY16 to FY19. Active tracking was conducted intensively for 3–6 weeks after releases each year 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 LCR from Park Moabi downstream to the Lake Havasu Delta. During 5 years of trammel netting and 3 years of remote 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 declined 30% in Laughlin Lagoon, compared to a 60% decline 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 indicated that the fish use the entire marsh, but during the summer months, they congregate around the firebreak canal (the main inflow into the marsh). Additional PIT scanning was conducted in FY18 and FY19, resulting in the contact of 236 and 189 unique razorback suckers, respectively. Fewer than 20 bonytail were contacted by PIT scanning from FY17 to FY19. Survival and distribution of native fishes in Topock Marsh was not evaluated in FY20 due to COVID-19 travel restrictions.

Reaches 4 and 5: In FY16, routine PIT tag scanning surveys were initiated below Palo Verde Dam, and this has continued through FY21. 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.

In FY19, an aggregation of razorback suckers was discovered in the main channel along a gravel bar just above McIntyre Park (presumably spawning). This aggregation allowed for greater access to resident adult fish, and contacts increased from the previous year to 1,861 razorback suckers. Bonytail contacts remained limited, with only 347 bonytail contacts during the year. Razorback sucker contacts increased again in FY20, with a total of 3,194 individuals being contacted in the study area. 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); therefore, no population estimate was possible. The Reach 4 razorback sucker population was estimated at 359 individuals (95% CI from 342 to 375) in FY20.

FY21 Accomplishments: Accomplishments for this work task have been summarized by river reach.

Reaches 4 and 5: In Reach 4, remote PIT scanning surveys were conducted throughout the FY but occurred with greater frequency in winter and spring. In total, remote PIT scanning resulted in the contact of 5,090 unique razorback suckers and 299 unique bonytail. Many of these contacts were made shortly after stocking. Focused electrofishing efforts were conducted around the spawning aggregation site above McIntyre Park and resulted in the capture of 33 individual razorback suckers. Data from FY20 and FY21 were used to generate a razorback sucker population estimate of 935 individuals (95% CI from 905 to 964), more than double the estimate of 359 (95% CI 342 to 375) made the previous year. Due to the limited number of bonytail recontacts, no population estimate could be generated.

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 captured from the spawning aggregation and implanted with longer-term (36-month) tags to examine dispersal of resident fish over a longer period.

FY22 Activities: Activities for this work task have been summarized by river reach.

Reach 3: A total of 1,062 razorback suckers and 2,014 bonytail were stocked into or near Topock Marsh in December 2021. Remote PIT scanning surveys will be conducted in Topock Marsh to evaluate habitat use by native fishes.

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. Surveys will occur near the McIntyre Park spawning aggregation and the A10 backwater complex, and an additional subreach from Palo Verde Dam to Interstate 10 will be surveyed to look for other spawning aggregations.

This work task will close in FY22. A portion of the surveys initiated under this work task will transition to system monitoring and will be conducted under Work Task D8 in future years.

Proposed FY23 Activities: This work task will close in FY22.

Pertinent Reports: The *Population Status and Distribution of Razorback Suckers and Bonytail Downstream from Palo Verde Diversion Dam, 2016–2021 Project Report* and the *Population Status and Distribution of Razorback Suckers and Bonytail Downstream from Palo Verde Diversion Dam, 2022 Annual Report* will be posted on the LCR MSCP website.

WORK TASKS – SECTION D

System Monitoring

Work Task D1: Marsh Bird Surveys

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$40,000	$43,779.61	$520,087.30	$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 NWR, 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 LCR 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 this work task was used for Work Task C66 and may be used with data from Work Task F7 in monitoring marsh birds.

Project Description: Marsh bird surveys will be conducted in coordination with the 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 LCR between the I-40 Bridge, near Needles, California, and Lake Havasu, including Topock Gorge in the Havasu NWR.

Previous Activities: 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. 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).

FY21 Accomplishments: Marsh bird surveys were conducted between the I-40 Bridge, near Needles, California, and Lake Havasu during March, April, and May 2021 in coordination with the USFWS as part of a multi-agency, system-wide monitoring effort. There were 15 Yuma clapper rails detected in March, 26 in April, and 51 in May. One western least bittern was detected in March, 5 in April, and 22 in May. California black rails were not detected in any of the 2021 surveys. Data were compiled and entered into the Avian Knowledge Network (AKN) database.

FY22 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. Data will be submitted to the USFWS and entered into the AKN database.

Proposed FY23 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. Data will be submitted to the USFWS and entered into the AKN database.

Pertinent Reports: The *Marsh Bird Surveys in Topock Gorge 2021 Annual Report* is posted on the LCR MSCP website.

Work Task D2: Southwestern Willow Flycatcher Presence/Absence Surveys

FY21 Estimates	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$420,000	$430,713.56	$11,154,122.92	$340,000	$340,000	$360,000	$360,000

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

Start Date: FY05

Expected Duration: FY26

Long-Term Goal: System monitoring of southwestern willow flycatchers

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

Location: Reaches 1–7 along the LCR, southern Nevada, the Bill Williams River, and the lower Gila River in 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): Work Task D3 (closed) provided information on southwestern willow flycatcher population numbers and demographics along the LCR. Post-development monitoring of southwestern willow flycatchers was moved from Work Task D2 to Work Task F9 beginning in FY18.

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 to 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.

FY21 Accomplishments: System-wide presence surveys were conducted at Alamo Lake, the Bill Williams River (areas outside of areas creditable to the LCR MSCP), Topock Marsh, and at riparian habitat below Parker Dam. Surveys were only conducted during the first three of five survey periods at five sites on the Bill Williams River because a wildfire destroyed much of the habitat on the western portion of the river on June 24.

A total of 60 southwestern willow flycatchers (table 1) were detected at 10 of the 46 survey sites, and 39 territories were documented.

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

Study Area	Number of Residents
Alamo Lake	53
Bill Williams River National Wildlife Refuge	2
Topock Marsh	5
Total	**60**

Nest success was calculated for three southwestern willow flycatcher nests at the Bill Williams River and Topock Marsh that contained flycatcher eggs. Two of the three nests fledged flycatcher young.

FY22 Activities: Presence surveys for southwestern willow flycatchers will be conducted at Alamo Lake, the portions of the Bill Williams River not creditable to the LCR MSCP, and Topock Marsh. Nest monitoring will be conducted at Topock Marsh.

Proposed FY23 Activities: Presence and occupancy surveys for southwestern willow flycatchers will be conducted at Alamo Lake, the portions of the Bill Williams River not creditable to the LCR MSCP, and Topock Marsh.

Pertinent Reports: The *Southwestern Willow Flycatcher Presence/Absence Surveys, 2020 Annual Report* is posted on the LCR MSCP website. The 2021 annual report will be posted upon completion.

Work Task D5: Monitoring Avian Productivity and Survivorship

FY21 Estimates	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$250,000	$202,872.97	$4,248,050.68	$250,000	$0	$0	$0

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

Start Date: FY05

Expected Duration: FY22

Long-Term Goal: System monitoring of avian species by conducting intensive monitoring of conservation areas and sites that typify current conditions along the LCR

Conservation Measures: MRM1 and MRM2 (BEVI, ELOW, GIFL, GIWO, SUTA, VEFL, WIFL, YBCU, and YWAR)

Location: Reach 3, BLCA on the Havasu NWR, Arizona; and Reach 4, Cibola NWR Unit #1 Conservation Area, Arizona

Purpose: To collect intensive, site-specific data on avian species' demographics, physical condition, species composition and diversity, and site persistence at existing and created habitat sites

Connections with Other Work Tasks (Past and Future): Data from this work task are used in conjunction with data collected from the system-wide bird monitoring program (D6) to monitor overall bird use of the LCR. Data collected at 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 Program 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.

Reclamation established a MAPS banding station at the Cibola NWR Unit #1 Nature Trail in 2002 prior to LCR MSCP implementation. In 2005, an additional station was established on the Havasu NWR (at the New South Dike) 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.

FY21 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. Nine sessions were completed in FY21. The tenth session was not conducted due to COVID-19 travel restrictions.

During the breeding season, there were 228 captures at the BLCA and 81 captures at Cibola NWR Unit #1. Three LCR MSCP species were captured and banded during the MAPS season. At the BLCA, there were 1 Bell's vireo, 2 yellow warblers, and 3 summer tanagers captured and color banded. Two summer tanagers and 2 yellow warblers were captured and color banded at Cibola NWR Unit #1. One color-banded summer tanager was recaptured at the BLCA; its initial capture was in 2011. One color-banded summer tanager, which was initially banded in 2019, was recaptured at Cibola NWR Unit #1.

In addition, the methods and information gathered through MAPS Program protocol from 2000 through 2021 was evaluated against future monitoring needs. The work task documented species migrating and breeding along the LCR, that some birds return to breed at the BLCA, Cibola NWR Unit #1, and the CVCA, and that birds nesting in the created land cover had good body condition scores, indicating they were getting adequate food. However, few birds were recaptured or resighted, so the MAPS protocol could not efficiently address the LCR MSCP monitoring questions about changes in covered species presence as created land cover matures. Bird territory data collected under Work Task F2 provide better

value, as they can be analyzed more effectively with habitat data (F1), and the protocol can be used to sample more locations with the available funding. It was decided that FY20 would be the last year the LCR MSCP will participate in the MAPS Program.

FY22 Activities: A final report will be prepared summarizing MAPS banding and recapture results from 2000 through 2021. This work task will close in FY22.

Proposed FY23 Activities: This work task closed in FY22.

Pertinent Reports: The report titled *Monitoring Avian Productivity and Survivorship and Targeted Bird Banding at LCR MSCP Conservation Areas in 2021* and the final report will be posted on the LCR MSCP website upon completion.

Work Task D6: System Monitoring of Riparian Obligate Avian Species

FY21 Estimates	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$530,000	$474,485.94	$3,939,316.88	$450,000	$75,000	$60,000	$60,000

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, the Bill Williams River, and nearby riparian habitat

Purpose: To monitor riparian obligate avian species covered under the LCR MSCP to document populations, 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 or near the LCR and the Bill Williams River will be monitored for the Arizona Bell's vireo, elf owl, Gila woodpecker, gilded flicker, Sonoran yellow warbler, summer tanager, and vermilion flycatcher. It is inefficient to monitor all covered species individually throughout the entire LCR MSCP planning area. The Arizona Bell's vireo, Gila woodpecker, Sonoran yellow warbler, summer tanager, and vermilion flycatcher will be monitored together using standard multi-species survey protocols. The elf owl and gilded flicker will be monitored using a species-specific call-playback method and other effective methods. The presence and breeding of the covered

species will be documented and analyzed to estimate species' distribution and populations in riparian habitat along or near the LCR and the Bill Williams River.

Previous Activities: Surveys for the Arizona Bell's vireo, Gila woodpecker, gilded flicker, Sonoran yellow warbler, summer tanager, and vermilion flycatcher were conducted in the riparian habitat of the LCR and Bill Williams River using random point-count transects from FY05 to FY06 and a double sampling rapid/intensive area search protocol from FY07 to FY15 and FY19 to FY20. The Arizona Bell's vireo and Sonoran yellow warbler were estimated to be the LCR MSCP covered bird species with the largest population sizes within the study area from FY07 to FY15. The Gila woodpeckers and summer tanager were present within the study area in lesser numbers, and the gilded flicker and the vermilion flycatcher were rarely detected.

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.

In FY18, FY19, and FY20, specific surveys and reconnaissance surveys for the gilded flicker were conducted within 10 kilometers of LCR MSCP conservation areas along the LCR and Bill Williams River using methods developed under Work Task C52 (closed). Areas surveyed included areas of the Bill Williams River, Parker Dam Camp and adjacent areas, sites east of Cibola NWR Unit #1, the CVCA, the PVER, and along Laguna Dam Road between the Yuma Proving Grounds and the Mittry Lake Wildlife Area. Only a pair were observed near Kohen Ranch in the Bill Williams River NWR. Information shared by other agencies confirmed gilded flickers were also present between Lincoln Ranch and Alamo Dam along the Bill Williams River, the PVER, YEW, and Mittry Lake. They appear to be using the PVER and YEW for foraging during summer, and may utilize other conservation areas as well, but they are either infrequent users or are behaving too cryptically to be detected.

Monitoring methods were regularly reviewed and improved since FY06 to increase detection of covered species. Refinement of the multi-species survey mobile electronic field form and ArcGIS Online summary continued to streamline data collection and included additional quality assurance/quality control filters and queries. An evaluation of the multi-species survey protocol and monitoring plan for conservation area monitoring (F2) and system-wide monitoring (D6) was initiated in FY16 to clarify the monitoring questions the data will inform and to improve the accuracy of monitoring methods. The following tasks have been complete:

- Potential analysis and survey methods were analyzed for suitability and cost efficiency.

- A power analysis of the double sampling area search survey protocol and point-count survey method was conducted.

- Future management and monitoring objectives for managing land cover as suitable habitat for covered bird species were drafted for the adaptive management plan and included identifying metrics and modelling that may provide better information for assessing the success of created land cover and identifying if bird use changes in positive and/or negative ways as land cover matures and changes.

- The vegetation type map, funded under Work Task G4, was reviewed and the data incorporated into the analysis.

FY21 Accomplishments: Area search surveys for the Arizona Bell's vireos, Gila woodpeckers, gilded flickers, Sonoran yellow warblers, summer tanagers, and vermilion flycatchers were conducted in 80 plots in system-wide habitat along the LCR and Bill Williams River. LCR MSCP covered bird species and other territorial breeding birds were documented in each region:

- **Hoover Dam to Bill Williams River (excluding the Havasu NWR):** Three area search plots were surveyed in this region. There were 71 pairs of territorial birds confirmed breeding comprising 13 species. Two pairs of Arizona Bell's vireos and one vermilion flycatcher pair were confirmed breeding.

- **Havasu NWR:** Eight area search plots were surveyed in this region. There were 139 pairs of territorial birds confirmed breeding comprising 19 species. Three pairs of the Sonoran yellow warblers, two pairs of Gila woodpeckers, one Arizona Bell's vireo pair, and one summer tanager pair were confirmed breeding.

- **Bill Williams River:** Twenty-seven area search plots were surveyed in this region. There were 1,156 pairs of territorial birds confirmed breeding comprising 24 species. Eighty-seven pairs of the Sonoran yellow warblers, 44 pairs of Arizona Bell's vireos, 39 pairs of Gila woodpeckers, 21 pairs of summer tanagers, 6 pairs of gilded flickers, and 1 vermilion flycatcher pair were confirmed breeding.

- **Parker Dam to the Cibola NWR (excluding Colorado River Indian Tribes Land):** Ten area search plots were surveyed in this region. There were 113 pairs of territorial birds confirmed breeding comprising 15 species. Two pairs of Gila woodpeckers were confirmed breeding.

- **Cibola NWR:** Sixteen area search plots were surveyed in this region. There were 137 pairs of territorial birds confirmed breeding comprising 13 species. Two pairs of Gila woodpeckers were confirmed breeding.

- **Imperial National Wildlife Refuge (Imperial NWR) and adjacent areas:** Seven area search plots were surveyed in this region. There were 291 pairs of territorial birds confirmed breeding comprising 18 species. Eleven pairs of Gila were confirmed breeding.

- **Colorado River from the Imperial NWR to Yuma, Arizona:** Eight area search plots were surveyed in this region. There were 192 pairs of territorial birds confirmed breeding comprising 14 species. Six pairs of Gila woodpeckers were confirmed breeding.

- **Yuma, Arizona, to Southerly International Boundary with Mexico:** One area search plot was surveyed in this region. There were 42 pairs of territorial birds confirmed breeding comprising 10 species. Four pairs of Gila woodpeckers were confirmed breeding.

A power analysis of the double sampling area search survey methods and point-count survey method was finalized. Future management goals were defined, and these will be used in the adaptive management plans in G4. Other potential analysis and survey methods continued to be analyzed for suitability and cost efficiency.

A report documenting gilded flicker populations and high-potential habitat within 10 kilometers of LCR MSCP conservation areas was finalized. Biologists from other agencies detected gilded flickers near Rankin and Lincoln Ranch along the Bill Williams River east of the Bill Williams River NWR.

FY22 Activities: The evaluation of the multi-species survey protocol will be finalized, and a 10-year monitoring plan will be prepared.

Proposed FY23 Activities: The monitoring plan for the elf owl and the gilded flicker will be finalized.

Pertinent Reports: The *Riparian Bird Surveys in the Lower Colorado Region, 2021 Annual Report* and the *Gilded Flicker Surveys on the Lower Colorado River and Tributaries, 2020 Annual Report* are posted on the LCR MSCP website.

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

FY21 Estimates	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$50,000	$61,146.32	$7,143,230.78	$0	$0	$0	$0

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

Start Date: FY06

Expected Duration: FY21

Long-Term Goal: System-wide monitoring of yellow-billed cuckoos

Conservation Measures: MRM1 and MRM2 (YBCU)

Location: LCR MSCP planning area containing suitable habitat

Purpose: To conduct system-wide monitoring of yellow-billed cuckoo populations along the LCR 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 USFWS 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 were conducted from FY06 to FY20. 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 NWR, with a few scattered pairs elsewhere along the LCR. By FY16, yellow-billed cuckoos regularly colonized LCR MSCP conservation areas with cottonwood-willow land cover, and those breeding populations made up the majority of yellow-billed cuckoos detected on the LCR.

Birds continued to return to and breed in conservation areas for multiple years. Of the 74 nests monitored in FY14 and FY15, at least one young successfully fledged from 44 (61%) nests. By FY16, the objectives requiring intensive nest monitoring and tracking of individuals birds throughout the LCR were met, and the level of effort and scope of the project were reduced. Monitoring of yellow-billed cuckoos was split into separate work tasks beginning in FY18, with post-development monitoring conservation areas conducted under Work Task F10.

Monitoring of yellow-billed cuckoos affixed with geolocator devices in FY14 and FY15 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 PVER.

FY21 Accomplishments: Surveys were conducted on the Bill Williams River NWR, and there were nine cuckoo detections, with 3 possible breeding territories. No nests were incidentally detected. Surveys were discontinued at the Sandy Wash site mid-June after the riparian habitat was lost in the Planet Ranch fire. Followup surveys were conducted to search for cuckoos banded and tagged with geolocator devices at occupied areas throughout the LCR. None of the seven cuckoos with geolocator devices were resighted.

This work task closed in FY21, as the population of yellow-billed cuckoos on the LCR is predominately found on LCR MSCP conservation areas and is large enough to provide the monitoring data needed.

Proposed FY22 Activities: This work task closed in FY21.

Proposed FY23 Activities: This work task closed in FY21.

Pertinent Reports: The *Yellow-billed Cuckoo Surveys on the Lower Colorado River, 2020 Annual Report* is posted on the LCR MSCP website. The 2021 annual report will be posted upon completion.

Work Task D8: Razorback Sucker and Bonytail Stock Assessment

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$1,125,000	$1,204,857.53	$12,054,499.76	$1,125,000	$1,350,000	$1,350,000	$1,350,000

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 LCR 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 PIT scanning, trammel netting, and electrofishing, but visual surveys and surveys using specialized equipment and techniques (e.g., scuba divers, underwater photography, video recordings)

are also conducted periodically. Funding approved 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 AZGFD and NDOW. 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.

FY21 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 area). A total of 516 larvae were captured, with 317 larvae from Las Vegas Bay, 182 larvae from Echo Bay, and 17 larvae from the Muddy River/Virgin River inflow area. The majority of the larvae were returned to the lake following each sampling period.

The Lake Mead adult razorback sucker population was monitored throughout the year. Sixteen 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 104 razorback suckers: 2 from Las Vegas Bay, 27 from Echo Bay, 36 from the Muddy River/Virgin River inflow area, 5 from Bonelli Bay, and 34 from the Colorado River inflow area. Of the 104 razorback suckers captured, 53 were recaptured fish. The remaining razorback suckers captured were untagged and presumed to be wild spawned. No juvenile fish were captured in 2021. Based on capture data, the razorback sucker population in Lake Mead was estimated at 450 individuals (95% confidence interval [CI] from 358 to 586). Aging information was also obtained from 49 razorback suckers during the study year, bringing the total number of razorback suckers aged lake-wide to 643. The ages of razorback suckers captured from all monitoring areas in 2021 ranged from 4 to 15 years old.

Reach 2: A total of 10,732 razorback suckers and 400 bonytail were repatriated into Lake Mohave.

Annual razorback sucker roundups were conducted in December and March. During these efforts, 276 razorback suckers were captured using trammel nets. Forty-five additional razorback suckers were captured during October gill net surveys. Electrofishing surveys were conducted in the river section of Lake Mohave above the Willow Beach NFH in June and July. Thirty razorback suckers were captured.

Remote PIT scanning recorded 111,185 contacts throughout Lake Mohave. In the river section of the lake from River Mile 44 to above the Willow Beach NFH, scanner deployments resulted in 54,572 total contacts representing 3,001 unique PIT tags. In the basin section of Lake Mohave, scan time resulted in 56,392 contacts representing 1,870 unique PIT tags. Supplemental scanning was also conducted in the Liberty Cove to Chalk Cliffs section of the lake, resulting in 121 total contacts representing 10 unique PIT tags. Part of this total includes one repatriate bonytail, released in May 2018, that was contacted on February 18, 2021. Duplicate PIT tags contacted in multiple lake sections were removed from analyses, resulting in 4,604 unique razorback suckers being contacted. One additional repatriate bonytail released in April 2021 was contacted in the river section of the lake on May 2, 2021.

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 Lake Mohave was 3,120 individuals (95% CI from 2,016 to 5,067). Based on 2020–2021 remote PIT scanning, the lake-wide Lake Mohave repatriate population was estimated at 5,100 individuals (95% CI from 4,944 to 5,255). Subpopulation estimates using zone-specific scanning were also calculated and estimated the basin (River Miles 13–29) population at 2,342 individuals (95% CI from 2,256 to 2,427) and the river (River Mile 43–63) population at 2,693 individuals (95% CI from 2,575 to 2,810).

Reach 3: A total of 13,285 razorback suckers and 3,026 bonytail were released into Reach 3; all fishes were released with a PIT tag.

Capture/contact data 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.

Remote PIT scanning resulted in the contact of 9,106 unique razorback suckers, 29 bonytail, and 19 flannelmouth suckers. Only six of the bonytail contacts were from fish at large for more than 6 months, and only one was at large for more than 1 year. Electrofishing and trammel netting surveys resulted in the capture of 281 unique razorback suckers, 4 bonytail, and 44 flannelmouth suckers.

Due to the limited number of bonytail recontacts, no population estimate could be generated. Reach 3 had a razorback sucker population estimate of 5,422 individuals (95% CI from 5,207 to 5,637).

Reaches 4 and 5: A total of 18,682 razorback suckers and 8,059 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.

Remote PIT scanning resulted in the contact of 5,090 unique razorback suckers and 299 unique bonytail. Focused electrofishing efforts were conducted around the spawning aggregation site above McIntire Park and resulted in the capture of 33 individual razorback suckers. Data from FY20 and FY21 were used to generate a razorback sucker population estimate of 935 individuals (95% CI from 905 to 964), more than double the estimate of 359 (95% CI 342 to 375) made the previous year. Due to the limited number of bonytail recontacts, no population estimate could be generated.

FY22 Activities: Monitoring data will be collected in 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.

The development of an adaptive management plan for system monitoring of native fishes will also be initiated in FY22. The plan will formally document monitoring questions, identify data to be collected and how those data will be used to answer monitoring questions, develop adaptive management thresholds for monitoring efforts, and identify potential adaptive management actions.

Proposed FY23 Activities: Monitoring efforts will continue in all river reaches as previously outlined. Population and distribution data will be collected and summarized to provide up-to-date, system-wide stock assessments for razorback suckers and bonytail. A portion of the work previously completed under Work Task C64 will be completed under this work task beginning in FY23. The proposed budget has been increased to cover the costs of this additional monitoring.

Pertinent Reports: The *Razorback Sucker Studies on Lake Mead, Nevada and Arizona 2020–2021 Final Annual Report*, the *Demographics and Monitoring of Repatriated Razorback Sucker in Lake Mohave 2021 Annual Report*, the *Native Fish Monitoring in Reach 3, 2020 Annual Report,* and the *Native Fish Monitoring in Reach 3, 2021* annual report will be posted on the LCR MSCP website upon completion.

Work Task D9: System Monitoring of Covered Bat Species

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$100,000	$89,994.14	$2,682,133.68	$100,000	$100,000	$100,000	$15,000

Contact: Jenny Smith, (702) 293-8518, jenealsmith@usbr.gov

Start Date: FY04

Expected Duration: FY25

Long-Term Goal: System-wide monitoring and species research will be conducted for LCR MSCP bat species to monitor distribution and evaluate habitat implementation success (FY04–17), and system-wide monitoring and species research will be conducted for LCR MSCP bat species to monitor their distribution (FY18–55).

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

Location: System-wide along the LCR below Hoover Dam

Purpose: To conduct system-wide monitoring of covered bat species and 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) 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 FY20. 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 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.

FY21 Accomplishments: Eight acoustic monitoring stations were operated from June to August to detect bat presence. The stations were located at Havasu NWR-Pintail Slough, the Bill Williams River NWR, the 'Ahakhav Tribal Preserve, the Cibola NWR-Island Unit, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, YEW, and Hunters Hole. Western red bats were detected at all eight stations. Western yellow bats were detected at the Bill Williams River NWR, the Cibola NWR-Island Unit, the Mittry Lake Wildlife Area, and Hunters Hole. California leaf-nosed bats were detected at Havasu NWR-Pintail Slough, the 'Ahakhav Tribal Preserve, the Picacho State Recreation Area, the Mittry Lake Wildlife Area, and YEW. A pale Townsend's big-eared bat was only detected at the Bill Williams River NWR (table 1).

FY22 Activities: Eight 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.

Table 1.—Station location, number of nights the acoustic station operated during June through August 2021, and the number of nights each bat species was detected

Station	Number of Nights Recorded	Number of Nights Bat Species Were Detected			
		Western Red Bat	Western Yellow Bat	California Leaf-nosed Bat	Pale Townsend's Big-eared Bat
Havasu National Wildlife Refuge-Pintail Slough	92	2	0	17	0
Bill Williams River National Wildlife Refuge	92	13	2	0	1
'Ahakhav Tribal Preserve	92	6	0	13	0
Cibola National Wildlife Refuge-Island Unit	92	3	18	0	0
Picacho State Recreation Area	92	5	0	1	0
Mittry Lake Wildlife Area	92	14	4	7	0
Yuma East Wetlands	73	1	0	12	0
Hunters Hole	92	3	31	0	0

Proposed FY23 Activities: Eight acoustic monitoring stations will continue to operate, and data will be analyzed for covered and evaluation species presence during the summer peak activity periods.

Pertinent Reports: The *System-Wide Acoustic Monitoring of LCR MSCP Bat Species, 2020 Annual Report* and the *System-Wide Acoustic Monitoring of LCR MSCP Bat Species, 2021 Annual Report* will be posted upon completion.

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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$20,000	$13,155.83	$39,877.08	$0	$0	$0	$0

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

Start Date: FY19

Expected Duration: FY21

Long-Term Goal: System-wide monitoring of 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 sootywings, vegetation, and plant quality in cottonwood-willow habitat along the LCR 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 LCR 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: Cottonwood-willow riparian areas with a quailbush component were surveyed at the CVCA and PVER. Analyses indicated that of the variables measured, quailbush size and leaf density were most predictive of adult and egg sootywing presence. Sootywings were detected in cottonwood-willow riparian areas with a quailbush component in the BLCA, the PVER, Cibola NWR Unit #1, and Hunters Hole. Irrigation canals along cottonwood-willow riparian restoration areas were found to support healthy quailbush populated by sootywings.

FY21 Accomplishments: The final report was published. This work task closed in FY21.

FY22 Activities: This work task closed in FY21.

Proposed FY22 Activities: This work task closed in FY21.

Pertinent Reports: The *Monitoring of the MacNeill's Sootywing Skipper and its Habitats, 2020 Annual Report* is posted on the LCR MSCP website.

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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$600,000	$509,651.81	$397,760.76	$500,000	$500,000	$500,000	$500,000

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 of native fish populations and implement a long-term genetic management program

Connections with Other Work Tasks (Past and Future): This work task is related to Fish Augmentation (Section B), genetic research previously completed 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: Historic samples were inventoried and prepared for transfer to the Museum of Southwestern Biology at the University of New Mexico for long-term storage. Bonytail deoxyribonucleic acid (DNA) was isolated and purified for SNP development, and samples were processed for reduced representation sequencing. The new tissue archiving process was completed and initiated in FY21. DNA extractions continued for new tissue samples collected through ongoing research and monitoring efforts.

FY21 Accomplishments: A study plan was submitted that summarized the objectives of the project and approaches that would allow these goals to be achieved. This document also included a timetable for completion of activities and deliverables.

The optimization of the RASU GTseq panel was completed and samples are now being characterized as described in the scope of work. DNA from samples received in FY21 have been extracted. Historic larvae sampled from the mainstem (Lake Mead, Lake Mohave, and Reach 3) through 2019 were genotyped. Genotyping of adult, juvenile, and larval samples from the Yuma Cove backwater has been completed through 2016 and population genetic and parentage analyses performed. Accuracy of parentage analyses using SNPs compared to microsatellites was evaluated for samples from 2013 through 2015, finding that SNPs perform better than microsatellites for parentage analyses.

Genetic variation in BONY was assessed at 18 microsatellite loci in 110 individuals representing 2020 recruits from Pond 2 and Pond 6 at the Imperial NWR. Gene diversity and allelic richness measured in 2020 recruits in Pond 2 and Pond 6 were virtually unchanged from the adults originally stocked. For BONY SNP development, genomic DNA was isolated and purified from 190 individuals selected for high levels of variation samples and membership in family groups (male/father and larvae) as identified using microsatellite data. These samples are being processed for reduced representation sequencing, and bioinformatic analysis to identify SNP-containing loci will begin once sequence data are received.

Conceptual schema and the MySQL table structure of the genetic database for adult fin-clip samples was finalized, and the online application was developed and shared with collaborators to allow for testing and revision. Specimen records for all fin-clip tissue samples collected through September 2021 have been uploaded to the database.

The development of the archival system was completed, and this includes a back-up system. The use of preprinted Whatman filter paper for tissue archiving was initiated for hatchery stocking cohorts and fin clips from razorback suckers collected during monitoring efforts. These Whatman sheets were barcoded and cataloged.

FY22 Activities: The newly developed markers will be used to characterize razorback sucker brood fish from the Center, along with random samples from hatchery stocking cohorts. For razorback sucker backwater populations, SNP variants will be used to determine parentage for progeny and to assess reproductive success of adults. Bonytail SNPs will be identified using a bioinformatic analysis of next generation sequencing. The new tissue collection/archiving process will be fully implemented.

Tissue samples will be collected from adult, juvenile, and larval native fishes of backwater and mainstem populations and from a subset of fishes stocked during the year. Samples collected from backwater and mainstem populations will be processed throughout the year, and samples from stocking cohorts will be archived for future analyses. Results of genetic analyses will be used to assess the genetic health of native fish communities and the effectiveness of the LCR MSCP Fish Augmentation Program.

Proposed FY23 Activities: Tissue samples will be collected from backwater and mainstem native fish populations and from a subset of stocking cohorts. Samples will be processed or archived as appropriate, and analyses will be used to assess the genetic structure of native fish communities and to inform future management.

Pertinent Reports: The *Razorback Sucker Genetic Diversity Assessment, 2020 Final Report* and the *Genetic Monitoring of Native Fishes, FY21 Annual Report* will be posted on the LCR MSCP website upon completion.

WORK TASKS – SECTION E

Conservation Area Development and Management

Work Task E1: Beal Lake Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$500,000	$855,285.15	$7,479,516.61	$450,000	$650,000	$650,000	$750,000

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, between River Miles 238 and 239 on the Havasu NWR, 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 was combined with Work Task E2 (closed). Vegetation and species monitoring are being addressed under Section F work tasks. Portions of restoration research at the BLCA have been funded under Work Task G3.

Project Description: The BLCA was established on lands made available by the USFWS on the Havasu NWR. In December 2010, a Land Use Agreement (LUA) was signed 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 LUA was amended 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 type on the additional acreage.

The conservation area is located on the Havasu NWR, in Arizona, about 7 miles southeast of Needles, California.

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: To date, 120 acres of the cottonwood-willow land cover type has been established at the BLCA.

In FY01, Beal Lake was dredged and stocked with native fishes. Management of the lake is a continuation of the commitment to construct habitat for native fishes required under the 1997 Biological and Conference Opinion on Lower Colorado River Operations and Maintenance Activities.

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 BLCA.

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 PIT scanning surveys for several months following the toxic algae event. By mid-summer, young-of-year largemouth bass were observed in the backwater. The backwater was hydrologically isolated from Topock Marsh following the fishkill; this closure resulted in a rapid increase in specific conductivity, which approached 11,000 microsiemens per centimeter in FY14. 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. No golden algae have been detected since May 2013.

FY21 Accomplishments:

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

Cottonwood-Willow – A total of 1,191 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 using the existing pump stand. 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:

Beal Lake – Dredging of Beal Lake's existing channels was completed and has increased the backwater depth to an average of 12 feet over 50 acres. A new channel was created to connect the two northern channels for the BLCA expansion pump stand. All material was placed within the designated dredge spoil area adjacent to Beal Lake. Approximately 173,500 cubic yards were dredged from Beal Lake in FY21, increasing the total to 392,000 cubic yards. Dredging was suspended in FY20, due to COVID-19 travel restrictions. The approved fiscal year estimate did not include dredging, which resulted in obligations being higher than the approved estimate.

Monitoring:

Cottonwood-Willow – Vegetation data were collected using lidar technology. Monitoring stations, established 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.

Surveys were conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and rodents. In addition, avian mist netting was conducted, and an acoustic bat station was used to detect the presence of LCR MSCP bat species. Arizona Bell's vireos, Sonoran yellow warblers, and summer tanagers were confirmed breeding during surveys and also captured and color banded during mist netting. A summer tanager banded in a prior year was recaptured. No resident or breeding southwestern willow flycatchers were

detected. Yellow-billed cuckoos were detected and possibly breeding at the site and a Colorado River cotton rat was detected near the willow marsh. Bat monitoring results will be reported when the analysis is completed.

FY22 Activities:

Maintenance and Management:

Cottonwood-Willow – Routine management of the cottonwood-willow land cover type is ongoing. Riparian fields will be irrigated from March through September, and the marsh will be flushed in January to manage salinity.

Beal Lake – Routine maintenance and management of Beal Lake is ongoing. Annual removal, cleaning, and replacement of the wedge-wire screens along the rock structure was conducted in Beal Lake's unlined ditch in January 2022.

Restoration:

Cottonwood-Willow – The design for restoration of the BLCA expansion area will be developed in coordination with the USFWS. The Restoration Development and Monitoring Plan for the BLCA expansion will be completed. Coordination with Mohave Valley Electric Cooperative (MVEC) is underway to supply future power to the Havasu NWR firebreak canal and BLCA. In addition, control of saltcedar in the recently burned portions of the expansion area may occur to reduce sprouting.

Beal Lake – Design of the pump platform for the expansion area is anticipated to occur. Management of the lake through the water control structures will continue.

Monitoring:

Cottonwood-Willow – Vegetation data will be collected using lidar technology. Monitoring stations, established 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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and rodents, and bat presence will be monitored with an acoustic station.

Beal Lake – Beal Lake was stocked with native fishes. Monitoring of native fish populations and water quality will be conducted.

Proposed FY23 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 the marsh will be flushed 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 – Compliance and construction permits will be completed and submitted for the BLCA expansion. Completion of the final design for restoration of the BLCA expansion area and pump stand is anticipated. Control of saltcedar in the recently burned portions of the expansion area may occur to reduce sprouting.

Beal Lake – Management of the lake through the water control structures will continue.

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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos, and bat presence will be monitored with an acoustic station. Other wildlife monitoring will be conducted as needed.

Beal Lake – Monitoring of native fish populations and water quality will continue. Surveys will be conducted to document marsh bird presence following dredging.

Pertinent Reports: The *Beal Lake Conservation Area, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E4: Palo Verde Ecological Reserve

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$850,000	$1,046,340.90	$12,913,527.78	$900,000	$900,000	$1,000,000	$1,000,000

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 123-125 and 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 F work tasks. Work Task E37 was combined with this work task in FY21.

Project Description: The California Department of Fish and Wildlife (CDFW) made this property available for LCR MSCP habitat restoration activities. Initially, the CDFW identified about 1,300 acres for habitat restoration. In November 2019, Reclamation and the CDFW amended the PVER Agreement to expand the conservation area by 338 acres to approximately 1,638 total acres by incorporating PVER-South (E37). This conservation area intends to satisfy a portion of the LCR MSCP Habitat Conservation Plan requirements and a portion California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

The property includes two parcels of land within the PVID separated by about 3 miles of farm fields. The northern parcel is approximately 1,300 acres and was planted with the cottonwood-willow and honey mesquite land cover types. The southern parcel, totaling 338 acres, is planted and will be managed for the honey mesquite land cover type.

Maintenance and Management: The conservation area has extensive water delivery infrastructure consisting of miles of concrete-lined irrigation canals, irrigation drainage ditches, and access roads. Water is ordered through and provided by the PVID. Irrigation is based on site conditions and type of established land cover. Farming activities include vegetation removal along the roadside and ditches, typically performed quarterly, to reduce the potential of wildfires, in conjunction with maintenance of the irrigation canals, gates, and roads.

Cottonwood-Willow – Two pump platforms deliver water through the J and K Canals in the northern parcel. The cottonwood-willow land cover type receives irrigation bi-monthly from February through October. Irrigation does not occur from November through January unless required for salinity management.

Honey Mesquite – For honey mesquite, water is typically only used for establishment. Irrigation is reduced or stopped when the roots have reached the groundwater table.

The cost of operating and maintaining the conservation area includes farming, labor for irrigation, water tolls, and electrical power utility bills. The PVID provides water order data monthly to the LCR MSCP. The LCR MSCP and CDFW both contribute to the water and electric utilities proportional to the amount of acreage each manages.

Previous Activities: To date, 945 acres of the cottonwood-willow and 78 acres of the honey mesquite land cover types were established on the northern parcel, and 246 acres of the honey mesquite land cover type were established on the southern parcel, for a total of 1,269 acres, and are managed for LCR MSCP covered species. Planting occurred from FY06 through FY13 on the northern parcel and in FY21 on the southern parcel.

In January 2015, the existing pump was replaced with two 30-cubic-foot-per-second (cfs) electric irrigation pumps, with new delivery pipes and a pump stand, and electrical upgrades.

FY21 Accomplishments: Approximately 145 acres of honey mesquite was planted.

Maintenance and Management: During the annual pump inspection, severe erosion of the suction bells on both pumps was identified. This facilitated the removal of pump #2 and it was repaired, a vortex plate installed to reduce cavitation, and put back in service. This resulted in FY21 obligations exceeding the approved estimate. Pump #1 was not repaired until we had time to evaluate the repairs completed on Pump #2. Sediment was also removed from the pump basin during the 2-week water outage.

Irrigation and management activities continued as in previous years.

A research study was initiated to monitor and evaluate the effects of a gradual reduction and cessation of applied water on the health and productivity of volunteer cottonwoods in a planted honey mesquite stand.

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.

Surveys were conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, rodents, and sootywings. In addition, two acoustic bat stations were used to detect the presence of LCR MSCP bat species. Sonoran yellow warblers and summer tanagers were confirmed breeding. An unpaired adult southwestern willow flycatcher was detected, but it did not establish a territory at the conservation area. Yellow-billed cuckoos were detected and confirmed breeding, Colorado River cotton rats were captured, and sootywings were detected. Bat monitoring results will be reported when the analysis is completed.

FY22 Activities:

Maintenance and Management: Irrigation and management activities will continue as in previous years until data indicate adjustments are needed. A study designed to measure impacts of reduced irrigation on cottonwoods and willows will continue. The two pumps will be inspected and maintained. In addition, pump #1 is scheduled for removal, replacement of the suction bell, and installation of a vortex plate.

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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, rodents, and sootywings, and bat presence will be monitored with two acoustic stations.

Proposed FY23 Activities:

Maintenance and Management: The annual inspection and maintenance of the two 30-cfs pumps will be completed.

Irrigation and management of the PVER will continue as in previous years until data 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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos, and bat presence will be monitored with two acoustic stations. Other wildlife monitoring will be conducted as needed.

Pertinent Reports: The *Palo Verde Ecological Reserve, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E5: Cibola Valley Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$350,000	$518,424.23	$14,538,099.08	$350,000	$520,000	$520,000	$520,000

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, between River Miles 98–105, 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: The conservation area is in Arizona, about 15 miles south of Blythe, California, on lands owned by the Arizona Game and Fish Commission. The conservation area, former agricultural lands, have been converted to the cottonwood-willow and honey mesquite land cover types.

Maintenance and Management: The conservation area has extensive water delivery infrastructure consisting of miles of concrete-lined and unlined irrigation canals, irrigation drainage ditches, and access roads. Water is ordered through and delivered by the Cibola Valley Irrigation and Drainage District. Irrigation is based on site conditions and type of established land cover. Farming activities include vegetation removal along the roadside and ditches, typically performed quarterly, to reduce the potential of wildfires, in conjunction with maintenance of the irrigation canals, gates, and roads.

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 those furrows. Typically, irrigation is concluded within 2 to 3 years, when the roots have reached the groundwater table.

The annual cost of operating and maintaining the conservation area are includes water taxes, water tolls, electrical power utility bills, and assessments for district operation.

Previous Activities: To date, 457 acres of the cottonwood-willow and 808 acres of the honey mesquite land cover types have been established, for a total of 1,265 acres, and are managed for LCR MSCP covered species. Planting occurred from FY06 through FY11 and FY15 through FY19.

In FY07, the LCR MSCP secured 1,309 acres of land, serviced by the Cibola Valley Irrigation and Drainage District, to establish the CVCA. The AZGFD acquired the CVCA's fee title and water entitlements through a multi-organizational agreement involving the AZGFD, Reclamation, Mohave County Water Authority, The Conservation Fund, and the Hopi Tribe.

FY21 Accomplishments:

Maintenance and Management: Maintenance, management, flood irrigation, and monitoring of the established habitat continued. Visual inspections were completed to evaluate site conditions and the presence of invasive plant species. Invasive plant species control was completed on 92 acres.

The CVCA is considered fully developed; however, obligations for maintenance and irrigation activities exceeded the FY21 approved estimate due to increased costs for labor and materials. The LCR MSCP and the Arizona Game and Fish Commission acquired 5th priority water during FY21 and used the entire water entitlement, irrigating past the originally planned irrigation schedule, which resulted in additional labor charges.

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.

Surveys were conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and sootywings. In addition, two acoustic bat stations were used to detect the presence of LCR MSCP bat species. Arizona Bell's vireos, Sonoran yellow warblers, and summer tanagers were confirmed breeding. No resident or breeding southwestern willow flycatchers were detected. Yellow-billed cuckoos were detected and possibly breeding, and sootywings were detected. Bat monitoring results will be reported when the analysis is completed.

FY22 Activities:

Maintenance and Management: Regular maintenance, management, flood irrigation, and monitoring will continue. Invasive species control will continue as needed in spring and fall.

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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and sootywings, and bat presence will be monitored with two acoustic stations.

Proposed FY23 Activities:

Maintenance and Management: Regular maintenance, management, flood irrigation, and monitoring will continue. Invasive species control will continue as 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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos, and bat presence will be monitored with two acoustic stations. Other wildlife monitoring will be conducted as needed.

Pertinent Reports: The *Cibola Valley Conservation Area, 2019 Annual Report* is posted on the LCR MSCP website. The 2021 and 2021 annual reports will be posted upon completion.

Work Task E9: Hart Mine Marsh

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$1,150,000	$737,069.16	$8,609,806.65	$150,000	$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 NWR, between River Miles 90–93, Arizona

Purpose: To create and manage a mosaic of native land cover types for LCR MSCP covered species that utilize marsh as well as resident and migrating bird species along the LCR

Connections with Other Work Tasks (Past and Future): Vegetation and species monitoring are being addressed under Work Tasks F1–F4 and F7.

Project Description: In FY08, the Cibola NWR Land Use Agreement was amended to allow the establishment of a marsh complex at HMM on lands made available by the USFWS on the Cibola NWR. The marsh was created between FY09 and FY10.

The conservation area is on the CNWR, in Arizona, about 30 miles south of Blythe, California.

Maintenance and Management: Historically, the only source of water for HMM was drainage water from fields in Farm Unit #1 on the Cibola NWR, 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.

A flush of the marsh, conducted annually during the winter months, includes draining the marsh by gravity and then refilling with surface water pumped from the Colorado River. After the flushing, water levels within the marsh are maintained using drainage water by opening and closing gates from Arnett Ditch and by supplementing the flow with pumped river water.

Vegetation maintenance at the marsh employs an integrated management approach that uses 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 flushing the marsh, O&M of the water control structures, regular maintenance of the pumping system, electrical power utility bills, invasive and non-native vegetation control, and road maintenance.

Previous Activities: To date, 255 acres of the marsh land cover type have been established and are managed for LCR MSCP covered species.

ln FY08, the LCR MSCP and USFWS amended the Cibola NWR Land Use Agreement to make lands available for the marsh complex. The marsh complex was created between FY09 and FY10.

In FY13, a pipeline replacement project was completed, supplying water from the Unit #2 pump stand to the marsh. The project included designing and constructing a parallel pipe system with a valve manifold to facilitate using either the 20- or 40-cfs pumps through either pipeline.

In FY20, the LCR MSCP completed the pump replacement project design. The design includes two 30-cfs pump and simplifies the valving. A review of the project provided additional design recommendations, including and creation of a jetty and weir which moved the pumps further into the river to limit sedimentation.

FY21 Accomplishments:

Maintenance and Management: Maintenance, management, and monitoring of the established marsh was conducted. Invasive plant species were treated on the marsh perimeter, and a prescribed burn was completed on the north cell of the marsh. The marsh was drained, flushed, and filled to the water elevation required by the HCP in spring following the early February youth hunt but before the marsh bird nesting season.

A portion of the pump replacement project, including construction of the jetty and weir, and building of the platform construction were completed. Delays in project completion were a result of multiple issues including, but not limited to, COVID-19 travel restrictions and construction scheduling challenges, high river

stage, and longer than normal delivery timeframes for contracted items. As a result, the annual expenditures were less than the approved estimate, and the pump stand was not completed.

Monitoring: Vegetation data were collected using lidar technology. The USFWS conducted marsh bird surveys, and western least bitterns and Yuma clapper rails were detected and possibly breeding at the site.

FY22 Activities:

Maintenance and Management: Maintenance, management, and monitoring of the established marsh habitat continue, including invasive plant species treatments on an as-needed basis. Water levels will be manipulated to improve water quality in spring following the early February youth hunt but before the marsh bird nesting season.

The final phase of the pump replacement project is expected to be completed, including fabricating a trash rack, installing the pumps, severing the old discharge lines, connecting the new discharge lines, and coordinating with the electrical service provider for appropriate power supply.

Monitoring: Vegetation data will be collected using lidar technology. Surveys will be conducted for marsh birds and rodents.

Proposed FY23 Activities:

Maintenance and Management: Routine maintenance activities will continue at the marsh for the life of the LCR MSCP. No construction, restoration, or changes to marsh management are anticipated.

Monitoring: Vegetation data will be collected using lidar technology. Marsh bird surveys will be conducted. Other wildlife monitoring will be conducted as needed.

Pertinent Reports: The *Hart Mine Marsh Conservation Area, 2020 Annual Report* is posted on the LCR MSCP website. The *Hart Mine Marsh Conservation Area, 2021 Annual Report* will be posted upon completion.

Work Task E13: McAllister Lake

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$100,000	$46,684.37	$307,478.00	$400,000	$60,000	$60,000	$60,000

Contact: Andrea Finnegan, (702) 293-8203, afinnegan@usbr.gov

Start Date: FY05 (closed in FY07; reopened in FY17)

Expected Duration: FY55

Long-Term Goal: Habitat management

Conservation Measures: BONY2 and RASU2

Location: Reach 5, Imperial NWR, Arizona

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 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 a habitat for native fishes under the 1997 BO. The LCR MSCP subsumed the maintenance and management obligations, research, and backwater development for native fishes at McAllister Lake 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 improve the lake by designing and constructing a pumping system to exchange water to meet salinity and other water quality parameters at levels suitable for supporting native fishes.

Maintenance and Management: To manage salinity within the backwater, the lake is drawn down twice during the winter months and subsequently refills with lower salinity groundwater.

Previous Activities: A series of experimental pump tests were conducted to manage salinity during FY03 and FY04. After an approximately 18-month period without pumping, salinity levels (measured as specific conductance) increased from approximately 4,000 to approximately 10,000 microsiemens per centimeter. The results from these investigations suggested that salinity levels could be reduced through pumping and subsequently induced subsurface recharge but that regular water management (flushing) of the lake would be necessary to maintain desired salinity ranges.

In FY18, the decision was made not to evaluate this option but instead to proceed with the high-flow-rate pumping system. The high-flow-rate pumping system is an effective and lower-cost alternative that became an annual activity starting 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 complete.

FY21 Accomplishments: A single drawdown of the lake occurred in early spring to manage salinity.

The LCR MSCP planned to complete environmental compliance and permitting for the berm construction in FY21; however, an adjustment to the construction schedule has delayed the final compliance review.

The single drawdown, rather than two as planned, and a delay in construction timelines resulted in actual obligations less than the approved estimate for the fiscal year.

FY22 Activities: Two drawdowns of the lake are scheduled for early spring to manage salinity levels. Procurement of the materials and a dedicated pump for future annual water level management is underway.

Proposed FY23 Activities: Two drawdowns of the lake are scheduled for early spring to manage salinity levels.

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

Work Task E14: Imperial Ponds Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$500,000	$522,726.25	$12,360,908.24	$350,000	$350,000	$350,000	$400,000

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, BLRA1, BONY2, CLRA1, ELOW1, GIFL1, GIWO1, LEBI1, RASU2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, and YWAR1

Location: Reach 5, 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 monitoring and species research previously conducted under Work Tasks C25 (closed), D2, D7, D9, and D10 (closed); these activities will continue under Work Tasks F1, F5, and F7.

Project Description: In 2006, the LCR MSCP and USFWS signed a LUA to establish ponds, marsh, and cottonwood-willow on the IPCA. The six backwaters, totaling 80 acres, were constructed in FY06. The marsh in Field 18, totaling 13 acres, was planted in FY07 and provided Clean Water Act mitigation for dredging of the Laguna Reservoir, an action covered under the LCR MSCP. The farm fields, intended for the cottonwood-willow land cover type, along with additional fields, are being evaluated for salinity levels prior to any establishment of habitat.

The conservation area is on the INWR, in Arizona, about 20 miles northeast of Yuma, Arizona.

Maintenance and Management:

Disconnected Backwaters – Two groundwater wells supply water to the ponds. Each pond receives approximately 8.50 acre-feet per month, except July through September, when the water volume increases to 17 acre-feet of water per month. The targeted water delivery to the ponds is 765 acre-feet each year. Annual costs included electricity for the well, maintenance of the pumps and valves to direct water delivery, and boat ramp maintenance.

Marsh – A pump platform conveys lower water to Field 18 within the Imperial NWR marsh complex. Annual costs associated with the O&M of the marsh complex include irrigation activities, pump maintenance, invasive and non-native weed control, road maintenance, and electrical utility bill payments.

Farm Fields – A pump platform provides LCR water to the Imperial NWR management units. The fields are flood irrigated to grow a cover crop and reduce salinity.

Previous Activities: To date, 80 acres of disconnected backwater and 13 acres of marsh have been established and are managed for LCR MSCP covered species.

Disconnected Backwaters – Colorado River water had been supplied to the backwaters by a pump fitted with a wedge-wire screen system designed to prevent the passage of fish eggs and larvae into the backwaters. However, non-native fish were present in the backwaters, and the wedge-wire screen was a possible vector. Following an in-situ evaluation of the wedge-wire screen, completed under Work Task G3, results indicated that fish eggs and larvae of multiple species could pass through the wedge-wire screen. In response to the results of the in-situ evaluation, the water supply transitioned from pumped LCR water to water from a single well in 2009. A water management study was initiated in May 2011 and was completed in 2015 to evaluate the water quality in Pond 1 (well water delivery) and Ponds 2–6 (no water delivery). The water management study guided the development of a water delivery schedule, providing monthly water delivery volumes for each backwater. Installation of the second well in FY14 increased the available water volume to manage the ponds and provided redundancy if a well became inoperable.

Marsh – Field 18 was cleared in the winter of FY07 and planted with a common Olney's three-square bulrush-dominated marsh. Irrigation management follows the irrigation cycle of the adjacent field, Field 16, created and managed by the USFWS for California black rails and Yuma clapper rails. The marsh has provided habitat for LCR MSCP covered species since 2008.

Farm Fields – The fields were laser leveled and an irrigation system installed in FY08. The fields were then planted with a cover crop and are irrigated to reduce soil salinity.

In FY19, a memorandum from Reclamation to the USFWS documented the decision to construct Pond 7 on a portion of the Farm Fields Under Evaluation. A 14-acre backwater will use the existing groundwater delivery system and drainage swale.

FY21 Accomplishments:

Maintenance and Management: The annual inspection and maintenance of the pumps and operation of the disconnected backwaters, marsh, and Farm Fields under evaluation were completed. A surge test was conducted on the groundwater well pump after reduced flows were observed. The results of the surge test indicated a need to redrill the well.

Disconnected Backwater – The pumps delivered groundwater to the backwaters following the water delivery schedule. Vegetation was cleared from the boat ramps and riprap shorelines.

Marsh – Field 18 was managed for covered marsh bird species.

Farm Fields – Data collection from monitoring wells continued to evaluate soil salinity and groundwater depth.

Restoration:

Disconnected Backwaters – A design for a seventh backwater, to be built on a portion of the fields being evaluated, was completed. Compliance documents were drafted but will not be submitted until closer to the start of construction. The remaining fields will continue to be managed similar to previous years until construction commences.

Monitoring:

Disconnected Backwaters – Monitoring 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 were 175, 216, and 193 individuals for Ponds 1, 3, and 4, respectively, and bonytail estimates were 5, 0, and 74 individuals for Ponds 2, 5, and 6, respectively. Annual recruitment of bonytail continues to occur in Ponds 2 and 6. The majority of captured fish are untagged, suggesting that the actual populations may be larger than estimated. Larval razorback suckers and untagged juveniles continue to be captured in Pond 1, providing evidence of multiple successful recruitment events Limited recruitment

has been detected in Pond 3, based on the capture of four untagged fish. Pond 4 has not shown any signs of razorback sucker recruitment. The USFWS conducted marsh bird surveys at the ponds, but no covered marsh bird species were detected.

Marsh – Vegetation and marsh birds were monitored at the IPCA. Vegetation data were collected using lidar technology. The USFWS conducted marsh bird surveys at Field 18, and Yuma clapper rails were detected.

FY22 Activities:

Maintenance and Management: Onsite maintenance, utility payments, and water management will continue. The groundwater well pump was redrilled in December.

Disconnected Backwaters – Management of the water delivery schedule will continue for the backwaters. Vegetation encroaching on the boat ramps and riprap shorelines will be removed.

Marsh – The marsh will be managed for LCR MSCP covered marsh bird species.

Farm Fields – Irrigation water will be supplied from February through September to maintain a cover crop to manage salinity. Soil salinity and groundwater depth will be monitored.

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

Proposed FY23 Activities:

Maintenance and Management: Onsite maintenance, utility payments, and water management will continue.

Disconnected Backwaters – Management of the water delivery schedule will continue for the backwaters. Vegetation encroaching on the boat ramps and riprap shorelines will be removed.

Marsh – The marsh will be managed for LCR MSCP covered marsh bird species.

Farm Fields – Irrigation water will be supplied from February through September to maintain a cover crop to manage salinity. Soil salinity and groundwater depth will be monitored. A decision will be made, using monitoring data, on the best land cover for the farm fields not being used for construction of Pond #7.

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

Pertinent Reports: The *Imperial Ponds Conservation Area, 2009–2011 and* the *Imperial Ponds Conservation Area, 2019–2021 Annual Report* will be posted on the LCR MSCP website upon completion.

Work Task E16: Conservation Area Site Selection

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$60,000	$153,665.56	$8,856,211.78	$60,000	$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 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: 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 obtain 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 FY20, 18 conservation areas have been established.

FY21 Accomplishments: Coordination efforts with resource agencies continued. Efforts to integrate long-term maintenance and inspection of LCR MSCP conservation areas into Reclamation's existing programs were implemented. Capitalized assets were inventoried. Costs associated with the pickup, transport, and complete preventive maintenance for a backhoe stored at Planet Ranch was completed. The backhoe was an asset purchased under a previous service agreement, was picked up, serviced, and transported to Planet Ranch for use in future restoration activities. The costs for this contributed to the increase obligations. These actions contributed to obligations being higher than the approved estimate.

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 to identify lands with the potential for restoration if the need arises in the future.

FY22 Activities: Coordination efforts with resource agencies will continue to identify sufficient lands that might be brought into the program.

FY23 Proposed Activities: Coordination efforts with resource agencies will continue although sufficient lands to meet the minimum of 8,132 acres have been identified.

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

Work Task E17: Topock Marsh Pumping

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$1,000	$0	$1,759,612.65[1]	$1,000	$1,000	$1,000	$1,000

[1] Expenditures revised to account for accrual at the end of FY16 that was reversed in FY17.

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 NWR, 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 includes 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 USFWS constructed a concrete-lined inlet canal (firebreak canal) that diverts water by gravity to Topock Marsh. Pumps will be used to fill the marsh by March 15, which is the start of marsh bird breading season, when the river stage is too low to provide gravity-diverted water. Gravity diversion maintains the marsh elevation throughout the marsh bird breeding season and maintains wet soil conditions at southwestern willow breeding sites adjacent to the marsh.

Previous Activities: In early 2010, the LCR MSCP provided $1 million to construct the firebreak canal, which replaced the unlined Topock Inlet Canal. The new canal improved system efficiency to Topock Marsh by reducing water transmission losses. On April 28, 2010, the LCR MSCP Steering Committee authorized providing the USFWS with an additional $2.5 million to construct and

operate a pump station at the firebreak canal, also required under Avoidance and Minimization Measure 2 (AMM2). The USFWS concurred that the LCR MSCP had met its obligation under AMM2 and issued a letter stating that no further action was required by the LCR MSCP. Work Task E17 tracks expenditures and will be closed after $3,500,000 has been expended.

An engineering analysis of the pump station proposal was conducted. The funding requested by the USFWS was found insufficient to complete the project, and a proposal to use the HMF was discussed to meet the budgetary shortfall. The USFWS concurred with the use of the HMF and AMM2 funds to fund the project and formalized an agreement to move forward. The components of the agreement included: (1) all commitments under AMM2 will remain fulfilled, (2) all AMM2 funds will be expended before utilization of the HMF, and (3) prior to construction activities, the USFWS and LCR MSCP will execute an agreement to use the HMF that will detail the long-term roles and responsibilities of both agencies and marsh management objectives.

Reclamation built the original inlets and outlets to Topock Marsh and have some responsibility for continued operation in coordination with the USFWS. Therefore, the Yuma Area Office, responsible for river O&M, is providing engineering support to advance the project. In FY18, the Yuma Area Office presented the findings of an engineering and hydrological analysis to the USFWS. As a result of this analysis, multiple alternatives to maintain water levels in Topock Marsh were considered since gravity diversion alone will not fill the marsh in time for the marsh bird breeding season (March 15). In FY19, Yuma Area Office further refined these proposed alternatives, focusing efforts on a 60-cfs fixed pump station to augment gravity flows, delivered via the firebreak canal, into Topock Marsh. A 30% design was developed in FY20.

FY21 Accomplishments: A Value Engineering Study was performed on the design to provide a formal evaluation of the project and identify potential cost-saving alternatives. This study resulted in several recommendations that are under consideration. The most significant proposal was to change the pump style from a pair of 30-cfs vertical turbine pumps to one 60-cfs Archimedes screw pump. The screw pump style has several advantages, including lower long-term O&M costs, significantly higher overall durability, and increased water transport volume. A 30% design was completed for construction an Archimedes screw pump station.

FY22 Activities: Finalization of the report titled *Fire Break Canal Maintenance Plan and Budget* is expected. This report includes the anticipated annual maintenance activities and associated costs until 2055 and the estimated replacement costs of the firebreak canal in 2050. The budgetary information from this report, combined with the pump station estimate, will support the total funding request from the HMF.

The evaluation of the Value Engineering recommendations will be completed, and the 60% engineering plan set is scheduled to be finished. Preliminary permitting and environmental compliance work will begin. Finalization of the report titled *Topock Marsh Feasibility Report* and *Fire Break Canal Maintenance Plan and Budget*, which includes a cost estimate to determine the total funds required from the HMF, is also planned. The USFWS received funding for these activities in prior years.

Proposed FY23 Activities: The engineering plan set, including the 100% design, is expected to be completed. Contracting for the new pumping station is scheduled to begin. Completion of the necessary permitting and environmental compliance is also planned.

Pertinent Reports: N/A

Work Task E18: Law Enforcement and Wildland Fire Support

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$250,000	$194,614.85	$2,794,847.91	$215,000	$215,000	$215,000	$215,000

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 Section E work tasks.

Project Description: Law enforcement and wildland fire support for created habitat is funded under this work task. The BLM, USFWS, AZGFD, CDFW, NDOW, Bureau of Indian Affairs, and other agencies conduct law enforcement and firefighting activities on the LCR. 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.

The BLM Colorado River District Office is responsible for handling fire and law enforcement related activities for conservation areas on State and Reclamation lands. Conservation areas located on Federal refuges are managed for wildland fire and law enforcement by the USFWS. Those activities include planning, coordination, monitoring, outreach, risk assessments, site mapping, and inspections.

Inspections are intended to identify and address potential wildland fire management issues proactively; recommendations are discussed with the landowner and the LCR MSCP. These recommendations help identify high-risk areas, areas in need of fuel reduction, potential damage to infrastructure, and inform management of visitor use areas.

Previous Activities: The BLM and USFWS conducted law enforcement and firefighting activities on LCR MSCP conservation areas from FY05 to FY20. In FY20, the 5-year law and fire Interagency Agreements for FY21 – FY25 were finalized.

FY21 Accomplishments: Work with local fire and law agencies to support management activities continued. Activities included patrols, monitoring, planning, site visits, coordination meetings, and attendance at agency staff meetings.

Law enforcement conducted more than 200 patrols of LCR MSCP conservation areas. No significant law enforcement incidents occurred.

There were no fires that occurred on LCR MSCP conservation areas. However, the BLM suppressed several wildfires near LCR MSCP sites throughout the fire year. The most significant of these fires was the Planet Ranch Fire, located on the Bill Williams National Wildlife Refuge, which burned 1,260 acres in July 2021, including a small portion of the LCR MSCP's downstream credit, resulting from the Planet Ranch acquisition. A second fire, the Pipeline Fire, was located near Section 26 and burned 110 acres in December 2020.

FY22 Activities: Law enforcement and fire management activities will continue.

Proposed FY23 Activities: Law enforcement and fire management activities will continue.

Pertinent Reports: N/A

Work Task E21: Planet Ranch

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$1,000,000	$1,548,340.64	$22,592,603.54	$750,000	$750,000	$750,000	$1,000,000

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

Start Date: FY05 (closed in FY05; reopened in FY09)

Expected Duration: FY55

Long-Term Goal: Habitat creation and management

Conservation Measures: BEVI1, BONY2, CLRA1, CRCR2, ELOW1, GIFL1, GIWO1, LEB1, MNSW2, RASU2, SUTA1, VEFL1, WIFL1, WRBA2, WYBA3, YBCU1, YBCU2, and YWAR1

Location: Reach 3, Bill Williams River, 11 miles east of River Mile 190, Arizona

Purpose: To create and manage disconnected backwaters within a mosaic of native land cover types for LCR MSCP covered species

Connections with Other Work Tasks (Past and Future): Costs associated with a Federal land and water appraisal conducted in FY08 were captured under Work Task E16.

Project Description: Planet Ranch, located on the Bill Williams River, was acquired to secure the river corridor, and develop the property as a conservation area. Creditable acreage includes (1) active restoration of 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 NWR (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 and is managed by the LCR MSCP and AZGFD. LCR MSCP managed areas include the habitat area west of the

main north/south access road (approximately 1/3 of the conservation area). In addition, a small amount of acreage east of the main north/south access road is reserved for potential LCR MSCP use.

AZGFD managed lands are 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 and are not managed for LCR MSCP covered species.

Previous Activities: Historically, Planet Ranch was approximately 8,400 acres, of which roughly 2,400 acres were farmed for alfalfa. The site was a long-standing priority for acquisition given its proximity to the Bill Williams National Wildlife Refuge and habitat characteristics suitable for multiple LCR MSCP covered species.

In FY09, the Steering Committee approved Motion 09-001(r), which authorized Reclamation to enter negotiations to secure 3,418 acres of land and 5,549 acre-feet of water per year in the Planet Ranch valley from the Freeport Minerals Corporation (FMC). In 2014, legislation was signed directing the United States Secretary of the Interior to execute an agreement to acquire Planet Ranch. Program Decision Document 15-002, which authorized Reclamation to execute a lease for the land and water, was approved by the Steering Committee on April 22, 2015. A Federal appraisal determined the total acquisition cost of $8,300,000.

In FY15, upon execution of the lease, the FMC donated the land and water rights to the Arizona Game and Fish Commission. The lease between Reclamation and the FMC was transferred as part of the donation. The FMC retained lands on Planet Ranch that were not in the lease agreement.

In FY17 through FY19, designs for a 60-acre backwater were developed and finalized.

In FY19, construction of the site began and continued through FY21. The effort included excavating and hauling approximately 750,000 cubic yards of material, the construction of a 4,000 linear foot sheet pile wall to protect the site from periodic flows on the Bill Williams River, installation of 7,000 linear feet of high-density polyethylene pipe for supply and drain lines, setting four precast water control structures, and building of nearly 2 miles of road.

FY21 Accomplishments: Infrastructure required to manage water in the backwater ponds was completed and included installation of the groundwater well pumps and providing electricity to power them. This allowed the ponds to be filled and drained repeatedly to calculate filling time and estimate seepage loses. The filling and draining will continue into the next fiscal year before any conclusions can be made. Other activities completed included the installation

of more than 7,000 linear feet of five-rail fencing around the ponds to exclude burros and placement of gabion baskets in each pond to dissipate energy when filling the ponds to prevent erosion and maintain slope stability.

Two production wells were tested. Production Well #2 produces at a rate of approximately 4,200 gallons per minute, which exceeded expectations. Well #1 did not produce any meaningful volume of water, which was unexpected. Well #1 was redeveloped by alternately pumping water into and out of the well to try and clean the well screen, but those efforts were not successful in increasing production volume.

During construction, a release from Alamo Dam raised the water table under the ponds. The ponds were designed to operate at both high and low groundwater elevations; however, the release partially filled the ponds before the water levels could be maintained by the pumps. Pond #2, which was constructed with a layer of silt, maintained open water, which allowed for uncontrolled cattail growth. The three remaining ponds had minor amounts of cattail growth.

Marsh vegetation was planted on the shoreline of the ponds, but it was not successful due fluctuating water levels caused by the high seepage rate of the ponds and loss of the Well #1.

Obligations exceeded the budget estimate because several tasks planned for prior years were conducted. These activities included the installation of pumps and related electrical work.

Monitoring: Planet Ranch has two distinct areas where monitoring occurred in FY21.

Planet Ranch – Vegetation data were collected using lidar technology.

Middle Bill Williams River NWR – Surveys for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos were conducted. Arizona Bell's vireos, Gila woodpeckers, Sonoran yellow warblers, and summer tanagers were found breeding at the site. A territorial pair of southwestern willow flycatchers was detected, and yellow-billed cuckoos were detected and were possibly breeding.

FY22 Activities: Planet Ranch's water entitlement was fully utilized between April 3, 2021, and April 2, 2022. The pumps are shut off. The filling and draining indicate that the pond losses, due to seepage, are higher than were calculated in the geotechnical modeling report developed during design. Development of a plan to conduct additional investigations to determine the areas of high seepage and a plan to reduce that seepage is underway. The plan would

also address the replacement of Well #1 and the encroachment of cattail in Pond #2. Invasive and non-native plant control in and around the ponds is scheduled.

Monitoring:

Planet Ranch – Vegetation data will be collected using lidar technology. Surveys will be conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos.

Middle Bill Williams River NWR – Vegetation data will be collected using lidar technology. Surveys will be conducted for yellow-billed cuckoos.

Disconnected Backwaters – Fisheries related work will be postponed until issues with the backwaters have been addressed.

Proposed FY23 Activities: Detailed mapping of the soils beneath the ponds is planned to identify localized areas of high permeability where soil amendments would be appropriate to reduce seepage. Based on the results of the mapping, the plan to address the seepage rate of the ponds will be finalized. Permitting and compliance for the replacement well will be completed.

Site improvements are planned, such as installation of a new domestic well for the residences, automating the operation of groundwater wells, and replacing the metal siding on the maintenance shop. Invasive and non-native plant control in and around the ponds will continue.

Drilling to replace Well #1 is scheduled to be completed in two steps. First, a small-diameter pilot hole is drilled, the substrate is logged by a geologist, and then the permeability of the formation is tested by pumping. If the desired production rate is achieved, a larger-diameter production well is drilled at the same location. If the desired production rate is not achieved, additional pilot wells would be drilled and evaluated.

Monitoring:

Planet Ranch – Vegetation data will be collected using lidar technology. Water quality will be monitored. Surveys will be conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos.

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

Pertinent Reports: The *Planet Ranch, 2021 Annual Report* will be posted on the LCR MSCP website upon completion.

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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$2,000,000	$1,302,182.98	$9,194,436.83	$1,600,000	$5,000,000	$5,000,000	$3,000,000

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 NWR, 1/2 mile east of River Miles 95–99, 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). Vegetation and species monitoring are being addressed under Section F Work Tasks.

Project Description: Reclamation conducted multiple restoration research and demonstration projects on active farm fields within Unit #1 prior to the formal designation as a conservation area. A LUA was signed with the USFWS to create and maintain habitat on 956 acres within Cibola NWR Unit #1 in 2007. The area described in the LUA has been converted to the cottonwood-willow land cover type. In FY18, the LUA was amended to expand the conservation area to 2,492 total acres. The intent is to create additional cottonwood-willow land cover type in the expansion area.

The conservation area is on CNWR, in Arizona, about 20 miles south of Blythe, California.

Maintenance and Management: The conservation area has extensive water delivery infrastructure consisting of miles of concrete-lined irrigation canals, irrigation drainage ditches, and access roads. Water is pumped from a single pump stand and delivered the fields through the concrete-lined canals by the

USFWS. Irrigation is based on site conditions and established land cover. Farming activities include vegetation removal along the roadside and ditches to reduce the potential of wildfires and maintenance of the irrigation canals, gates, and roads.

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 those furrows. Typically, irrigation is concluded within 2 to 3 years, when the roots have reached the groundwater table.

The annual cost of operating and maintaining the conservation area includes farming, labor for irrigation, and electrical power utility bills.

Previous Activities: To date, 848 acres of the cottonwood-willow land cover type were established between FY07 and FY19. A new pump stand, including installation of two new pumps, was completed in FY19.

A concept for creating approximately 950 acres of the cottonwood-willow land cover type within the expansion area was developed in FY20. The created acres would be managed using both high and low water irrigation amounts depending on the land cover type or soil moisture goals. Planting in furrows will allow regular irrigation to be reduced or halted when mesquite or cottonwood-willow roots reach the groundwater table. High-density cottonwood-willow areas will be flood irrigated to create moist soil conditions for nesting birds.

FY21 Accomplishments: The FY21 approved budget was based on the proposed development schedule for the expansion area. Since development of the expansion was delayed, obligations were less than the approved amount.

Maintenance and Management: Maintenance, management, flood irrigation, and monitoring of the established cottonwood-willow habitat continued. Invasive species control was completed in spring and fall, primarily focusing on the Middle Hippy Fire and Lower Hippy Fire areas. Routine maintenance of the pumps and blading of interior roads were conducted.

Restoration: The planned planting of the Cibola North and South Connectors was delayed, as planting the Dennis Underwood Conservation Area was prioritized. The draft planting design for the connectors was developed. Draft Restoration Development and Monitoring Plans for the connectors and expansion area were initiated. These plans will incorporate the planting design and engineering design details as they become final.

The existing canal network was surveyed, and stationing added to the plan set being developed in AutoCAD. The data were also used to calculate hydraulic capacity of the canals and culverts using HEC-RAS. Multiple options to deliver water to the expansion area were discussed and formulated into four alternatives. The preferred alternative eliminated the need for a temporary irrigation system and reduced the risk to existing habitat and farming operations. The alternatives report and 30% design were completed and will be used as the basis for the required Value Engineering (VE) study. The alternatives report was presented to both the USFWS and PVID for comment.

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.

Surveys were conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos and rodents. In addition, avian mist netting was conducted and an acoustic bat station was used to detect the presence of LCR MSCP bat species. Gila woodpeckers and summer tanagers were confirmed breeding during surveys and Sonoran yellow warblers and summer tanagers were color banded and one summer tanager was recaptured during mist netting. No resident or breeding southwestern willow flycatchers were detected. Yellow-billed cuckoos were detected and confirmed breeding at the site and Colorado River cotton rats were captured. Bat monitoring results will be reported when the analysis is completed.

FY22 Activities:

Maintenance and Management: Maintenance, management, flood irrigation, and monitoring of created habitat will continue. Intensive invasive species control will continue, primarily focusing on the Middle Hippy Fire and Lower Hippy Fire areas. Routine maintenance of the pumps and roads is planned.

Restoration: The planting design, primarily the cottonwood-willow land cover type, will be incorporated into the *Restoration Development and Monitoring Plans for the North and South Connectors*. Plants, primarily cottonwood-willow, will be ordered for planting the Cibola North Connector.

A Value Engineering study and review of the 30% design was conducted. Information generated from the review will inform the future design milestones. The final design and plan set was completed, and details will be incorporated into other planning documents. Information on irrigation supply, field layout, and design will be incorporated into the planting design. The Project Management Plan will be completed.

Clearing of vegetation and placement of fill for canal ditch pads on over 700 acres has begun. A scope of work, plans, and specifications for concrete canal construction will be prepared.

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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and rodents, and bat presence will be monitored with an acoustic station.

Proposed FY23 Activities:

Maintenance and Management: Maintenance, management, flood irrigation, and monitoring of created habitat will continue. Intensive invasive species control will continue, primarily focusing on the Middle Hippy Fire and Lower Hippy Fire areas. Routine maintenance of the pumps and roads is planned.

Restoration: Approximately 155 acres of cottonwood-willow will be planted in the Cibola North Connector. Plants will be ordered for the FY24 planting of the Cibola South Connector.

Construction activities in the expansion area will continue. Procurement and placement of road base for new roads to service the expansion area is planned. Excavation & placement of material from swales & drains is expected to be continue. Clearing and leveling of the fields is planned. Procurement of 8,300 linear feet of pipeline is planned.

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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos, and bat presence will be monitored with an acoustic station. Other wildlife monitoring will be conducted as needed.

Pertinent Reports: The *Cibola National Wildlife Refuge Unit #1 Conservation Area, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E25: Big Bend Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$60,000	$17,318.58	$1,315,032.50	$50,000	$30,000	$30,000	$500,000

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 Section C work tasks and Work Task F5.

Project Description: In 2008, Reclamation, the State of Nevada, and Southern Nevada Water Authority (SNWA) worked to secure the Boy Scout Camp property to protect the adjacent backwater by including it as a LCR MSCP conservation area. The acquisition of the Boy Scout Camp property, combined with the commitment of the Nevada State Lands Department and the SNWA, limited future development in the area to protect the 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, which made the protection of the BBCA a priority of the LCR MSCP.

The conservation area is about 30 miles south of Laughlin, Nevada.

Maintenance and Management: Routine maintenance activities are minimal and are typically limited to road grading. In the event of summer thunderstorms, sediment removal can be necessary. A bathymetric lidar survey is conducted annually to provide elevation data to monitor sediment deposition.

Previous Activities: To date, 15 acres of connected backwater have been established.

Since 2010, the NDOW has managed the connected backwater as wakeless. Since FY13, routine monitoring of the BBCA has been conducted in fall and again monthly from January through May. Monitoring included electrofishing, trammel netting, remote PIT scanning, and larval light trapping in areas with historical contacts of native fishes and adequate water levels to permit access for sampling. Water quality monitoring was completed from January through May and quarterly, at a minimum, for the remainder of the year. Low numbers of razorback and flannelmouth suckers were contacted, including larvae of both species and flannelmouth sucker subadults. The backwater has a direct surface connection to the LCR; consequently, water quality parameters mirror that of the river. Beginning in 2016, annual bathymetric lidar surveys have been conducted to provide elevation data confirming portions of the backwater continue to fill with sediment. Planning has been completed to deepen the backwater by dredging.

FY21 Accomplishments:

Maintenance and Management: Maintenance activities were minimal. The annual bathymetric lidar survey was completed and the elevation data confirmed that portions of the backwater continued to fill with sediment. Obligations were less than anticipated due to reduced travel from COVID-19 travel restrictions. As a result of the restriction, the roads were not graded.

Monitoring: Sampling did not occur in November due to COVID-19 travel restrictions. Larval sampling was conducted from January through May and resulted in the capture of eight razorback sucker larvae and 30 flannelmouth sucker larvae. Mobile remote PIT scanners deployed once per month from January through May contacted 49 razorback suckers. These fish were all stocked less than 2 miles upstream in Laughlin Lagoon and contacted 1 week after their release. No other native fishes were contacted. Water quality monitoring was also completed in three of the four FY quarters, and all recorded parameters (i.e., temperature, dissolved oxygen, conductivity, and pH) were within suitable ranges for native fishes. No water quality data were recorded in the first quarter due to COVID-19 restrictions, and no trammel net surveys were conducted due to sedimentation and reduced access to the backwater. These efforts will be resumed following future dredging of the backwater.

FY22 Activities:

Maintenance and Management: Routine maintenance activities will continue. Landownership discussions with the State of Nevada will continue to identify a suitable location to place fill from planned maintenance dredging of the backwater. The annual bathymetric survey is also planned.

Monitoring: Monitoring efforts and water quality sampling will be postponed until the dredging of the backwater is completed.

Proposed FY23 Activities:

Maintenance and Management: Routine maintenance activities are planned along with conducting the annual bathymetric lidar surveys.

Pertinent Reports: The *Big Bend Conservation Area, 2019 Annual Report* has been posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E27: Laguna Division Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$100,000	$173,665.85	$27,993,055.33	$100,000	$100,000	$100,000	$100,000

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, 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 provided land for large-scale riparian and marsh restoration and enhancement. In 2007, a Laguna Division Planning Group comprised of interested parties identified potential restoration projects within the division. The project is intended to satisfy a portion of the LCR MSCP Habitat Conservation Plan requirements and a portion of California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

The undeveloped ground, which became the LDCA, was a relatively wide area with a series of low linear depressions remnant of former river meanders. The site is a mosaic of cottonwood-willow, honey mesquite, and marsh habitat types maintained with a designed maximum base flow of 100 cfs. 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 manage water levels based on habitat requirements but may also store excess flows through a coordinated effort with Reclamation's Water Operations Group. If excess flows are anticipated, adjustments of the water control structures accommodate a portion of the riverflow.

The conservation area is in Arizona and California, about 20 miles northeast of Yuma, Arizona.

Maintenance and Management: The LDCA design minimizes the annual O&M costs. The water delivery and management systems are remotely operated and do not require onsite personnel. Water is diverted from the desilting forebay of the Gila Gravity Main Canal and gravity delivered to the site through a pipeline. No pumps, or associated maintenance costs, are needed to manage the conservation area.

Inspection of the LDCA headworks structure, the diversion point within the Gila Gravity Main Canal forebay, is conducted for preventative maintenance annually. The inspection includes draining the water from the headworks, visually inspecting the cathodic protection system, pressure washing the interior of the structure and assessing the structure for corrosion, and visually inspecting the downstream side of the Gila Canal diversion structure sluice gate. The water control structures and overshot gates are inspected quarterly. General site maintenance, including cleaning of the solar panels for the gate controls, safety buoy lines are inspected, and road maintenance is performed.

Access within LCDA is limited to non-vehicular traffic. Law enforcement and wildland fire support are conducted by the Bureau of Land Management (E18).

Previous Activities: To date, 979 acres of the cottonwood-willow and 26 acres of the honey mesquite land cover types in Arizona, and 151 acres of the cottonwood-willow and 17 acres of the honey mesquite land cover types in California have been established, for a total of 1,173 acres, and are managed for LCR MSCP covered species. The CDFW approved the *Laguna Division Conservation Area Restoration Development and Monitoring Plan.*

The headworks structure was constructed in the westernmost sluice gate of the Gila Gravity Main Canal. The structure can divert up to 100 cfs. Approximately 2,800 feet of 48-inch high-density polyethylene pipe routes the flow from the headworks structure to the LCDA.

Four water control structures were installed on the site and allow water surface elevations to be changed and manage water flow. The system allows for management flexibility, including diverting the entire flow into the Mittry Lake Wildlife Area or the historic river channel.

Development of the LCDA included excavation of approximately 3,200,000 cubic yards of material. Clearing and contouring of the conservation area began in 2011, with site development completed in 2014. More than 800,000 marsh plants and 1 million trees and shrubs were planted.

FY21 Accomplishments:

Maintenance and Management: The annual inspection of the LDCA headworks structure was postponed due to COVID-19 travel restrictions. Quarterly preventative maintenance and inspection of the water control structures was completed. General site maintenance was performed.

Daily management of the slip meter and two overshot gates within the conservation area were transferred to Reclamation's River Operations Group using established guidelines and standard operating procedures. This change allows river operations to instantaneously make changes to store or release water without receiving confirmation from the LCR MSCP in accordance with the guidelines. The LCR MSCP paid for all training this fiscal year, which contributed to the higher than anticipated costs, in return for reduced costs to the program in the long-term.

A portion of the obligations exceeded the approved amount due to the increased on-site activity necessary to train and implement local river operations staff to operate the slip meter and overshot gates. The cost of training was not included in the approved estimate but will benefit the program by reducing long-term operating costs and any future travel restrictions. In addition, internal staff turnover increased costs.

The standard operating procedures for inspection were updated.

Monitoring: Vegetation data were collected using lidar technology. Surveys were conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos. Arizona Bell's vireos, and Gila woodpeckers were detected breeding. No resident or breeding southwestern willow flycatcher were detected. Yellow-billed cuckoos were detected and there was probable breeding.

FY22 Activities:

Maintenance and Management: The annual inspection of the LCDA headworks and cathodic protection system was completed in January of 2022. Quarterly preventive maintenance of the water control structures and general site maintenance is planned.

Straw bales may be placed as needed for soil stabilization. Several areas of the interior roads have significant plant encroachment and will be cleared to allow for vehicles to pass.

Treatment for control of invasive and non-native plant species within the habitat area is planned.

Monitoring: Vegetation data will be collected using lidar technology. Surveys will be conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and rodents.

Proposed FY23 Activities:

Maintenance and Management: The annual inspection of the LDCA headworks and cathodic protection system is planned. Quarterly preventive maintenance of the water control structures and general site maintenance is also planned. Treatments to control invasive and non-native plant species are planned.

Monitoring: Vegetation data will be collected using lidar technology. Surveys will be conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos. Other wildlife monitoring will be conducted as needed.

Pertinent Reports: The *Laguna Division Conservation Area, 2019 Annual Report* is posted on the LCR MSCP website. The 2016, 2020, and 2021 annual reports will be posted upon completion.

Work Task E28: Yuma East Wetlands

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$275,000	$202,970.50	$3,404,482.53	$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 FY13, the Quechan Indian Tribe, AZGFD, city of Yuma, the Yuma Crossing National Heritage Area Corporation , and Reclamation agreed to the terms and conditions in the multi-party LUA to manage the 380-acres of created land cover types as a conservation area.

The Yuma Crossing National Heritage Area Corporation, a 501(c)3 non-profit organization, is responsible for managing day-to-day operations. The LCR MSCP is responsible for 70 percent (%) of the funding for long-term O&M of created habitats and adaptive management actions that benefit species covered under the LCR MSCP Habitat Conservation Plan. The city of Yuma, Quechan Tribe, and Heritage are each responsible for 10% of the operating cost. Infrequent, but substantial, capital improvements may also occur and will be in addition to annual operating costs.

Maintenance and Management: The *Yuma East Wetlands Annual Management Plan* describes the work associated with the O&M of the site. The plan is developed collaboratively with the concurrence of all partners before the obligation of LCR MSCP funding. The document describes the scope of work, budget, and responsibilities for each fiscal year. The plan is limited to routine O&M activities.

Annual O&M 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: To date, 183 acres of CW, 103 acres of HM, and 94 acres of marsh land cover types have been established for a total of 380 acres and are managed for LCR MSCP covered species. Monitoring began in FY13. Previous activities include the replacement of the north channel pump in FY18 and the installation of flow meters in FY18 and FY19.

In FY00, 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.

FY21 Accomplishments:

Maintenance and Management: YEW was operated and maintained in accordance with the *FY21 Yuma East Wetlands Annual Management Plan*. LCR MSCP-supported activities included 22 flood irrigation cycles, road and pump maintenance, trash cleanup, and sediment removal from the intakes of the flood irrigation pumps. In the spring of FY21, the *FY22 Yuma East Wetlands Annual Management Plan* was developed and approved. The annual management plan and budget required no significant changes.

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.

Surveys were conducted for marsh birds, riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and rodents. In addition, an acoustic bat station was used to detect the presence of LCR MSCP bat species. Gila woodpeckers, western least bitterns, and Yuma clapper rails were detected breeding at the site. No resident or breeding southwestern willow flycatcher were detected. Yellow-billed cuckoos were detected and confirmed breeding, and Yuma hispid cotton rats were captured. Bat monitoring results will be reported when the analysis is completed.

FY22 Activities:

Maintenance and Management: YEW will be operated and maintained in accordance with the work identified in the *Yuma East Wetlands Annual Management Plan*. The annual management plan for next year will be developed with the partners in spring. No significant changes to the operating plan or budget are anticipated. An assessment of the condition of infrastructure is planned.

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. Surveys will be conducted for marsh birds, riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and rodents, and bat presence will be monitored with an acoustic station.

Proposed FY23 Activities:

Maintenance and Management: YEW is expected to be operated and maintained in accordance with the work identified in the *Yuma East Wetlands Annual Management Plan*. The FY24 annual management plan will be developed with the partners in the spring of 2023. 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. Surveys will be conducted for marsh birds, riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and rodents, and bat presence will be monitored with an acoustic station.

Pertinent Reports: The *Yuma East Wetlands, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E31: Hunters Hole

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$30,000	$36,977.87	$630,975.54	$30,000	$160,000	$40,000	$40,000

Contact: Jeremy Brooks, (702) 293-8157, jjbrooks@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: In 2012, the LCR MSCP assumed management of Hunters Hole as an LCR MSCP conservation area on lands withdrawn by Reclamation.

The conservation area is in Arizona, about 16 miles southwest of Yuma. The conservation area was converted to the cottonwood-willow land cover type and is managed for LCR MSCP covered species.

Maintenance and Management: The annual cost associated with managing Hunters Hole includes maintenance of the pumps and valves, the electrical power utility bills, and grading interior roads. Irrigation is provided by a groundwater well through a series of automated valves. Irrigation occurs from February to November. Once the irrigation system has started, no onsite personnel are required until it is shut down at the end of the irrigation season.

Previous Activities: To date, 43 acres of the cottonwood-willow land cover type have been established and are managed for LCR MSCP covered species. The conservation area was planted in FY12. Monitoring began in 2013.

In FY20, staff assessed the condition of the well and pump and determined replacement of the pump is needed, but the well does not need to be drilled at this time.

FY21 Accomplishments:

Maintenance and Management: Hunters Hole was managed and maintained in conformance with the standard operating procedure for the site. Irrigation cycles and water use were monitored.

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.

Surveys were conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos. In addition, an acoustic bat station was used to detect the presence of LCR MSCP bat species. Five riparian bird species were detected breeding at the site, but no covered species were detected. Only two of four yellow-billed cuckoo surveys were conducted; the last two surveys were cancelled due to security concerns associated with illegal border crossings at the U.S.-Mexico border. Bat monitoring results will be reported when the analysis is completed. Rodent trapping was scheduled but not conducted due to COVID-19 travel restrictions.

FY22 Activities:

Maintenance and Management: The site will continue to be managed and maintained in conformance with the standard operating procedures for the site. No significant management actions are anticipated.

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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, yellow-billed cuckoos, and rodents, and bat presence will be monitored with an acoustic station.

Proposed FY23 Activities:

Maintenance and Management: The site will continue to be managed and maintained in conformance with the standard operating procedures for the site. The groundwater well pump will be replaced.

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. Surveys will be conducted for riparian birds, southwestern willow flycatchers, and yellow-billed cuckoos, and bat presence will be monitored with an acoustic station.

Pertinent Reports: The *Hunters Hole, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted on upon completion.

Work Task E33: Pretty Water Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$20,000	$8,094.25	$1,839,619.67	$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 NWR, River Miles 95–97, Riverside County, 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: In 2012, the LCR MSCP and the USFWS amended the Cibola NWR Land Use Agreement to allow the establishment of a honey mesquite at the PWCA. The honey mesquite was planted in FY15. The PWCA consists of approximately 566 acres intended to satisfy both a portion of the LCR MSCP Habitat Conservation Plan requirements and a portion of California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

The conservation area is on the Cibola NWR, in California, about 20 miles south of Blythe.

Maintenance and Management: The PWCA was fully developed in FY15 and the provides honey mesquite land cover type with minimal long-term O&M costs. Annual management activities are limited to visual inspections of the honey mesquite, coordination with the USFWS, and minor road grading. Invasive plant species control may be periodically required.

Previous Activities: In 2012, the California Department of Fish and Wildlife approved the *Sharks Tooth Restoration Development and Monitoring Plan*. Shortly after the plan was approved, the name of the conservation area changed to the PWCA.

In FY15, the site was cleared and planted with 22,500 honey mesquite trees. Trees were irrigated using a water truck for three years. Following the completion of manual tree irrigation, public access was re-established along the main access roads, rock barriers were built around the newly expanded parking area, and the primitive boat ramp received minor maintenance.

FY21 Accomplishments:

Maintenance and Management: Visual inspections were conducted to evaluate site conditions, including documenting the presence of invasive plant species. The site was treated for invasive and non-native plant species. Annual expenditures were less than the approved estimate because no road maintenance was required.

Monitoring: Surveys were conducted for riparian birds and sootywings. Thirteen bird species were detected breeding at the site, but no covered species were detected. No sootywings were detected.

FY22 Activities:

Maintenance and Management: Visual inspections will continue to be used to evaluate site conditions. Invasive and non-native plant species control and minor road maintenance will be completed as needed.

Monitoring: Vegetation data will be collected using lidar technology. Surveys will be conducted for riparian birds and sootywings.

Proposed FY23 Activities:

Maintenance and Management: Visual inspections will continue to be used to evaluate site conditions. Invasive and non-native plant species control and minor road maintenance will be completed as needed.

Monitoring: Vegetation data will be collected using lidar technology. Surveys will be conducted for riparian birds and sootywings.

Pertinent Reports: The *Pretty Water Conservation Area, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E35: Mohave Valley Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$300,000	$125,170.92	$10,609,848.05	$100,000	$50,000	$50,000	$50,000

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: In FY16, a lease was signed between the California State Lands Commission (Commission) and Reclamation to develop the land as a conservation area by creating a connected backwater. In FY20, the lease was amended to 92 acres to return a portion used as a fill area to the Commission. This project is intended to satisfy a portion of the LCR MSCP Habitat Conservation Plan requirements and a portion of California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

The conservation area is in California, about 15 miles south of Needles, on lands owned by the California State Lands Department. The conservation area, former undeveloped land, was excavated to create a connected backwater.

Maintenance and Management: The backwater is connected to the main stem of the Colorado River. Surface water enters the backwater over a stop log structure at the inlet bridge and then is held at a higher stage by a stop log structure on the outlet bridge before discharging back to the river. The stop logs allow raising or lowering the water surface and require annual maintenance.

Water surface elevations within the MVCA are monitored using the established gauging station at the southern outlet bridge, which is manually downloaded quarterly.

Over 2 miles of post and cable fence is inspected annually and typically requires minor erosion repair after summer storm events.

Previous Activities: To date, 63 acres of connected backwater in Reach 3 have been established and are managed for LCR MSCP covered species.

In FY14, a geotechnical survey was conducted to classify the soils beneath the proposed backwater. The survey confirmed the material is suitable for dredging.

In FY16, a lease was signed between the Commission and Reclamation to develop the 149-acre conservation area as a connected backwater The land is owned by the Commission and was leased to San Bernardino County. Before approaching the Commission and county in 2012 about the backwater project, parcel was used as an off-highway vehicle recreational area. The Commission (landowner) and the county (lessee) agreed to authorize creation of the conservation area, and the county was willing to divide the property to accommodate both uses. The design was completed and consisted of creating a connected backwater, which diverts water from 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 *Mohave Valley Conservation Area Restoration Development and Monitoring Plan* was approved by the CDFW.

In FY17, construction began and was completed in FY19; the backwater was opened for public use. A total of 1.475 million cubic yards of material was moved: 1.15 million cubic yards using land-based equipment and 325,000 cubic yards by dredging.

FY21 Accomplishments: Limited routine maintenance activities occurred, including road maintenance along the western boundary of the MVCA. Installation of 5,200 linear feet of post and cable fence was completed along the eastern side of the conservation area boundary line from the inlet bridge to the outlet bridge to minimize off-highway vehicle issues within the MVCA.

The data from the stilling well logger was collected and compared with river gage data provided by the River Operations Group to ensure that target water surface elevations were maintained.

Obligations were less than anticipated because surplus post and cable fencing was used, and travel restrictions limited maintenance activities and routine site visits throughout the year.

Monitoring: The two permanent PIT scanners installed at the inflow and outflow structures ran continuously. The inflow scanner contacted 3,113 razorback suckers and 1 flannelmouth sucker, and the outflow scanner contacted 2,576 razorback suckers, 2 bonytail, and 1 flannelmouth sucker. Razorback sucker larvae were abundant near the inflow during multiple surveys, suggesting that larvae are being entrained as they drift down river from upstream spawning sites. Two netting events conducted in conjunction with the Reach 3 roundups resulted in the capture of 36 razorback suckers.

FY22 Activities: Management and monitoring of the conservation area will continue. Routine maintenance activities, including road maintenance and the removal of invasive plant species, are scheduled.

Monitoring: 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.

Proposed FY23 Activities: Management and monitoring of the conservation area will continue, but at a reduced level, as reflected in the requested budget. 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. Data collected through these efforts will be used to direct future monitoring and sampling activities.

Pertinent Reports: The *Mohave Valley Conservation Area, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E36: Parker Dam Camp

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$5,000	$5,386.23	$39,223.53	$10,000	$20,000	$10,000	$10,000

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, 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: In FY17, an agreement was signed between the LCR MSCP and the Lower Colorado Dams Office to establish a conservation at the site of the historic Parker Dam Camp.

The conservation area is in California, about 1/2 mile south Parker Dam on lands withdrawn by Reclamation. The conservation area, former housing area for dam workers, is protected from development and being converted to the honey mesquite land cover type through natural regeneration.

Maintenance and Management: The conservation area contains a substantial amount of honey mesquite, which has established without the need for planting. Therefore, annual maintenance and management is minor and consist of periodic site visits, removal of invasive and non-native vegetation, and occasional debris removal from material left over from removal of the residences. The debris removal is conducted in conjunction with vegetation control.

Previous Activities: To date, 80 acres of the honey mesquite land cover type have been established and are managed for LCR MSCP covered species. 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.

FY21 Accomplishments:

Monitoring: Surveys were conducted for riparian birds, and Arizona Bell's vireos and Gila woodpeckers were confirmed breeding.

FY22 Activities:

Operations and Management: General site maintenance activities are planned.

Monitoring: Surveys will be conducted for riparian birds.

Proposed FY23 Activities:

Operations and Management: General site maintenance activities and cleanup (invasive and non-native plant species and debris) are planned.

Monitoring: Surveys will be conducted for riparian birds.

Pertinent Reports: The *Parker Dam Camp, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E38: Three Fingers Lake

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$10,000	$5,480.20	$350,764.25	$10,000	$10,000	$10,000	$10,000

Contact: Jessie Stegmeier, (702) 293-8121, jstegmeier@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 NWR, River Mile 90, 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 is conducted under Section F work tasks.

Project Description: In 2018, the LCR MSCP and USFWS amended the Cibola NWR Land Use Agreement to allow for the establishment of a marsh complex at Three Fingers Lake. Once restored, the complex will include 245 acres of marsh habitat within the State of California within the 673-acre conservation area. The conservation area is intended to satisfy a portion of 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: 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.

Three Fingers Lake was dredged in the late 1990s, establishing 24 acres of open water with a small fringe of cattail vegetation. Invasive saltcedar dominates the surrounding landscape. Discussions with the USFWS resulted in a restoration concept that would create a large marsh complex similar in size to HMM (E9). The restoration concept includes reshaping and contouring the ground surrounding the dredged channel to allow for better water management. Water levels will be maintained through a combination of river stage and pumped surface water throughout the year.

FY21 Accomplishments:

Restoration/Monitoring: No restoration activities were planned.

FY22 Activities:

Restoration/Monitoring: No restoration activities are planned. Periodic site visits will continue in addition to surface and groundwater data collection.

Proposed FY23 Activities:

Restoration/Monitoring: No restoration activities are planned. Periodic site visits will continue in addition to surface and groundwater data collection.

Pertinent Reports: N/A

Work Task E39: Dennis Underwood Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$1,500,000	$1,539,051.45	$14,347,443.03	$750,000	$750,000	450,000	450,000

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 and species monitoring are conducted under Section F work tasks.

Project Description: In FY19, the Steering Committee approved Program Decision Document 19-001, *Land and Water Approval*, which authorized Reclamation to execute a permanent easement for conservation purposes with the Metropolitan. Reclamation secured the easement for $9,730,000 for 635 acres of land, with 575 water toll acres. Compensation for the use of the land and water is based on a Federal appraisal.

The conservation area is in California, about 15 miles south of Blythe, on lands owned by the Metropolitan. The conservation area, former agricultural lands, is being converted to the cottonwood-willow and honey mesquite land cover types. This conservation area intends to satisfy a portion of the LCR MSCP Habitat Conservation Plan requirements and a portion of California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

Maintenance and Management: The conservation area has extensive water delivery infrastructure consisting of miles of concrete-lined irrigation canals and access roads. Water is ordered through and provided by the PVID. Irrigation is based on site conditions and type of established land cover. Farming activities

include vegetation removal along the roadside and ditches, typically performed quarterly, to reduce the potential of wildfires in conjunction with maintenance of the irrigation canals, gates, and roads.

The costs associated with operating the conservation area includes farming, labor for irrigation, water tolls, and electrical power utility bills. The PVID provides water order data monthly to the LCR MSCP.

Cottonwood-Willow – The cottonwood-willow land cover type receives irrigation bi-monthly from February through October. Irrigation does not occur from November through January unless required for salinity management.

Honey Mesquite – Water is typically only used for establishment. Irrigation is reduced or stopped when the roots have reached the groundwater table.

Previous Activities: To date, 122 acres of honey mesquite have been established and are managed for LCR MSCP covered species.

In FY19, the Restoration Development and Monitoring Plan was completed; it outlined the proposed cottonwood-willow and honey mesquite land cover type development within the conservation area. The earthwork to create the microtopography prior to planting was completed. Approximately 122 acres of the honey mesquite land cover type was planted.

In FY20, weather and COVID-19 restrictions resulted in the cancellation of planting. The planting schedule was extended from 2 years to 3 years as shown on figure 1-17. The change reduced the acreage planted each year, but it allows for alternate planting techniques, such as hand planting, if future social distancing measures are required and the mass transplanter can't be used.

FY21 Accomplishments:

Maintenance and Management: Two concrete-lined water delivery canals, that are used to deliver water to the cottonwood-willow land cover type were replaced. Removal of invasive and non-native plant species in the honey mesquite land cover type was completed.

Restoration: Cottonwood-willow was planted on 152 acres in Phase 1.

FY22 Activities:

Maintenance and Management: Irrigation and management activities will continue as in previous years until data indicate adjustments are needed.

Restoration: Cottonwood-willow will be planted on approximately 208 acres in Phase 2. Irrigation for the new planting will be twice per month following planting through October.

Proposed FY23 Activities:

Maintenance and Management: Irrigation and management activities will continue as in previous years until data indicate adjustments are needed.

Restoration: The cottonwood-willow land cover type will be planted on approximately 147 acres in Phase 3.

Monitoring: Post-development monitoring will begin after restoration is complete and the plants are mature enough to provide habitat.

Pertinent Reports: The *Dennis Underwood Conservation Area, 2019 Annual Report* is posted on the LCR MSCP website. The 2020 and 2021 annual reports will be posted upon completion.

Work Task E40: Yuma Meadows Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$1,500,000	$568,674.42	$3,676,045.49	$4,000,000	$750,000	$2,500,000	$4,000,000

Contact: John Swatzell, (702) 293-8156, jswatzell@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): Vegetation and species monitoring is conducted under Section F work tasks

Project Description: In FY18, the YMCA was selected as a new conservation area where a combination of disconnected backwaters and rearing ponds would be created. The YMCA is approximately 433 acres in size. Development of the conservation area is expected to include excavation of 123 acres of disconnected backwaters that will be managed for razorback suckers and bonytail. Construction of 12 smaller lined rearing ponds, each approximately 1 acre in size, are also envisioned. The conservation area will include buildings within 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. This conservation area is intended to satisfy a portion of the LCR MSCP Habitat Conservation Plan requirements and a portion of California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

The conservation area is in California, about 13 miles northeast of Yuma, Arizona, on lands withdrawn by Reclamation.

Previous Activities: In FY18, a Value Planning Study was completed.

In FY19, a Value Engineering Study was conducted to evaluate the design drawing set and identify areas of concern that needed to be addressed before completing the final design. Additional geotechnical investigations occurred throughout the year to refine and calibrate the design drawings.

In FY20, the 100% design drawing set for construction of the site were completed.

FY21 Accomplishments:

Maintenance and Management: Using the building rehabilitation assessment report as a guide, plans were finalized to remove the welding shop, and minor repairs to the existing offices and warehouses were initiated.

Restoration: Road base was procured and stockpiled for future road construction around the grow-out ponds. Clearing and grubbing of the grow-out pond pad (14 acres) was completed. Construction of the north alignment of the lower access road and the pump pad was finished. The lower access road will allow for drilling the groundwater production wells for the grow-out ponds.

The design of the fish sorting facility, including underground utilities, and fish rearing ponds were completed. Procurement of the building and award of a contract to purchase and install the underground electrical service to the building were not completed, which resulted in obligations in FY21 being less than approved.

FY22 Activities: With COVID-19 on the rise, the decision was made to delay excavation of the rearing ponds at the YMCA. The intent of the 2-year delay is to help avoid increased costs due to higher-than-normal prices, and the lack of availability of heavy equipment and materials resulting from supply chain issues associated with COVID-19, while not effecting the end date for development of all conservation areas.

Maintenance and Management: Demolition of the welding shop was completed.

Restoration: Efforts to build the infrastructure necessary to operate the rearing ponds and sorting facility were initiated and include drilling of the groundwater wells for the grow-out ponds, placement of gravel for the foundation of the sorting facility, procuring materials and constructing the metal building for the sorting facility, and procuring electrical supplies and installation of underground power to the future well sites and sorting facility are planned.

Monitoring: Compliance monitoring will be conducted as needed prior to, and during, construction and will be funded under Section F work tasks.

Proposed FY23 Activities:

Maintenance and Management: Upgrades to existing offices and warehouses are planned and include perimeter security lighting, drilling of a new domestic well, and installing a water treatment system. Efforts to build the infrastructure necessary to operate the rearing ponds continue and include the installation of the control panels and associated wiring for operation of the groundwater wells and sorting facility. Clearing of the rearing ponds footprint will continue.

Restoration: The groundwater wells for the grow-out pond and sorting facility will be tested. They will continuously pump for at least 3 months to confirm pumping capacity.

Monitoring: Compliance monitoring will be conducted as needed prior to, and during, construction and will be funded under Section F work tasks.

Pertinent Reports: The *Yuma Meadows Conservation Area Restoration, Development, and Monitoring Plan* is posted on the LCR MSCP website.

Work Task E41: Section 26 Conservation Area

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$3,000,000	$750,756.07	$363,829.94	$2,500,000	$2,000,000	$2,000,000	$500,000

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 is conducted under Section F Work Tasks.

Project Description: In FY17, Section 26 was selected as a new conservation area where a connected backwater would be created. The conservation area is approximately 97 acres in size. Constructing the backwater includes excavation to create 23 acres of the connected backwater land cover type. Connected backwaters typically involve the removal of overburden by land-based equipment to a depth slightly below the groundwater table and dredging to reach the targeted water depths. This conservation area is intended to satisfy a portion of the LCR MSCP Habitat Conservation Plan requirements and a portion of California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06.

The conservation area is in California, about 14 miles south of Needles, on lands withdrawn by Reclamation.

Previous Activities: In FY17, a BLM cadastral crew confirmed landownership.

In 2018, aerial photos and lidar data were collected to reproduce the topography of the site.

In FY20, the *Section 26 Conservation Area Restoration, Development, and Monitoring Plan* was completed.

FY21 Accomplishments: A Value Engineering Study was completed to review the 30% design. Additional hydraulic modeling was conducted, which determined that only one inlet river connection, without a jetty, was necessary to meet backwater target-depth design criteria. As a result, the design drawings were updated in the 60% plan set to reflect the one inlet design approach. Clearing of vegetation from the area to be dredged for the backwater, partially cleared by a fire in December, was completed. Land-based excavation scheduled to start in March was postponed until FY22 to coincide with the availability of the dredge following completion of dredging at Beal Lake. This adjustment in the construction schedule resulted in obligations being lower than the approved fiscal year estimate.

FY22 Activities: The 100% design drawings were completed. Land-based excavation started in November and ended in March to remove approximately 100,000 cubic yards of material at the backwater inlet river connection and existing dry overburden near the inlet. The excavation will provide access for the dredge and sufficient depth in the backwater to float the dredge. The dredge was assembled at the Havasu NWR and was launched into the river to dredge the backwater to a target elevation of 442 feet. Dredging began in March at the southernmost end and will continue north.

Monitoring: Compliance monitoring will be conducted as needed prior to, and during, construction and will be funded under Section F work tasks.

Proposed FY23 Activities: Land-based excavation will resume. Dredging operations are projected to last over 2 years, moving approximately 400,000–500,000 cubic yards of fill to create 23 acres of connected backwater.

Monitoring: Compliance monitoring will be conducted as needed prior to, and during, construction and will be funded under Section F work tasks.

Pertinent Reports: The *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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$600,000	$602,741.41	$8,031,430.83	$600,000	$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 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: From FY10 to FY14, ground-based vegetation monitoring was conducted at most established conservation areas. In FY14, after an external review, adaptive management recommendations for vegetation monitoring were implemented, which included selecting spatially randomized plots that target areas where the vegetation structure and soils were consistent with southwestern willow flycatcher and yellow-billed cuckoo habitat characteristics.

In FY14, the transition to using remote sensing techniques from long-term vegetation monitoring began. Lidar provides 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.

In FY16, lidar data were used to automate the vegetation classification and assign the Anderson-Ohmart structure type to cottonwood-willow and honey mesquite vegetation at all conservation areas. The results 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 acquired lidar data for the entire LCR MSCP planning area during FY18 and FY19 in cooperation with other 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) identifying areas for system-wide monitoring of suitable habitat for several covered species, (2) creating a stratified random sampling design for the system-wide riparian bird monitoring project, and (3) identifying areas for future conservation areas.

FY21 Accomplishments: Lidar data collected in FY20 for LCR MSCP conservation areas were received in FY21. Lidar data for select conservation areas were collected in FY21. Lidar data collected in FY20 were used to perform the habitat creation accomplishment analyses.

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 included shallow

groundwater monitoring stations to monitor groundwater levels and groundwater salinity and soil monitoring stations that monitor soil moisture and soil salinity. Data were analyzed and will be used to refine irrigation schedules at conservation areas that are actively irrigated.

The previously developed tool to monitor vegetation health at established conservation areas was used to evaluate vegetation health. The tool uses satellite imagery from a constellation capable of providing medium-resolution imagery on at least a monthly basis. The tool automatically generates rasters of NDVI values on a pre-programmed time step and generates change rasters between time steps. The change rasters can be used to identify areas that experience negative changes in NDVI values, indicative of a decline in vegetation health, and warranting additional monitoring.

FY22 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. Lidar data collected in FY21 for LCR MSCP conservation areas were received in FY22 and used to perform the habitat creation accomplishment analyses.

The salinity and soil moisture monitoring network was expanded to include monitoring at newly planted areas of the Dennis Underwood Conservation Area. The network continued to be operated at all existing locations. Data continue to be analyzed and will be used to refine irrigation schedules at conservation areas that are actively irrigated.

Vegetation health will be monitored at established conservation areas by identifying areas that have experienced negative changes in NDVI values, indicative of a decline in vegetation health, and warranting additional monitoring.

Proposed FY23 Activities: Long-term habitat monitoring will continue using the previously developed techniques. 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.

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 planted in FY22 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: The report titled *Vegetation Type and Density Mapping – LCR MSCP Conservation Areas, Lower Colorado River, 2021* is posted on the LCR MSCP website.

Work Task F2: Avian Monitoring at Conservation Areas

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$475,000	$432,732.94	$3,985,711.43	$445,000	$600,000	$400,000	$400,000

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: LCR MSCP conservation areas containing suitable habitat

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 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, IPCA, HMM, the LDCA, the MVCA, Planet Ranch, the PVER, the PWCA, and Three Fingers Lake. Post-development monitoring for avian covered species was conducted at the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the LDCA, Parker Dam Camp, the PVER, the PWCA, and YEW. The double sampling 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. The Arizona Bell's vireo, the Sonoran yellow warbler, and the summer tanager were the covered species that had the largest populations breeding at the conservation areas.

Monitoring methods were regularly reviewed and improved since FY06 to increase detection of covered species. Refinement of the multi-species survey MEFF and ArcGIS Online summary continued to streamline data collection and included additional quality assurance/quality control filters and queries. An evaluation of the multi-species survey protocol and monitoring plan for conservation area monitoring (F2) and system-wide monitoring (D6) was initiated in FY16 to clarify the monitoring questions the data will inform and to improve the accuracy of monitoring methods. The following tasks have been completed:

- Potential analysis and survey methods were analyzed for suitability and cost efficiency.

- A preliminary power analysis of the double sampling area search survey protocol and point-count survey method was conducted.

- Future management and monitoring objectives for managing land cover as suitable habitat for covered bird species were drafted for the adaptive management plan and included identifying metrics and modelling that may provide better information for assessing the success of created land cover and identifying if bird use changes in positive and/or negative ways as land cover matures and changes.

- The vegetation type map, funded under Work Task G4, was reviewed and the data incorporated into the analysis.

FY21 Accomplishments: Avian post-development monitoring was conducted at the following conservation areas: the BLCA, the CVCA, Cibola NWR Unit #1, Hunters Hole, the LDCA, Parker Dam Camp, the PVER, the PWCA, and YEW. LCR MSCP covered bird species and other territorial breeding birds were documented at each conservation area:

- **BLCA:** Four area search plots were surveyed. There were 90 pairs of territorial birds confirmed breeding comprising 15 species. Seven pairs of Sonoran yellow warblers, three pairs of Arizona Bell's vireos, and three pairs of summer tanagers were confirmed breeding.

- **Cibola NWR Unit #1:** Fifteen area search plots were surveyed. There were 139 pairs of territorial birds confirmed breeding comprising 17 species. Two pairs of summer tanagers and one Gila woodpecker pair were confirmed breeding.

- **CVCA:** Eighteen area search plots were surveyed. There were 196 pairs of territorial birds confirmed breeding comprising 20 species. Two pairs of summer tanagers, one Arizona Bell's vireo pair, and one Sonoran yellow warbler pair were confirmed breeding.

- **Hunters Hole:** One area search plot was surveyed. There were 10 pairs of territorial birds confirmed breeding comprising 5 species. There were no LCR MSCP covered species confirmed breeding.

- **LDCA:** Eleven search plots were surveyed. There were 366 pairs of territorial birds confirmed breeding comprising 12 species. Five pairs of Arizona Bell's vireos and three pairs of Gila woodpeckers were confirmed breeding.

- **PVER:** Fourteen area search plots were surveyed. There were 232 pairs of territorial birds confirmed breeding comprising 15 species. Three pairs of summer tanagers and two pairs of Sonoran yellow warblers were confirmed breeding.

- **Parker Dam Camp:** Three area search plots were surveyed. There were 83 pairs of territorial birds confirmed breeding comprising 14 species. Two pairs of Arizona Bell's vireos and one Gila woodpecker pair were confirmed breeding.

- **PWCA:** Nine area search plots were surveyed. There were 71 pairs of territorial birds confirmed breeding comprising 13 species. There were no LCR MSCP covered species confirmed breeding.

- **YEW:** Six area search plots were surveyed. There were 117 pairs of territorial birds confirmed breeding comprising 11 species. Two pairs of Gila woodpeckers were confirmed breeding.

All conservation areas had numerous pairs of non-territorial breeders as well.

Revisions were made to the power analysis of the double sampling area search protocol and point-count survey method, and it was finalized. Potential analysis and survey methods continued to be reviewed for suitability and cost efficiency.

FY22 Activities: Avian post-development monitoring will be conducted at the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the LDCA, Parker Dam Camp, Planet Ranch, the PVER, the PWCA, and YEW. The 10-year monitoring plan will be finalized.

Proposed FY23 Activities: Avian post-development monitoring for LCR MSCP covered species will be conducted at the BLCA, Cibola NWR Unit #1, the CVCA, the Dennis Underwood Conservation Area, Hunters Hole, the LDCA, Parker Dam Camp, Planet Ranch, the PVER, the PWCA, and YEW. A 10-year monitoring plan will be finalized for the elf owl and gilded flicker. The budget will increase to prepare for conducting future surveys with Reclamation staff, including conducting a pilot project to detect covered species presence with Autonomous Recording Units.

Pertinent Reports: The *Riparian Bird Surveys in the Lower Colorado Region, 2021 Annual Report* is posted on the LCR MSCP website.

Work Task F3: Rodent Monitoring at Conservation Areas

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$65,000	$58,264.96	$793,455.48	$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: LCR MSCP conservation areas in Reaches 3–7 containing suitable habitat

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: Surveys were conducted at conservation areas from FY06 to FY20 to detect Colorado River cotton rats, Yuma hispid cotton rats, and desert pocket mice. 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 BBCA, the BLCA, Cibola NWR Unit #1, the CVCA, HMM, and the PVER. Yuma hispid cotton rats were captured at Hunters Hole, the LCDA, and YEW.

FY21 Accomplishments: Surveys were conducted at the BLCA, Cibola NWR Unit #1, the PVER, and YEW. Colorado River cotton rats were captured at the BLCA and Cibola NWR Unit #1. Yuma hispid cotton rats were captured at YEW. No surveys were conducted at Hunters Hole due to security concerns associated with illegal border crossings at the U.S.-Mexico border.

FY22 Activities: Surveys will be conducted at the BLCA, Cibola NWR Unit #1, the CVCA, HMM, Hunters Hole, the LDCA, the PVER, and YEW.

Proposed FY23 Activities: Surveys will continue as part of the post-development monitoring efforts at conservation areas in Reaches 3–7 containing appropriate habitat.

Pertinent Reports: The *Post-Development Monitoring of Rodent Populations, 2020 Annual Report* is posted on the LCR MSCP website. The FY21 annual report will be posted upon completion.

Work Task F4: Bat Species Monitoring at Conservation Areas

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$90,000	$93,405.85	$1,582,241.26	$90,000	$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: LCR MSCP conservation areas in Reaches 3–5; BLCA, Havasu NWR, Arizona; CVCA, Cibola NWR Unit #1, Cibola, Arizona; and PVER, California. Additional conservation areas will be surveyed to document presence as needed.

Purpose: The purpose of this work task is to assess the use of conservation areas by the two LCR MSCP covered bat species (western red bat and western yellow bat) and the two evaluation species (pale Townsend's big-eared bat and California leaf-nosed bat).

Connections with Other Work Tasks (Past and Future): Pre- and post-development 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 (western red bat and western yellow bat) and the two evaluation species (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 FY20 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 YEW. Pale Townsend's big-eared bats have been detected at the BLCA, Cibola NWR Unit #1, the CVCA, Planet Ranch, and the PVER. Surveys for covered and evaluation bat species were also conducted at the 'Ahakhav Tribal Preserve under Work Task F4 (acoustic monitoring FY08–19 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. The acoustic monitoring stations at the 'Ahakhav Tribal Preserve, YEW, and Hunters Hole were moved to the system-wide network in FY19.

FY21 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.

FY22 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 FY23 Activities: Bat presence will continue to be monitored at conservation areas in Reaches 3–5 using four 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, 2019 Annual Report* is posted on the LCR MSCP website. The FY20 and FY21 annual reports will be posted upon completion.

Work Task F5: Post-Development Monitoring of Fishes at Conservation Areas

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$400,000	$402,431.42	$3,730,856.35	$400,000	$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 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 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 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, dissolved oxygen, pH, and conductivity (salinity) as well as periodic evaluations of chemical makeup and selenium levels.

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 underway, native fish activities are postponed until renovation is completed.

Routine monitoring of the BBCA has been conducted in November and monthly from January through May each year since FY11. Monitoring has included recording water quality, 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. The backwater in this conservation area has a direct surface connection to the LCR; consequently, water quality parameters have remained 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 have run continuously and contact native fishes daily. This conservation area has been a preferred stocking location since it was completed. The backwater is monitored annually for larval and adult fishes.

Monitoring of the Imperial ponds was previously completed under Work Task C25 (closed) and 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. Razorback sucker recruits have been captured in Pond 1 since FY18, and multiple juveniles have been captured in Pond 3 since FY19.

FY21 Accomplishments:

BBCA: Sampling did not occur in November due to COVID-19 restrictions. Larval sampling was conducted from January through May and resulted in the capture of 8 razorback sucker larvae and 30 flannelmouth sucker larvae. Mobile remote PIT scanners deployed once per month from January through May contacted 49 razorback suckers. These fish were all stocked less than 2 miles upstream in Laughlin Lagoon and were contacted 1 week after their release. No other native fishes were contacted. Water quality monitoring was also completed

in three of the four FY quarters, and all recorded parameters (i.e., temperature, dissolved oxygen, conductivity, and pH) were within suitable ranges for native fishes. No water quality data were recorded in the first quarter due to COVID-19 restrictions, and no trammel net surveys were conducted due to sedimentation and reduced access to the backwater. These efforts will be resumed following future dredging of the backwater.

MVCA: The two permanent PIT scanners installed at the inflow and outflow structures ran continuously throughout the year. The inflow scanner contacted 3,113 razorback suckers and 1 flannelmouth sucker, and the outflow scanner contacted 2,576 razorback suckers, 2 bonytail and 1 flannelmouth sucker. Razorback sucker larvae were abundant near the inflow during multiple surveys, suggesting that larvae are being entrained as they drift down river from upstream spawning sites. Two netting events conducted in conjunction with the Reach 3 roundups resulted in the capture of 36 razorback suckers.

IPCA: 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 FY21 are summarized in table 1.

Table 1.—Imperial Ponds Population Estimates

Pond	Species	Population Estimate	95% CI
1	Razorback sucker	175	169–181
2	Bonytail	5	5–5
3	Razorback sucker	216	207–225
4	Razorback sucker	193	189–197
5	Bonytail	0	0–0
6	Bonytail	74	72–77

Annual recruitment of bonytail continues to occur in Ponds 2 and 6. The majority of captured fish were untagged, suggesting the actual populations are greater than the remote PIT scanning estimates. No fish have been contacted in Pond 5 since August 2020. Water quality data and the lack of scanning contacts suggest a fishkill occurred at that time. Larval razorback suckers and untagged juveniles continue to be captured in Pond 1; multiple size classes provide evidence that numerous recruitment events have occurred. Limited recruitment has been detected in Pond 3, based on the capture of four untagged fish. Pond 4 did not show any signs of razorback sucker recruitment in FY21.

Planet Ranch: Backwater productivity and water quality monitoring were not initiated as planned due to uncontrolled cattail growth, which limited access, and higher than expected seepage rates from the backwaters. This work will be postponed until these issues have been addressed.

FY22 Activities:

BLCA: Dredging activities have been completed. Beal Lake will be stocked with native fishes and native fish populations and water quality will be monitored throughout the year.

BBCA: Monitoring efforts and water quality sampling will be postponed until the dredging of the backwater is completed.

MVCA: 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.

IPCA: Field work will continue to focus on population monitoring and documenting recruitment in native fish backwaters. Activities will include monitoring fishes 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. Pond 5 will be stocked with 300 bonytail in an even ratio of males to females.

Planet Ranch: Fisheries related work will be postponed until issues with the backwaters have been addressed.

Proposed FY23 Activities: Native fish monitoring at completed conservation areas will continue at levels similar to previous years.

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

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$20,000	$16,780.81	$607,224.28	$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 sootywings

Conservation Measures: MNSW1 and MRM2 (MNSW)

Location: LCR MSCP conservation areas in Reaches 1–4. Additional conservation areas will be surveyed to document presence as needed.

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). Beginning in FY19, system-wide monitoring of sootywings in cottonwood-willow habitat containing quailbush along the LCR will be conducted under Work Task D14 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 CVCA and 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.

Results from analyses conducted from 2014 through 2019 indicated that, of the variables measured, quailbush size and leaf density were most predictive of sootywing adult and egg presence.

Sootywings have been detected in Reaches 3–4 at the BLCA, Cibola NWR Unit #1, the CVCA, HMM, the PVER, and the PWCA. They are known to occur as far south as Hunters Hole in Reach 7.

FY21 Accomplishments: Presence surveys for sootywings were conducted in potential habitat within the CVCA, PVER, and PWCA. Sootywings were detected at the CVCA and PVER.

FY22 Activities: Presence surveys for sootywings will be conducted in the honey mesquite land cover type within the CVCA, PVER, and PWCA.

Proposed FY23 Activities: Presence surveys for sootywings will be conducted in the honey mesquite land cover type at conservation areas in Reaches 3 and 4 to monitor for continued presence of sootywings.

Pertinent Reports: The *Monitoring of the MacNeill's Sootywing Skipper and its Habitats, 2021 Annual Report* will be posted on the LCR MSCP website upon completion.

Work Task F7: Marsh Bird Monitoring at Conservation Areas

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$10,000	$7,751.71	$223,931.74	$10,000	$13,000	$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: LCR MSCP conservation areas where marsh habitat was created, including HMM on the Cibola NWR; the IPCA on the Imperial NWR; and YEW, in Yuma, 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 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 BBCA, the BLCA, the ponds at the IPCA, and the LDCA to determine if areas containing marsh vegetation at these conservation areas were also utilized by LCR MSCP covered marsh bird species.

FY21 Accomplishments: Marsh bird surveys were conducted during breeding season at HMM, the IPCA, and YEW (tables 1–3). A fourth survey was conducted at HMM and the IPCA to detect migratory Yuma clapper rails that arrive in May.

Table 1.—California Black Rail Detections

Conservation Area	Survey 1	Survey 2	Survey 3	Survey 4
HMM	0	0	0	0
IPCA Field 18	0	0	0	0
YEW	0	0	0	NS

NS = not surveyed. Only three surveys are required under the protocol.

Table 2.—Western Least Bittern Detections

Conservation Area	Survey 1	Survey 2	Survey 3	Survey 4
HMM	0	11	6	9
IPCA Field 18	0	0	0	0
YEW	1	0	0	NS

NS = not surveyed. Only three surveys are required under the protocol.

Table 3.—Yuma Clapper Rail Detections

Conservation Area	Survey 1	Survey 2	Survey 3	Survey 4
HMM	6	16	16	18
IPCA Field 18	3	2	0	0
YEW	0	4	3	NS

NS = not surveyed. Only three surveys are required under the protocol.

FY22 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.

Proposed FY23 Activities: Marsh bird surveys will be conducted on conservation areas with creditable marsh land cover: HMM, IPCA Field 18, and YEW. Post-development surveys will also be conducted at Beal Lake to document marsh bird presence after dredging of the lake. Data will be entered into the LCR MSCP and AKN databases and analyzed.

Pertinent Reports: The *Marsh Bird Surveys at Conservation Areas, 2021 Annual Report* will be posted on the LCR MSCP website upon completion.

Work Task F8: Reptile and Amphibian Monitoring at Conservation Areas

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$25,000	$5,774.47	$18,013.22	$1,000	$7,000	$1,000	$1,000

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 BLCA, the Havasu NWR, 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 to view natural riparian habitat. The USFWS and AZGFD shared lessons learned regarding facility management challenges, habitat characteristics, and species activity periods. LCR MSCP biologists observed surveys conducted by the USFWS in FY19 at the Havasu NWR in and around the BLCA. The LCR MSCP

participated in the annual Northern Mexican Gartersnake Coordination Meeting. A range of monitoring and management objectives for the adaptive management plan were drafted.

FY21 Accomplishments: The monitoring and management objectives for the northern Mexican gartersnake were refined, and the draft CEM (G6) was reviewed. Comments were submitted on the draft environmental assessment for establishing critical habitat for the northern Mexican gartersnake. A biologist traveled to Parker, Arizona, to help USFWS conduct northern Mexican gartersnake surveys on the Bill Williams River near Planet Ranch, but surveys were cancelled due to the Planet Ranch fire and road damage that prevented access to the Mineral Wash area. The U.S. Geological Survey was contacted to find out whether northern Mexican gartersnakes were encountered during a southern water snake study in Reach 5 in 2016 and where traps were set. No northern Mexican garternsakes were encountered during those surveys. Avoidance monitoring was not required in FY21.

FY22 Activities: Monitoring may be conducted if additional data are needed for compliance documentation or to avoid impacts to species during maintenance activities.

Proposed FY23 Activities: Monitoring may be conducted if additional data are needed for compliance documentation or to avoid impacts to species during maintenance activities. The monitoring plan will be prepared.

Pertinent Reports: N/A

Work Task F9: Southwestern Willow Flycatcher Monitoring at Conservation Areas

FY21 Estimates	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$360,000	$337,494.58	$1,054,243.59	$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 LCR and lower Bill Williams River

Purpose: To monitor southwestern willow flycatcher populations at LCR MSCP conservation areas

Connections with Other Work Tasks (Past and Future): Work Task D2 included post-development and system-wide monitoring of southwestern willow flycatcher population numbers and demographics along the LCR from FY05 to FY17. Monitoring of southwestern willow flycatchers 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.

FY21 Accomplishments: Presence surveys for southwestern willow flycatchers were conducted at 47 sites on LCR MSCP conservation areas and the Middle Bill Williams River NWR (E21) containing the cottonwood-willow land cover type. This included the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the LDCA, the Middle Bill Williams River NWR, the PVER, and YEW.

Migratory willow flycatchers were detected at all conservation areas. An unpaired adult southwestern willow flycatcher was detected at the PVER on July 14 but did not establish a territory at the conservation area. Nest monitoring and color banding activities were not conducted.

FY22 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.

Proposed FY23 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.

Pertinent Reports: The *Southwestern Willow Flycatcher Monitoring Along the Lower Colorado River and Tributaries, 2021 Annual Report* will be posted on the LCR MSCP website upon completion.

Work Task F10: Yellow-billed Cuckoo Monitoring at Conservation Areas

FY21 Estimates	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	F25 Proposed Estimate
$650,000	$664,003.61	$2,418,608.94	$620,000	$500,000	$400,000	$400,000

Contact: Jeff Hill, (702) 218-9572, jhill@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: LCR MSCP conservation areas containing suitable habitat

Purpose: To conduct surveys to monitor 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 USFWS 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 from FY18 to FY20 at all LCR MSCP conservation areas with suitable cottonwood-willow habitat, including the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the LDCA, the PVER, Planet Ranch, YEW, and the Middle Bill Williams River NWR. Birds banded in previous years were resighted, and nests were found incidental to these activities. Followup visits were conducted to determine the breeding status of yellow-billed cuckoos detected in conservation areas.

Cuckoos were detected at the BLCA, Cibola NWR Unit #1, the CVCA, Hunters Hole, the LDCA, the Middle Bill Williams River NWR, the PVER, and YEW. Breeding was confirmed at the BLCA (FY18), the Middle Bill Williams River NWR (FY19, FY21), the CVCA (FY18–20), Cibola NWR Unit #1 (FY18–20), and YEW (FY18–19).

FY21 Accomplishments: Surveys were conducted at all LCR MSCP conservation areas with suitable cottonwood-willow habitat, including the BLCA, Cibola NWR Unit #1, the CVCA, the LDCA, the PVER, and YEW. Two of four scheduled surveys were conducted at Hunters Hole, with the other two being canceled due to security concerns associated with illegal border crossings at the U.S.-Mexico border. The reduction in surveys did not result in cost savings, as increased costs were incurred to implement safety protocols and training of a new project lead. Birds banded in previous years were resighted, and nests were found incidental to these activities. Followup visits were conducted to determine the breeding status of yellow-billed cuckoos detected in conservation areas. Followup visits to find cuckoos tagged with geolocator devices in previous years (D7) were conducted, which provided opportunities to detect additional cuckoo activity. These detections were used to estimate the number of cuckoo territories.

There were 240 detections of cuckoos throughout the LCR MSCP conservation areas. Cuckoos were detected at the BLCA, Cibola NWR Unit #1,the CVCA, the PVER, the LDCA, and YEW. There were 9 confirmed, 23 probable, and 29 possible breeding territories estimated, with nine confirmed nests found. No breeding territories were confirmed at the BLCA, the CVCA, Hunters Hole, and the LDCA. There were five confirmed territories and five nests at the PVER. At Cibola NWR Unit #1, there were three confirmed territories and three nests. One confirmed territory and one confirmed nest was found at YEW. Three cuckoos banded in previous years were positively resighted at the same conservation areas where they were originally banded. Two males were resighted at PVER, one that was initially banded in 2013 and the other in 2016. One female was resighted at Cibola NWR Unit#1 that was initially banded in 2019.

A range of monitoring objectives were drafted for consideration in the adaptive management plan that will inform future monitoring intensity and locations.

FY22 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 FY23 Activities: Call-playback surveys will be conducted at three conservation areas planted with cottonwood-willow habitat at least 2 years old. Conservation areas will be surveyed on a rotating schedule so they are surveyed every three years.

Pertinent Reports: The *Yellow-billed Cuckoo Surveys on the Lower Colorado River, 2020 Annual Report* is posted on the LCR MSCP website. The FY21 annual report will be posted upon completion.

WORK TASKS – SECTION G

Adaptive Management Program

Work Task G1: Data Management

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$850,000	$1,071,735.77	$10,711,859.36	$750,000	$750,000	$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 Work Tasks – Section H Funding Accounts.

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 Lower Colorado River 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. 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, which allowed for cross-project data management and analyses.

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.

FY21 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 implementation of the new website design and migration to a content management system continued in FY21.

Technical editing for all reports posted on the LCR MSCP website was supported under this work task.

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 captures via netting or electrofishing, and (2) the remote scanning database, which includes contacts via remote sensing.

Additional projects were transferred to second-generation MEFFs, notably the first for the Fisheries Group, which will assist field staff in digitally collecting data for deployment and retrieval of mobile remote PIT scanners. Additional proofing and reporting tools were developed, and existing tools were maintained for projects using second-generation MEFFs. These tools take advantage of the same field data collection platform, adding additional efficiency to the data management workflow. Field data collection devices compatible with this new platform and software tools to support the devices and platform were acquired. Several quality control and data manipulation tasks were automated to increase efficiency and data quality.

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.

Cartographic support and map creation for all LCR MSCP staff was supported under this work task.

Obligations were higher than approved due to the volume of reports requiring technical editing, an increase in cartographic requests, and the development of the adaptive management information management system (due to Federal regulations, information technology costs need to be captured under an information technology work task).

FY22 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. Implementation of the website redesign will be completed. Support for technical editing of all published reports continues.

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 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/quality control procedures, and post-processing techniques using the new platform.

Cartographic support and map creation for all LCR MSCP staff continues to be supported under this work task.

Proposed FY23 Activities: Updates and additional content will be incorporated into the new content management system for the newly redesigned website. Support for technical editing of all published reports will continue.

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, fisheries, or restoration field data collection project not using MEFFs will be updated to second-generation MEFFs. Automation of field data, post-processing, and publishing of data for internal use and external sharing will also continue.

Cartographic support and map creation for all LCR MSCP staff will continue to be supported under this work task.

Pertinent Reports: N/A

Work Task G3: Adaptive Management Research Projects

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$100,000	$20,015.09	$2,899,553.92	$100,000	$0	$0	$0

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

Start Date: FY06

Expected Duration: FY22

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 Work Tasks – Section H Funding Accounts.

Project Description: The adaptive management process is an assurance that the conservation actions presented in the HCP 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.

FY21 Accomplishments: Funding was provided to complete a viability analysis of the Lake Mead razorback sucker population. This work was completed in coordination with the USFWS and included modeling the future of this population under various scenarios (e.g., no management action, augmentation, other possible management strategies, etc.).

FY22 Activities: Research questions identified during fish augmentation, species research, system-wide monitoring, habitat creation, and post-development monitoring were evaluated for development into adaptive management research projects under this work task, and no needs were identified.

This work task will close in FY22 due to the conclusion of the research component of the program and no anticipated need for short-term research funding.

Proposed FY23 Activities: This work task will close in FY22.

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

Work Task G4: Science/Adaptive Management Strategy

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$400,000	$172,221.62	$3,353,507.71	$300,000	$300,000	$300,000	$300,000

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

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: 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 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 CEMs.

The LCR MSCP participates in interagency meetings and workshops to discuss natural resource conservation along the LCR. These meetings bring together scientists, managers, and resource users interested in the LCR 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, Reclamation policy for review of scientific information, and the U.S. Department of the Interior Code of Scientific and Scholarly Conduct. This process also ensures that research and monitoring meet 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 Colorado River Terrestrial and Riparian meetings and 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. The *LCR MSCP Five-Year Monitoring and Research Priorities Report 2018–22* was completed in FY19.

On October 27, 2011, the Steering Committee approved minor modifications to five conservation measures (BONY3, BLRA1, RASU3, STBU1, and THMI1) . On April 23, 2014, three minor modifications to conservation measures were approved by the Steering Committee (BEVI1, CRCR2, WYBA3). On April 20, 2020, the Steering Committee approved minor modifications to four conservation measures (RASU5, CLRA1, LEBI1, BLRA1). Scientific literature and results from LCR MSCP monitoring provided the justifications for approving these minor modifications.

Independent program reviews were completed on bat and vegetation monitoring projects.

FY21 Accomplishments: Scientific peer reviews were conducted on approximately 52 reports, which are posted on the LCR MSCP website. These reviews were accomplished through the established internal and external peer review process.

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 development of adaptive management plans for each research and monitoring effort continued in FY21. 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

Development of an adaptive management information management system to work in conjunction with the adaptive management projects/plans began in FY21. This system will be used to provide an interactive experience for the end user to review, update, and incorporate adaptive management structured decision-making processes. This system will also provide a dynamic interface that allows managers to easily access and update individual components of adaptive management projects/plans and generate reports.

The habitat creation accomplishment analysis was conducted during FY21 using data from FY20.

Obligations were less than approved due to work being accomplished with funds that were obligated during FY20 and some costs being required by Federal regulations to be obligated under Work Task G1.

FY22 Activities: A habitat creation accomplishment analysis was conducted to show acreage totals for each conservation measure and applicable conservation area. These totals can be found in table 1-8 in the "Program Overview" section of this document. Remotely sensed data and data collected on the ground were used to determine creditable acres.

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. Development of decision support tools has been postponed until completion of the adaptive management plans.

Development of an adaptive management information management system to work in conjunction with the adaptive management projects/plans continues.

Proposed FY23 Activities: Research and monitoring activities will be reviewed and evaluated internally as well as through independent, external reviewers. Specific programs may include avian, small mammal, insect, fisheries, and habitat monitoring programs.

Information from the CEMs will continue to be used for analyses of current and proposed management actions. 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 information management system will be completed and put into production to assist in the implementation of adaptive management plans.

The monitoring and research priorities report will be reviewed to ensure the priorities in the report are still priorities for the program and that efforts are in line with those priorities.

Pertinent Reports: N/A

Work Task G6: Conceptual Ecological Models

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$40,000	$25,404.07	$244,291.42	$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, 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 in 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. CEMs for the bonytail, flannelmouth sucker, and sootywings were finalized and posted on the LCR MSCP website in FY19.

CEM updates for the California black rail and western red bat were finalized and posted on the LCR MSCP website in FY20.

CEMs for the following evaluation species were finalized and posted in FY20: California leaf-nosed bat, lowland leopard frog, and pale Townsend's big-eared bat.

FY21 Accomplishments: Updates to existing CEMs continued. 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 were finalized and posted for the remaining evaluation species (Colorado River toad and desert pocket mouse) and the northern Mexican gartersnake.

CEM updates for the Colorado River cotton rat, Arizona Bell's vireo, Yuma clapper rail, elf owl, gilded flicker, Gila woodpecker, western least bittern, relict leopard frog, summer tanager, vermilion flycatcher, southwestern willow flycatcher, western yellow bat, yellow-billed cuckoo, Yuma hispid cotton rat, and Sonoran yellow warbler were finalized and posted on the LCR MSCP website in FY21.

FY22 Activities: Updates to existing CEMs continue.

Proposed FY23 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: CEMs for the Colorado River toad, desert pocket mouse, and the northern Mexican gartersnake, as well as CEM updates for the Colorado River cotton rat, Arizona Bell's vireo, Yuma clapper rail, elf owl, gilded flicker, Gila woodpecker, western least bittern, relict leopard frog, summer tanager, vermilion flycatcher, southwestern willow flycatcher, western yellow bat, yellow-billed cuckoo, Yuma hispid cotton rat, and Sonoran yellow warbler are posted on the LCR MSCP website.

WORK TASKS – SECTION H

Funding Accounts

Work Task H1: Habitat Maintenance Fund

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21[1]	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$0	$0	$32,466,770.00	$0	$0	$0	$0

[1] Cumulative expenditures reflect total required contributions to develop the fund.

Contact: Jeremy Brooks, (702) 293-8157, jjbrooks@usbr.gov

Start Date: FY06

Expected Duration: FY55

Long-Term Goal: Maintenance of existing habitat

Conservation Measures: BLRA2, CLRA2, WIFL2, and YBCU2

Location: LCR (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, 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.

The LCR MSCP serves as the funding source for HMF projects 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 HCP 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 NWR (Reach 3);Reach 5, primarily within the Imperial NWR; and Mittry Lake (Reach 6), which is located on 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 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, USFWS Arizona Ecological Services Field Office, and USFWS Region 2 Regional Office resulted in an agreement to leverage remaining 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.

FY21 Accomplishments: No funds were expended from the HMF for project purposes. The total dollar value of the HMF at the end of FY21, with interest, was $35,998,419.76.

Existing Marsh Maintenance on National Wildlife Refuges: 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 from the prior year with the USFWS regarding the use of the HMF to fund a coordinated, long-term, controlled burn program at the Havasu NWR and Imperial NWR did not materially progress, but it is believed that the USFWS intends to submit a proposal in a future fiscal year.

Actively Managed Rail fields at the Imperial NWR: An issue concerning the reliability of water required to operate the pump stands at the Imperial NWR has been identified. One of the pump stands provides water to fields established and managed for rail species covered under the program. An agreement in principal has been reached between the USFWS and Reclamation to identify the cause of the problem and to provide funding to fix the identified issues using the HMF. The USFWS provided $325,999 to investigate the issue and procure some of the materials necessary to alleviate the problem.

FY22 Activities:

Existing Marsh Maintenance on National Wildlife Refuges: The USFWS will develop a proposal to manage marsh habitat on National Wildlife Refuges along the LCR. Implementation of this 10-year plan would begin after a proposal is submitted and the project is authorized.

Actively Managed Rail Fields at the Imperial NWR: Reclamation will model and evaluate the water delivery issue and identify actions required. After modeling is complete, the USFWS will draft and submit a scope of work to use the HMF, if necessary.

Topock Marsh: A proposal to construct a new pumping station may be submitted by the USFWS after an engineering design and cost estimate have been completed.

Mittry Lake: No activities or proposals are anticipated.

Proposed FY23 Activities:

Existing Marsh Maintenance on National Wildlife Refuges: If a proposal is received, it would be reviewed and considered.

Actively Managed Rail Fields at the Imperial NWR: An agreement to use the HMF to construct a new water delivery system is expected to be signed.

Topock Marsh: An agreement to use the HMF to construct a new pump stand is expected to be signed.

Mittry Lake: Activities will be considered if a proposal is received by the LCR MSCP.

Pertinent Reports: N/A

Work Task H2: Remedial Measures Fund

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21[1]	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$1,208,328	$1,208,328	$10,880,791.38	$1,245,740	$1,387,428	$1,387,428	$1,387,428

[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: LCR (Reaches 1–7)

Purpose: To implement remedial measures in order to respond to changed circumstances as necessary

Connections with Other Work Tasks (Past and Future): Any Section B and 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 HCP. 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 HCP. The measures will be implemented within the available LCR MSCP budget, including contingency funds allocated through this work task.

Previous Activities: A RMF process was established and approved by the Steering Committee in FY12.

FY21 Accomplishments: A total of $1,208,328 was deposited into three non-Federal interest-bearing accounts among the States of Arizona, California, and Nevada. They consisted of $302,082 of funding from Arizona, $302,082 from Nevada, and $604,164 from California. The total dollar value of the RMF at the end of FY21, including interest, was $11,522,832.16. No funds have been withdrawn from the RMF to date.

FY22 Activities: A total of $1,245,740 will be deposited into three non-Federal interest-bearing accounts among the States of Arizona, California, and Nevada.

Proposed FY23 Activities: A total of $1,387,428 is expected to be deposited into three non-Federal interest-bearing accounts among the States of Arizona, California, and Nevada.

Pertinent Reports: N/A

WORK TASKS – SECTION I

Public Outreach

Work Task I1: Public Outreach

FY21 Estimate	FY21 Actual Obligations	Cumulative Expenditures Through FY21	FY22 Approved Estimate	FY23 Proposed Estimate	FY24 Proposed Estimate	FY25 Proposed Estimate
$125,000	$118,884.54	$1,214,868.60	$125,000	$50,000	$50,000	$50,000

Contact: Nathan Lenon, (702) 293-8015, nlenon@usbr.gov

Start Date: FY05

Expected Duration: FY55

Long-Term Goal: To 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 public about LCR MSCP implementation activities

Connections with Other Work Tasks (Past and Future): All LCR MSCP work tasks

Project Description: Outreach program 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 Colorado River Terrestrial and Riparian meetings since FY06 and has participated in Colorado River Aquatic Biologists meetings since FY05. These meetings provide centralized forums for scientists and resource managers to discuss current research and monitoring projects taking place on the LCR. 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 (fact sheet) 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.

FY21 Accomplishments: COVID-19 and resulting Federal guidelines prevented in-person events in FY21. Work focused on virtual presentations and creating new illustrated materials for the future.

The LCR MSCP participated in several "Nevada Reading Week" programs with three local Clark County School District Schools. These programs emphasized animal adaptations, featuring several LCR MSCP covered species. Care packs of our illustrated bookmarks were sent to each of the school's libraries to distribute to students.

The LCR MSCP participated in STEM Tank partnering with Lied STEM Academy. This activity consisted of judging 40 different science, technology, engineering, and mathematics related proposals for inventions. Other judges included engineers from the surrounding community, and it concluded with a livestreamed final round.

Virtual presentations were conducted with a University of Nevada, Las Vegas conservation biology class and Project WET (Water Education for Teachers).

Two razorback sucker models were created in anticipation of an expansion of the Hoover Dam Visitor Center. Posters and folders featuring illustrations and conservation messages for three species were created for future outreach events.

FY22 Activities: Work is expected to continue in order to focus on virtual presentations and creating new illustration materials.

A distribution plan will be developed to share the large inventory of posters, bookmarks, and folders with schools in the program area. Several new illustrations are planned for FY22, which can be printed as additional products. Conference exhibit banners will be updated.

Virtual programs will continue to be emphasized as opportunities arise. Presentations will be given to several different organizations, virtually, during the year.

The LCR MSCP is partnering with the NDOW on their renovation to the Lake Mead Hatchery Visitor Center exhibit space. Life-sized razorback sucker and bonytail models and an extensive collection of historical photos will be

provided for interpretive panel content describing the LCR MSCP Fish Augmentation Program. This product will educate visitors about the purpose of native fish conservation.

Proposed FY23 Activities: Future outreach plans are based on forthcoming guidance on in-person events.

Pertinent Reports: The *Fiscal Years 2020–2021 Outreach Activities Report* will be posted on the LCR MSCP website upon completion.

ATTACHMENTS

Attachment A – Letter from Central Arizona Water Conservation District

May 10, 2022

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The Multi-Species Conservation Program (MSCP) Non-Federal share for the Federal Fiscal Year 2023, both annually and quarterly, are shown by state below. The inflation index used is 1.743.

FY23 is year 18 of the program and the 8th year of Arizona's 20-year payback period.

FY 2023 Non-Federal Share (2003 $)	$ 9,991,000
FY 2023 Inflation Index	1.743
FY 2023 Non-Federal Share (Escalated $)	$17,414,313

FY 2023 Non-Fed	Arizona Payback	Other Work Tasks	Remedial Measures	Total Non-Fed Payment Due
Arizona	$ 917,650.28	$4,006,721.25	$ 346,857.00	$ 5,271,228.53
Nevada	(458,825.14)	4,006,721.25	346,857.00	3,894,753.11
California	(458,825.14)	8,013,442.50	693,714.00	8,248,331.36
Totals	$ 0.0	$16,026,885.00	$1,387,428.00	$17,414,313.00

FY 2023 Quarterly Payments		Arizona Payback	Other Work Tasks	Remedial Measures	Total Non-Fed Payment Due
Arizona	Q1	$ 229,412.57	$ 1,001,680.31	$86,714.25	$1,317,807.13
	Q2	229,412.57	1,001,680.31	86,714.25	1,317,807.13
	Q3	229,412.57	1,001,680.31	86,714.25	1,317,807.13
	Q4	229,412.57	1,001,680.32	86,714.25	1,317,807.14
	FY Totals	$ 917,650.28	$ 4,006,721.25	$346,857.00	$5,271,228.53
Nevada	Q1	$ (114,706.29)	$ 1,001,680.31	$ 86,714.25	$ 973,688.27
	Q2	(114,706.29)	1,001,680.31	86,714.25	973,688.27
	Q3	(114,706.29)	1,001,680.31	86,714.25	973,688.27
	Q4	(114,706.27)	1,001,680.32	86,714.25	973,688.30
	FY Totals	$ (458,825.14)	$4,006,721.25	$346,857.00	$3,894,753.11
California	Q1	$ (114,706.29)	$2,003,360.63	$173,428.50	$2,062,082.84
	Q2	(114,706.29)	2,003,360.63	173,428.50	2,062,084.84
	Q3	(114,706.29)	2,003,360.63	173,428.50	2,062,082.84
	Q4	(114,706.27)	2,003,360.61	173,428.50	2,062,082.84
	FY Totals	$ (458,825.14)	$8,013,442.50	$693,714.00	$ 8,248,331.36

If you have any questions, please call or e-mail either Doug Dunlap, 623-869-2360 (ddunlap@cap-az.com) or Jack Ozomaro, 623-869-2174 (Jozomaro@cap-az.com)
Thanks,

Chris Hall
Assistant General Manager - Finance and Administration,
Central Arizona Project

Attachments

Cc John Swett, MSCP Program Manager, Bureau of Reclamation
Laura Vecerina, MSCP Program Deputy Manager, Bureau of Reclamation
Ted Cooke, General Manager, CAP
Vineetha Kartha, Colorado River Programs Manager, CAP
Douglas Dunlap, Manager-Finance and Accounting, CAP
Jack Ozomaro, Financial Analyst-Financial Operations, CAP

FY 2023 Non-Federal Share ($2003 $)	$9,991,000
FY 2023 Inflation Index	1.743
FY 2023 Non-Federal Share (Escalated $)	$17,414,313

	Payback	Other Work Tasks	Remedial Measures	Total Payment
Arizona	917,650.28	4,006,721.25	346,857.00	5,271,228.53
Nevada	(458,825.14)	4,006,721.25	346,857.00	3,894,753.11
California	(458,825.14)	8,013,442.50	693,714.00	8,248,331.36
Total	-	16,026,885.00	1,387,428.00	17,414,313.00
AZQ1	229,412.57	1,001,680.31	86,714.25	1,317,807.13
AZQ2	229,412.57	1,001,680.31	86,714.25	1,317,807.13
AZQ3	229,412.57	1,001,680.31	86,714.25	1,317,807.13
AZQ4	229,412.57	1,001,680.32	86,714.25	1,317,807.14
	917,650.28	4,006,721.25	346,857.00	5,271,228.53
NVQ1	(114,706.29)	1,001,680.31	86,714.25	973,688.27
NVQ2	(114,706.29)	1,001,680.31	86,714.25	973,688.27
NVQ3	(114,706.29)	1,001,680.31	86,714.25	973,688.27
NVQ4	(114,706.27)	1,001,680.32	86,714.25	973,688.30
	(458,825.14)	4,006,721.25	346,857.00	3,894,753.11
CAQ1	(114,706.29)	2,003,360.63	173,428.50	2,062,082.84
CAQ2	(114,706.29)	2,003,360.63	173,428.50	2,062,082.84
CAQ3	(114,706.29)	2,003,360.63	173,428.50	2,062,082.84
CAQ4	(114,706.27)	2,003,360.61	173,428.50	2,062,082.84
	(458,825.14)	8,013,442.50	693,714.00	8,248,331.36

Individual State's share in $			
California Share - 50%	50%	$	8,707,156.50
Arizona Share - 25%	25%	$	4,353,578.25
Nevada Share - 25%	25%	$	4,353,578.25
Total Non-Federal Share		$	17,414,313.00

Arizona Payback ($10,529,550/20yrs = $526,477.50 X 1.743 =	$	917,650.28
California	$	(458,825.14)
Nevada	$	(458,825.14)

Total Non-Federal Share for FY23		
California Share	$	8,248,331.36
Arizona Share	$	5,271,228.53
Nevada Share	$	3,894,753.11
Total Non-Federal Share	$	17,414,313.00

U.S. BUREAU OF LABOR STATISTICS

Databases, Tables & Calculators by Subject

Change Output Options: From: 2012 To: 2022 GO
☐ Include graphs ☐ Include annual averages More Formatting Options

Data extracted on: April 27, 2022 (12:26:47 PM)

PPI Commodity Data

Series Id: WPUID612
Not Seasonally Adjusted
Series Title: PPI Commodity data for Intermediate demand by commodity type-Materials and components for construction, not seasonally adjusted
Group: Intermediate demand by commodity type
Item: Materials and components for construction
Base Date: 198200

Download: xlsx

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	215.3	216.9	217.4	218.3	219.1	219.2	218.5	218.7	219.2	219.1	219.5	219.9
2013	221.2	222.2	222.7	223.4	222.9	222.6	222.4	223.0	222.9	222.9	223.0	223.1
2014	224.8	225.8	226.6	226.9	227.4	227.4	227.7	228.2	228.5	228.6	228.5	228.4
2015	229.0	229.1	229.1	229.4	229.1	229.0	228.8	228.0	227.5	227.7	227.6	227.2
2016	227.5	227.5	227.8	228.3	228.7	229.1	229.7	230.3	230.0	229.7	229.7	230.1
2017	231.5	232.5	233.2	234.4	234.6	234.8	234.7	235.6	236.0	237.0	237.5	237.7
2018	239.7	241.2	244.3	245.4	248.1	249.0	249.4	249.2	249.6	249.6	249.1	249.7
2019	250.7	251.5	251.2	251.9	251.7	251.2	252.3	251.3	251.1	250.8	250.8	250.8
2020	252.1	252.8	254.3	252.9	252.8	253.8	255.3	258.8	263.2	262.5	261.4	263.4
2021	269.1	273.8	280.4	288.1	298.4	306.0	306.649	306.394	307.483	311.360	316.861	323.038(P)
2022	334.011(P)	340.298(P)	345.585(P)									

P : Preliminary. All indexes are subject to monthly revisions up to four months after original publication.

Bureau of Economic Analysis

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product

[Index numbers, 2012=100] Seasonally adjusted

Last Revised on: March 30, 2022 - Next Release Date April 28, 2022

Line		2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
1	**Gross domestic product**	**113.346**	**112.859**	**113.888**	**114.439**	**115.652**	**117.413**	**119.115**	**121.188**
2	**Personal consumption expenditures**	**110.946**	**110.491**	**111.490**	**111.910**	**112.970**	**114.753**	**116.257**	**118.062**
3	Goods	94.588	93.230	94.345	94.418	95.771	97.929	99.671	102.113
4	Durable goods	85.421	84.783	86.344	86.386	86.879	90.325	92.430	94.835
5	Nondurable goods	99.485	97.712	98.544	98.636	100.547	101.789	103.269	105.710
6	Services	119.599	119.709	120.620	121.263	122.105	123.589	124.900	126.251
7	**Gross private domestic investment**	**109.395**	**109.134**	**110.022**	**110.143**	**110.919**	**111.952**	**113.571**	**115.991**
8	Fixed investment	110.334	110.694	111.307	111.840	112.855	114.095	116.031	118.528
9	Nonresidential	104.488	104.867	104.899	105.009	105.207	105.433	106.553	108.582
10	Structures	120.799	120.620	120.931	121.086	122.253	124.898	128.216	135.395
11	Equipment	97.739	97.755	97.330	96.802	97.341	96.558	97.648	99.290
12	Intellectual property products	103.328	104.420	104.848	105.682	105.063	105.457	105.706	106.131
13	Residential	136.132	136.402	139.442	141.651	145.838	151.113	156.425	160.893
14	Change in private inventories	---	---	---	---	---	---	---	---
15	**Net exports of goods and services**	---	---	---	---	---	---	---	---
16	Exports	97.686	93.047	95.998	97.440	102.192	106.830	109.335	111.037
17	Goods	90.082	84.632	87.831	89.297	94.733	100.193	102.901	104.687
18	Services	114.959	112.352	114.659	115.985	118.569	120.650	122.462	123.845
19	Imports	89.139	86.349	88.008	88.489	91.286	94.210	95.617	96.929
20	Goods	85.212	82.180	83.900	84.261	87.241	90.193	91.501	92.822
21	Services	109.732	108.574	109.755	111.061	112.329	114.824	116.791	117.980
22	**Government consumption expenditures and gross investment**	**114.503**	**114.253**	**114.922**	**115.769**	**117.294**	**119.033**	**120.798**	**123.038**
23	Federal	111.400	111.443	112.267	112.957	114.063	115.226	116.641	118.259
24	National defense	109.646	109.298	110.259	110.933	112.146	113.329	114.680	116.238
25	Nondefense	114.148	114.765	115.398	116.111	117.063	118.200	119.712	121.420
26	State and local	116.535	116.093	116.659	117.612	119.417	121.545	123.542	126.190
	Addendum:								
27	Gross national product	113.332	112.846	113.873	114.432	115.632	117.392	119.093	121.165

Attachment B – Acronyms and Abbreviations

AOP	Annual Operating Plan
ARF	Arizona Recreational Facilities, LLC
BCPA	Boulder Canyon Project Act
BWSCP	Binational Water Scarcity Contingency Plan
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
DCP	Drought Contingency Plan
Decree	Supreme Court Consolidated Decree of 2006 in *Arizona* v. *California*, 547 U.S. 150
DPOCs	drain pump outlet channels
FY	fiscal year
GRIC	Gila River Indian Community
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	kilowatthour(s)

LBOps	Lower Basin Drought Contingency Operations
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
PVID	Palo Verde Irrigation District
Reclamation	Bureau of Reclamation
RRA	Reclamation Reform Act
SCAT	San Carlos Apache Tribe
SDCWA	San Diego County Water Authority
SIB	Southerly International Boundary
U.S.	United States
2019 Joint Report	*Joint Report of the Principal Engineers with the Implementing Details of the Binational Water Scarcity Contingency Plan in the Colorado River Basin*

Attachment B – Description of Take

B-1: Federal Flow-Related Covered Actions and Accomplishments, Calendar Year 2021

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 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 from 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 2021, the Lake Mead elevation varied between 1,087.43 and 1,064.91 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 2021, 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, as adjusted for system conservation activities, creation/delivery of Intentionally Created Surplus (ICS),and required Drought Contingency Plan (DCP) contributions. Arizona consumptively used 2,425,736 acre-feet, California consumptively used 4,404,727 acre-feet, and Nevada consumptively used 242,168 acre-feet. In 2021, unused entitlement within the Lower Division States was made available to the junior priority entitlement holders. The Central Arizona Water Conservation District (CAWCD) left 155,096 acre-feet of Arizona's unused apportionment in Lake Mead as non-ICS water to meet a portion of the State of Arizona's required DCP contribution.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 Accomplishments[2, 3]
2.2.1.3 Annual Operations Normal, Surplus, Shortage, and Unused Apportionment (page 2-6; Table 2-3, page 2-9)	• Issuance of an Annual Operating Plan (AOP) for Colorado River reservoirs 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 Treaty between the United States of America and Mexico, Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, signed on February 3, 1944, 59 Stat. 1219 (Mexican Water Treaty), and subsequently adopted Minutes of the International Boundary Water Commission (IBWC) • Determination of shortage, normal, or surplus conditions based on the *Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead* (Interim Guidelines) • Implementation of applicable provisions of the Lower Basin DCP, consistent with the 2019 Colorado River DCPs as authorized by Public Law 116-14	• 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 2021, which documented the operating condition for Lake Mead under the Interim Guidelines and applicable provisions of the Lower Basin DCP, was issued on January 8, 2021. Annual operations were reported through the AOP pursuant to the LROC, the Interim Guidelines, and the Lower Basin DCP to reflect current hydrologic conditions. An ICS Surplus Condition was determined for 2021. ICS was created and delivered in 2021 in accordance with the Interim Guidelines and Lower Basin DCP. 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 Mexican Water Treaty and Minutes 242 and 323. No review of the LROC was conducted in 2021.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 Accomplishments[2, 3]
2.2.1.4 Daily Hoover Dam Operations (Table 2-4, page 2-10)	• Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver Mexican Water Treaty water to Mexico, and generate hydropower with these water releases	• Monthly energy targets are set prior to each month based on the best information available with respect to downstream water demands and lake elevation targets at 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, deliver Mexican Water Treaty water to Mexico, and 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.
2.2.1.4 Daily Davis Dam Operations (Table 2-5, page 2-11)	• Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver Mexican Water Treaty water to Mexico, and generate hydropower with these water releases	• Timing of releases, to a limited degree, may be varied by a few days based on available downstream storage, Lake Mohave and Lake Havasu operational constraints, downstream water requirements, and hydropower needs	• Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States and generate hydropower with these water releases	Water releases from Davis Dam were made to satisfy beneficial use requirements of entitlement holders in the United States, deliver Mexican Water Treaty water to Mexico, and generate hydropower with these water releases. The timing of releases was varied based on available downstream storage, Lake Mohave and Lake Havasu operational constraints, downstream water requirements, and hydropower needs.
2.2.1.4 Daily Parker Dam Operations (Table 2-6, page 2-11)	• Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver Mexican Water Treaty water to Mexico, and generate hydropower with these water releases	• Timing of releases, to a limited degree, may be varied by the hour based on hydropower needs, water requirements, or other operational constraints immediately downstream from the dam	• Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States and generate hydropower with these water releases	Water releases from Parker Dam were made to satisfy beneficial use requirements of entitlement holders in the United States, deliver Mexican Water Treaty water to Mexico, and generate hydropower with these water releases. The timing of releases was varied based on available downstream water requirements, hydropower needs, and other operational constraints immediately downstream from Parker Dam.
2.2.1.4 Daily Senator Wash, Imperial Dam, Laguna Dam, and Warren H. Brock Reservoir Operations (Table 2-7, page 2-11)	• Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver Mexican Water Treaty water to Mexico, and generate hydropower with water releases for Senator Wash	• Senator Wash, Imperial Dam, and Laguna Dam operations to prevent over-deliveries, to release water to entitlement holders, for sluicing operations, to deliver a portion of the Mexican 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 Brock Reservoir were made to satisfy beneficial use requirements of entitlement holders in the United States and/or deliver Mexican Water Treaty water to Mexico. Water releases from Senator Wash, Imperial Dam, Laguna Dam, and 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 Mexican Water Treaty water deliveries to Mexico.
2.2.1.5 Electric Power Generation (page 2-11)	• Operational requirements to satisfy 43 Code of Federal Regulations (CFR) Part 431 requirements	—	—	Hydroelectric power generated: • Hoover Dam: 3,535,735,110 kilowatt hours (kWh) • Davis Dam: 1119,539,000 kWh

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 Accomplishments[2, 3]
43 CFR Part 431 (page 2-14)				• Parker Dam: 438,941,000 kWh Operations met the requirements to satisfy 43 CFR Part 431.
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 2021, 10,000 acre-feet of water were pumped by the LCWSP well field. In accordance with its contractual obligations, the Imperial Irrigation District (IID) reduced its consumptive use of Colorado River water by 10,000 acre-feet, which were made available for use by the LCWSP contractors, including The Metropolitan Water District of Southern California (Metropolitan), pursuant to LCWSP Contract No. 06-XX-30-W0452, as amended, dated March 26, 2007.
2.2.1.7 Mexican Water Treaty Deliveries (page 2-17; Table 2-9, page 2-20)	• Delivery of Mexico allotment (1.5 million acre-feet [maf]) pursuant to the Mexican Water Treaty and related minutes • Delivery of Mexico allotment (up to 1.7 maf) when the United States Secretary of the Interior 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 • Delivery of Mexico allotment pursuant to the Mexican Water Treaty and Minutes 322 and 323 • Compliance with the salinity requirements of Minute 242 of the Mexican 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 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	• Delivery of emergency water to Tijuana pursuant to Minute 322 of the Mexican Water Treaty and contract • Retention of a portion of the Metropolitan's entitlement in Lake Mead to accommodate delivery of water pursuant to Minute 323 of the Mexican Water Treaty	Water delivery met the Mexico allotment (1.5 maf) pursuant to the Mexican Water Treaty and related Minutes. Deliveries to Mexico were made pursuant to the Mexican Water Treaty and related Minutes as follows: Delivery at the limitrophe = 4,478 acre-feet Diversion for delivery at Tijuana = 0 acre-feet Delivery at the SIB = 94,385 acre-feet Diversion channel discharge = 190 acre-feet Delivery at the NIB = 1,356,008 acre-feet Pursuant to Minute 323 and the *Joint Report of the Principal Engineers with the Implementing Details of the Binational Water Scarcity Contingency Plan (BWSCP) in the Colorado River Basin*, dated July 11, 2019 (2019 Joint Report), Mexico deferred delivery of 38,962 acre-feet in 2021 for the creation of Mexico's water reserve and deferred delivery of 41,000 acre-feet to meet Mexico's required BWSCP contribution. Additionally, Mexico delivered 35,023 acre-feet from Mexico's Water Reserve in 2021, which was delivered for environmental purposes within Mexico pursuant to Sections VIII.A and VIII.B of Minute 323. A total of 28,856 acre-feet of water passed to Mexico in excess of Treaty requirements. Reclamation complied with the salinity requirements of IBWC Minute 242. A total of 134,535 acre-feet of agricultural drainage return flow were bypassed pursuant to IBWC Minute 242. Drainage pumping and delivery of drainage return flows were made to Mexico at the NIB and SIB.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 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 2021*, was published on May 13, 2022. A summary of diversions, return flows, and consumptive use is provided below. The final report is available at https://www.usbr.gov/lc/region/g4000/wtracct.html **Arizona**: Diversions = 3,231,777 acre-feet Measured returns = 604,378 acre-feet Unmeasured returns = 201,663 acre-feet Consumptive use = 2,425,736 acre-feet **California**: Diversions = 4,990,724 acre-feet Measured returns = 634,542 acre-feet Unmeasured returns = 84,564 acre-feet Consumptive use = 4,404,727 acre-feet* * Includes 133,109 acre-feet delivered from William H. Brock Reservoir. **Nevada**: Diversions = 481,079 acre-feet Measured returns = 237,414 acre-feet Unmeasured returns = 1,497 acre-feet Consumptive use = 242,168 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]	2021 Accomplishments[2, 3]
2.2.2.1 Specific Surplus and Shortage Guidelines (page 2-22; Table 2-11, page 2-24)	• Delivery of surplus water pursuant to Article II(B)(2) of the Decree • Delivery of water pursuant to Article II(B)(3) of the Decree (shortage) • Determination of shortage conditions based on criteria developed in the Interim Guidelines • Determination of surplus conditions based on criteria developed in the Interim Guidelines • DCP contribution pursuant to Lower Basin Drought Contingency Plan Agreement, dated May 20, 2019, and its Attachment Exhibit 1 – Lower Basin Drought Contingency Operations	• 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 Decree	No reductions in deliveries pursuant to Article II(B)(3) of the Decree occurred. In accordance with Section III.B.1.a of the Lower Basin Drought Contingency Operations (LBOps), the State of Arizona made a DCP contribution in the amount of 192,000 acre-feet. Additionally, in accordance with Section III.E.4 of LBOps, the State of Arizona also made a DCP contribution in the amount of 11,392 acre-feet for the DCP contribution deficiency incurred in 2020. The State of Arizona's total DCP contribution for 2021 was 203,392 acre-feet. In accordance with Section III.B.2.a of LBOps, the State of Nevada made a DCP contribution in the amount of 8,000 acre-feet.
2.2.2.2 Flood Release Contracts (page 2-24; Table 2-12, page 2-25)	• Delivery of water under executed flood release contracts	• Execution of contracts for water released during flood control operations	• Participate in the development of, and consult in the execution of, flood release contracts	No water deliveries were made under flood release contracts.
2.2.2.3 Changes in the Storage and Delivery of State Entitlement Waters through Various Administrative Actions (page 2-25; Table 2-13, page 2-26)	—	—	—	No administrative actions were taken to reduce the water deliveries as listed in Table 2-13 of the biological assessment.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 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 – 369 acre-feet • City of Needles – 175 acre-feet **System Conservation Actions:** • Colorado River Indian Tribes, Arizona (CRIT) – 54,685 acre-feet • Fort McDowell Yavapai Nation – 13,933 acre-feet • Gila River Indian Community (GRIC) – 40,000 acre-feet • Mohave Valley Irrigation and Drainage District – 6,925 acre-feet • Palo Verde Irrigation District (PVID)/Metropolitan Forbearance and Fallowing Program – 12,305 acre-feet • Reclamation (242 Well Field Expansion) – 8,813 acre-feet **DCP:** • DCP Contribution by the CAWCD – 203,392 acre-feet* * Includes the 2020 DCP contribution Deficiency in the amount of 11,392 acre-feet. The DCP contribution was made through the creation and simultaneous conversion of Extraordinary Conservation ICS to DCP ICS (48,296 acre-feet) and the creation of non-ICS water (155,096 acre-feet). **Creation/(Delivery) of ICS:** <u>State of Arizona:</u> • Creation of Extraordinary Conservation ICS by the CAWCD – 6,147 acre-feet** • Creation of Extraordinary Conservation ICS by the GRIC – 40,000 acre-feet ** 48,296 acre-feet of ICS creation by the CAWCD is included in Arizona's DCP contribution. <u>State of California:</u> • Delivery of Extraordinary Conservation ICS by the Metropolitan – (18,786) acre-feet • Creation of Extraordinary Conservation ICS by the IID – 1,579 acre-feet **Reclamation Yuma Desalting Plant** – 191 acre-feet Collectively, these actions contributed to a net reduction in flow below Hoover Dam of 369,728 acre-feet. Values are provided on a consumptive use basis.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 Accomplishments[2, 3]
Flow Changes Below Davis Dam to Parker Dam (Table 2-15, after page 2-26)	—	—	—	**Pilot System Conservation Program Conservation:** • City of Needles – 175 acre-feet **System Conservation Actions:** • CRIT – 54,685 acre-feet • Fort McDowell Yavapai Nation – 13,933 acre-feet • GRIC – 40,000 acre-feet • Mohave Valley Irrigation and Drainage District – 6,925 acre-feet • PVID/Metropolitan Forbearance and Fallowing Program – 12,305 acre-feet • Reclamation (242 Wellfield Expansion) – 8,813 acre-feet **DCP:** • DCP Contribution by the CAWCD – 203,392 acre-feet* * Includes the 2020 DCP contribution deficiency in the amount of 11,392 acre-feet. The DCP contribution was made through the creation and simultaneous conversion of Extraordinary Conservation ICS to DCP ICS (48,296 acre-feet) and the creation of non-ICS water (155,096 acre-feet). **Creation/(Delivery) of ICS:** State of Arizona • Creation of Extraordinary Conservation ICS by the CAWCD – 6,147 acre-feet:** • Creation of Extraordinary Conservation ICS by the GRIC – 40,000 acre-feet ** 48,296 acre-feet of ICS creation by the CAWCD is included in Arizona's DCP contribution. State of California: • Delivery of Extraordinary Conservation ICS by the Metropolitan– 18,786 acre-feet • Creation of Extraordinary Conservation ICS by the IID – 1,579 acre-feet **Reclamation Yuma Desalting Plant** – 191 acre-feet Collectively, these actions contributed to a net reduction in flow below Davis Dam of 369,359 acre-feet. Values are provided on a consumptive use basis.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 Accomplishments[2, 3]
Flow Changes Below Parker Dam to Imperial Dam (Table 2-16, after page 2-26)	—	—	—	**System Conservation Actions:** • CRIT – 54,685 acre-feet • PVID/Metropolitan Forbearance and Fallowing Program – 12,305 acre-feet • Reclamation (242 Wellfield Expansion) – 8,813 acre-feet **Creation/(Delivery) of ICS:** State of California: • Creation of Extraordinary Conservation ICS by the IID – 1,579 acre-feet **PVID/Metropolitan Forbearance and Fallowing Program** – 42,305 acre-feet* * The volume of conserved water generated by the PVID/Metropolitan Forbearance and Fallowing Program made available to the Metropolitan during the reporting year. **Metropolitan/Bard Water District Seasonal Fallowing Program** – 5,802 acre-feet **Colorado River Water Delivery Agreement Conservation:** • IID Transfer to the San Diego County Water Authority (SDCWA) – 205,000 acre-feet • Coachella Valley Water District (CVWD) Coachella Canal Lining Project Conservation: 26,000 acre-feet – CVWD transferred to the SDCWA – 21,500 acre-feet – CVWD transferred to the Metropolitan/San Luis Rey settlement parties – 4,500 acre-feet • IID Reduction for Miscellaneous Present Perfected Rights (PPRs) – 9,314 acre-feet • CVWD Reduction for Miscellaneous PPRs – 2,272 acre-feet

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 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 LCH 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. **Reclamation Yuma Desalting Plant** – 191 acre-feet **Additional Conservation:*** • IID Qualified Conserved Water Stored with the Metropolitan – 26,667 acre-feet • IID Additional Conserved Water – 1,762 acre-feet * For informational purposes: By letter dated April 25, 2022, the IID notified Reclamation that, in 2021, the IID provisionally created 30,008 acre-feet of extraordinary conservation in excess of its Colorado River Water Delivery Agreement water transfer obligations, of which 26,667 acre-feet of qualified conserved water was stored with the Metropolitan in accordance with the IID-Metropolitan Settlement and Release Agreement dated September 16, 2021. In accordance with the California Agreement for the Creation and Delivery of Extraordinary Conservation Intentionally Created Surplus dated December 13, 2007, 1,579 acre-feet were stored by the IID as Extraordinary Conservation ICS; the remaining 1,762 acre-feet were diverted by the Metropolitan as unused water in accordance with the California Seven-Party Agreement. Collectively, these actions contributed to a net reduction in flow below Parker Dam of 399,773 acre-feet. Values are provided on a consumptive use basis.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 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)	• The BCPA requires all Colorado River water users to have a contract with the United States Secretary of the Interior	• Implementation of appropriate policy or rule to address unlawful use of Colorado River water • Execution of water delivery contracts with entities or individuals identified as unlawful users	• Consult with States in the development of policies or rules to address unlawful use of Colorado River water • Consult with the States on the execution of water delivery contracts with entities or individuals identified as unlawful users	The well inventory is being performed for Reclamation by the U.S. Geological Survey to identify wells that draw water directly from the lower Colorado River or pump water that would be replaced by water drawn from the lower Colorado River.
Unallocated Colorado River Water in Arizona, Exclusive of Central Arizona Project (CAP) (page 2-30; Table 2-19, page 2-31) Note: Changed title from "Unallocated or Noncontract Water in Arizona, Exclusive of CAP"	• Delivery of water pursuant to executed contracts for unallocated water in Arizona (non-CAP)	• Execution of water delivery contracts for unallocated water in Arizona (non-CAP)	• Review of water delivery contracts and consultation with Arizona on contract recommendations	Unallocated non-CAP Arizona water was delivered to the CAWCD 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.
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 18, 2021, the San Carlos Apache Tribe (SCAT) and the town of Gilbert entered into a lease for the delivery of up to 11,446 acre-feet of its CAP water to the town of Gilbert during calendar year 2021. On May 18, 2021, the SCAT and Pascua Yaqui Tribe entered into a lease for the delivery of up to 1,720 acre-feet of its CAP water to the Pascua Yaqui Tribe during calendar year 2021. On May 19, 2021, the SCAT and Freeport Minerals Corporation entered into a lease for the delivery of up to 11,500 acre-feet of its CAP water to Freeport Minerals Corporation during calendar year 2021. On September 20 and 29, 2021, the CAWCD, the United States, and 14 entities executed CAP non-Indian agricultural water subcontracts consistent with a January 16, 2014, recommendation from the Arizona Department of Water Resources to reallocate 46,629 acre-feet of CAP Non-Indian Agricultural priority water.

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 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 (*Note*: Of this amount, 15,000 acre-feet were delivered to the CVWD in accordance with Section 13 of the *Second Amendment to Delivery and Exchange Agreement between MWD and CVWD For 35,000 Acre-Feet* dated December 11, 2019, and Letter Agreement No. 21-XX-30-W0710 between Reclamation and the CVWD dated May 7, 2021.) **IID Transfer to the SDCWA** – 205,000 acre-feet **Coachella Canal Lining Project Conservation** – 26,000 acre-feet • CVWD transfer to the SDCWA – 21,500 acre-feet • CVWD transfer to San Luis Rey Settlement Parties – 4,500 acre-feet **IID Intra-Priority 3 Transfer to the CVWD** – 78,000 acre-feet **IID Reduction for Miscellaneous PPRs** – 9,314 acre-feet **CVWD Reduction for Miscellaneous PPRs** – 2,272 acre-feet

Federal Covered Actions *Biological Assessment* Chapter 2	Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions[1]	2021 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 calendar year 2021.
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 contracts were executed or amended to recognize a change in amounts of delivery or changes in points of diversion.
Changes in Type of Water Use (page 2-34; Table 2-24, page 2-34)	• Delivery of water pursuant to executed contracts or contract amendments that recognize changed water use types	• Execution of contracts or contract amendments that recognize changed water use types	• Review of contracts and consultation with Reclamation on new or amended contracts	No contracts were executed or amended to recognize a change in type of water use in calendar year 2021.
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 contracts were executed or amended to include or exclude land from service areas in calendar year 2021.
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 2021.
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]	2021 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 2015.
2.5.3.5 Headgate Rock Dam Operation and Maintenance (page 2-88)	—	• Water releases and generate hydropower with these water releases	—	Existing practices were continued.
2.6 U.S. FISH AND WILDLIFE SERVICE	—	—	• Water entitlement holder	See section 2.2.1.8 accomplishments in this table.
2.7 BUREAU OF LAND MANAGEMENT	—	—	• Water entitlement holder	See section 2.2.1.8 accomplishments in this table.

[1] See the *Lower Colorado River Multi-Species Conservation Program Final Habitat Conservation Plan*, *Volume II*, "Section 2.1.1, Relationship of Non-Federal Covered Activities to Federal Nondiscretionary Actions." This can be accessed at http://www.lcrmscp.gov/publications/hcp_volii_dec04.pdf

[2] Reporting for the non-Federal flow-related covered activities (attachment B, table B-3) is included in the Federal flow-related covered actions and accomplishments.

[3] Flow-related Federal covered actions and flow-related non-Federal covered activities are reported for calendar year 2015.

B-2: Federal Non-Flow-Related Covered Actions and Incidental Take Summary, Fiscal Year 2021

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)	—	—	—							No activities in fiscal year (FY) 2021.
Wash Fans (page 2-40; Table 2-30, page 2-42)	—	• Wash fan removal	—							No activities in FY21.
Protected Bankline Maintenance and Care of Unprotected Banklines (page 2-43)	—	• Protected bankline location and maintenance	—							No activities in FY21.
Levee Maintenance (page 2-44)	—	• Levee location and maintenance	—							No activities in FY21.

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	—	5	Imperial Dam	49.9	Saltcedar and arrowweed	25	1,3 and 6	Maintenance dredging above Imperial Dam began in FY21, to include Arizona and California. Habitat acres impacted are for disposal site.
Jetties and Training Structures (page 2-47; Tables 2-33 – 2-34, page 2-48)	—	• Jetty and training structure location and maintenance	—							No activities in FY21.
Stockpiles (page 2-49; Table 2-37, page 2-49)	—	• Location of three future stockpiles	—							No activities in FY21.
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 activities performed on Yuma Valley Well YV-13 (upgrades and development).
				7	South Gila wells	A34 to A36	None	0	1, 3, and 6	No activities in FY21.
		• Maintenance of open channel drains and outfall channels		7	Yuma Mesa wells	A5 to A19	None	0	1, 3, and 6	Maintenance activities performed on the Yuma Mesa conduit and Yuma Mesa Wells 5 through 13 (pump repairs, electrical upgrades, and Supervisory Control and Data Acquisition).
		• Maintenance and replacement of gauging stations, survey line markers, and boat ramps		7	Drain pump outlet channels (DPOCs)	A34 to A36	None	0	1, 3, and 6	DPOCs were cleaned.
				7	Main outlet drain extension (MODE)	26	None	0	1, 3, and 6	Cleared main outlet drain, MODE, and bypass canal.
				3, 4	Gaging stations	87.3 and 243.6	None	0	1, 3, and 6	Repaired Cibola gage cableway and performed electrical upgrades to Needles gage.
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 and upgrades were performed on wells in the 242 well field (pumps 15–22). 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	—							No activities in FY21.
Parker Division (page 2-57; Table 2-39, page 2-57)	—	• Backwater maintenance	—	4	No Name Lake	155.0	Saltcedar and Phragmites	1	1, 3, and 6	Worked with CRIT to improve (replace) inlet and outlet
Palo Verde Division (page 2-58; Table 2-40, page 2-58)	—	• Backwater maintenance	—							No activities in FY21.
Cibola Division (page 2-58; Table 2-41, page 2-59)	—	• Backwater maintenance	—							No activities in FY21.
Imperial Division (page 2-59; Table 2-42, page 2-59)	—	• Backwater maintenance	—							No activities in FY21.
Laguna Division (page 2-60; Table 2-43, page 2-60)	—	• Backwater maintenance	—							No activities in FY21.
Yuma Division (page 2-60; Table 2-44, page 2-61)	—	• Backwater maintenance	—							No activities in FY21.
Limitrophe Division Mitigation Obligations (page 2-61; Table 2-45, page 2-62)	—	—	—	7	Fortuna Pond			0	1, 3, and 6	Well maintenance and pump replacement.

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 activities in FY21.
2.2.4 Future Non-Flow-Related Actions (page 2-63)	—	—	—							
2.2.4.1 Topock Marsh (page 2-63)	—	—	—							No activities in FY21.
2.2.4.2 Laguna Reservoir (page 2-63)	—	—	—	6	Laguna Dam	49.0	None	0	1, 3, and 6	Completed dredging activities above Laguna Dam (Laguna Reservoir Restoration Project).
2.2.4.3 Bankline Maintenance – Unprotected Banklines (page 2-65; Table 2-46, page 2-66)	—	—	—							No activities in FY21.
2.2.4.4 Proposed Jetties (page 2-67; Table 2-48, page 2-67)	—	—	—							No activities in FY21.
2.3 WESTERN AREA POWER ADMINISTRATION										No activities in FY21.
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					No activities in FY21.
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					No activities in FY21.
2.4.4 Boating Access (page 2-72)		• Maintenance and enhance-ment of boating access on Lake Mead and Lake Mohave								No activities in FY21.

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 BUREAU OF INDIAN AFFAIRS										
2.5.2.1 Ongoing Irrigation System Operation and Maintenance (page 2-74)		• Irrigation system operation and maintenance for existing irrigation projects		3	Fort Mohave	—	None	0	1 and 3	Continued existing practices.
				3	Chemehuevi	—	None	0	1 and 3	Continued existing practices.
				4	Colorado River Indian Tribe	—	None	0	1 and 3	Continued existing practices.
				6	Fort Yuma	—	None	0	1 and 3	Continued existing practices.
				7	Cocopah	—	None	0	1 and 3	Continued existing practices.
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 activities in FY21.
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 activities in FY21.
2.5.3.2 Future Water Conservation Practices (page 2-85)		• Installation, operation, and maintenance of new equipment								No activities in FY21.

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	
2.5.3.3 Future Farmland Development (page 2-85)		• Develop additional agricultural acreage, including construction of irrigation systems								No activities in FY21.
2.5.3.6 Future Wildland Fire Management (page 2-88)		• Implementation of new fuel management projects								No activities in FY21.
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 2020

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							Activities for vegetation and habitat management programs are covered under separate compliance.
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 rainbow 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							Activities for maintenance of aids to navigation and boating access are covered under separate compliance.
Law Enforcement Patrol Activities (page 2-9)	• Administer law enforcement and boating safety program using watercraft patrols							Law enforcement patrol activities are covered under separate compliance.

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	2.38 acres
	• The facilities through which return flows are returned to the river	6	Bard Water District				1 and 3	1.06 acres Only emergency work during marsh bird breeding season, March 15 – July 31.
	• 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							
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 activities in FY21.

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	—	—	—	—	—	—	No activities in FY21.
	• Aquatic, wetland, and riparian revegetation enhancement activities	—	—	—	—	—	—	No activities in FY21.
	• 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 3, 2021

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 2021 Work Plan and Budget, Fiscal Year 2019 Accomplishment Report*

This responds to your memorandum of July 12, 2021, requesting consistency review by the Fish and Wildlife Service (Service) of the combined document containing the Fiscal Year 2022 Work Plan and Budget, Fiscal Year 2020 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 2020 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 2020 covered by the LCR MSCP (October 1, 2019-September 31, 2020), 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 23, 2021.

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 2022 Work Plan and Budget contains the work tasks and estimated costs for LCR MSCP implementation during Fiscal Year 2022 beginning on October 1, 2021. 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)

Attachment D – Financial Statement

D-1: Required Contributions, FY06 – FY21

	Subtotal FY06 – FY10	Subtotal FY11 – FY15	Subtotal FY16 – FY20	FY21	Total FY06 – FY21
Bureau of Reclamation[1]					
Cash	33,058,872.00	86,558,220.00	79,047,906.00	15,166,338.00	**213,831,336.00**
Funding Credit	0.00	3,800,520.00	0.00	0.00	3,800,520.00
Bureau of Reclamation Total	**33,058,872.00**	**90,358,740**	**79,047,906.00**	**15,166,338.00**	**217,631,856.00**
Arizona					
Cash	3,270,883.60	5,506,147.38	22,081,473.79	4,282,976.33	35,141,481.10
Funding Credit	0.00	165.12	0.00	0.00	165.12
Cash Tribal Contractors	*N/A*	*N/A*	16,399.74	5719.01	22,118.75
Habitat Maintenance Fund	737,000.00	7,379,692.50	0.00	0.00	8,116,692.50
Remedial Measures Fund	*N/A*	667,806.00	1,419,467.00	302,082.00	2,389,355.00
Arizona Total	**4,007,883.60**	**13,553,811.00**	**23,517,340.53**	**4,590,777.34**	**45,669,812.47**
Nevada					
Cash	9,220,135.20	18,053,715.27	16,462,444.67	3,089,001.92	46,825,297.06
Funding Credit	0.00	330.23	0.00	0.00	330.23
Cash Tribal Contractors	*N/A*	*N/A*	2,382.82	904.16	3,286.98
Habitat Maintenance Fund	737,000.00	7,379,692.50	0.00	0.00	8,116,692.50
Remedial Measures Fund	*N/A*	1,237,884.00	1,419,467.00	302,082.00	2,959,433.00
In-Kind Credit	436,000.00	436,000.00	0.00	0	872,000.00
Nevada Total	**10,393,135.20**	**27,107,622.00**	**17,884,294.49**	**3,391,988.08**	**58,777,039.77**
California					
Cash	16,846,894.93	28,693,127.34	32,910,187.23	6,215,416.47	84,665,625.97
The Metropolitan Water District of Southern California	9,924,055.91	12,095,549.69	18,166,007.35	3,361,469.64	43,547,082.59
Imperial Irrigation District	2,727,356.94	7,454,596.05	6,521,452.26	1,251,222.89	17,954,628.14
Coachella Valley Water District	1,487,649.26	4,066,143.30	3,557,155.77	682,485.21	9,793,433.54
Los Angeles Department of Water and Power	843,001.25	2,304,147.87	1,985,133.03	377,124.77	5,509,406.92
San Diego County Water Authority	456,454.63	0.00	0.00	0	456,454.63
Palo Verde Irrigation District	664,552.28	739,618.77	803,977.54	171,097.42	2,379,246.01
Southern California Public Power Authority	347,118.16	948,766.78	817,767.59	155,399.81	2,269,052.34
Southern California Edison Company	297,529.86	813,228.66	699,195.73	132,650.30	1,942,604.55
Bard	33,058.88	90,358.74	79,047.90	15,166.34	217,631.86
Colorado River Board of California	33,058.88	90,358.74	79,047.90	15,166.34	217,631.86
Needles	33,058.88	90,358.74	79,047.90	15,166.34	217,631.86
Cash Schedule D Contractors	*N/A*	*N/A*	122,354.26	38,467.41	160,821.67
Funding Credit					
San Diego County Water Authority	336,958.27	2,168,609.76	1,897,149.75	363,992.11	4,766,709.89
The Metropolitan Water District of Southern California	0.00	1,987,279,52	**0.00**	**0.00**	**1,987,279.52**
Habitat Maintenance Fund	**1,474,000.00**	**14,759,385.00**	**0.00**	**0.00**	**16,233,385.00**
Remedial Measures Fund	***N/A***	**2,088,905.38**	**2,838,934.00**	**604,164.00**	**5,532,003.38**
California Total	**18,657,853.20**	**49,697,307.00**	**37,646,270.98**	**7,183,572.58**	**113,185,003.76**
TOTAL	**66,117,744.00**	**180,717,480.00**	**158,095,812.00**	**30,332,676.00**	**435,263,712.00**

[1] Reflects the Bureau of Reclamation's (Reclamation) required funding amount. Reclamation's credits and debits are tracked in table D-2e.

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	239,784.00	1.518	363,992.11
2022	114,848.61	114,848.61	1.565	179,738.08
2023	0.00			

[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	0.00			

[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	0.00			

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	0.00			

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	131,418.46[3]	1.387	94,750.15	5,688,428.69
2017	(724,589.65)	1.393	(520,164.86)	5,168,263.83
2018	1,295,823.63	1.410	919,023.85	6,087,287.68
2019	2,012,002.08	1.442	1,395,285.77	7,482,573.45
2020	(716,296.69)	1.501	(477,212.99)	7,005,360.46
2021	235,409.47	1.518	155,078.70	7,160,439.16

[1] Based on expenditures.
[2] Revised inflation index.
[3] E17 expenditures revised to account for accrual at end of FY16 that was reversed in FY17. This adjusted the FY16 Federal Credit.

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[2]	$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										$35,113,363.19
2020										$35,741,432.17
2021										$35,998,419.76
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."
[2] The Habitat Maintenance Fund was fully funded in FY15.

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[2]	$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
2020										$8,549,441.92
2021										$8,550,296.02
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."
[2] The Arizona Habitat Maintenance Fund was fully funded in FY15.

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[2]	$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										$8,621,644.68
2020										$8,817,789.49
2021										$8,900,793.84
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."
[2] The Nevada Habitat Maintenance Fund was fully funded in FY15.

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]	$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
2020										$18,374,200.76
2021										$18,547,329.90
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."
[2] The California Habitat Maintenance Fund was fully funded in FY15.

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	$798,000.00	$0.00	$798,000.00	1.251[1]	$998,298.00	$0.00	$998,298.00	$998,298.00	$1,001,102.71
2014	$266,000	$266,000.00	$0.00	$266,000.00	1.276[1]	$339,416.00	$0.00	$339,416.00	$1,337,714.00	
2014[2]						$37,373.00		$37,373.00	$1,375,087.00	
2014[3]			$756,381.59	$756,381.59	1.347		$1,018,846.00	$1,018,846.00	$2,393,933.00	
2014[4]							$38,632.44	$38,632.44	$2,432,565.44	$2,441,713.88
2015[2]						$37,373.00		$37,373.00	$2,469,938.44	
2015[3]			$892,398.95	$892,398.95	1.347		$1,202,061.38	$1,202,061.38	$3,671,999.82	
2015	$266,000	$266,000.00		$266,000.00	1.358	$361,228.00	($38,632.44)	$322,595.56	$3,994,595.38	$4,019,296.52
2016	$796,000	$796,000.00	$0.00	$796,000.00	1.387	$1,104,052.00	$0.00	$1,104,052.00	$5,098,647.38	$5,154,340.85
2017	$796,000	$796,000.00	$0.00	$796,000.00	1.393	$1,108,828.00	$0.00	$1,108,828.00	$6,207,475.38	$6,315,323.07
2018	$796,000	$796,000.00	$0.00	$796,000.00	1.410	$1,122,360.00	$0.00	$1,122,360.00	$7,329,835.38	$7,542,121.16
2019	$796,000	$796,000.00	$0.00	$796,000.00	1.442	$1,147,832.00	$0.00	$1,147,832.00	$8,477,667.38	$9,142,832.05
2020	$796,000	$796,000.00	$0.00	$796,000.00	1.501	$1,194,796.00	$0.00	$1,194,796.00	$9,672,463.38	$10,242,242.64
2021	$796,000	$796,000.00	$0.00	$796,000.00	1.518	$1,208,328.00	$0.00	$1,208,328.00	$10,880,791.38	$11,522,832.16
2022	$796,000	$796,000.00	$0.00	$796,000.00	1.565	$1,245,740.00	$0.00	$1,245,740.00		
2023	$796,000	$796,000.00	$0.00	$796,000.00	1.743	$1,387,428.00	$0.00	$1,387,428.00		
2024	$796,000	$796,000.00	$0.00	$796,000.00						
2025	$796,000	$796,000.00	$0.00	$796,000.00						
2026	$796,000	$796,000.00	$0.00	$796,000.00						
2027	$796,000	$796,000.00	$0.00	$796,000.00						
2028	$796,000	$507,800.01	$0.00	$507,800.01						
2029	$796,000	$199,000.00	$0.00	$199,000.00						
2030	$796,000	$32,149.45	$0.00	$32,149.45						
Total	**$13,270,000**	**$11,621,219.45**	**$1,648,780.54**	**$13,270,000.00**						

[1] Original inflation index.
[2] Underfunding makeup.
[3] Underfunding makeup additional.
[4] Underfunding overpay.

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	$0.00	$199,500.00	1.251[1]	$249,574.50	$0.00	$249,574.50	$249,574.50	$249,574.50
2014	$66,500	$66,500.00	$0.00	$66,500.00	1.276[1]	$84,854.00	$0.00	$84,854.00	$334,428.50	
2014[2]						$18,686.50		$18,686.50	$353,115.00	
2014[3]			$166,580.55	$166,580.55	1.347		$224,384.00	$224,384.00	$577,495.00	
2014[4]							$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	$199,000.00	$0.00	$199,000.00	1.387	$276,013.00	$0.00	$276,013.00	$943,819.00	$944,722.67
2017	$199,000	$199,000.00	$0.00	$199,000.00	1.393	$277,207.00	$0.00	$277,207.00	$1,221,026.00	$1,227,167.99
2018	$199,000	$199,000.00	$0.00	$199,000.00	1.410	$280,590.00	$0.00	$280,590.00	$1,501,616.00	$1,526,352.71
2019	$199,000	$199,000.00	$0.00	$199,000.00	1.442	$286,958.00	$0.00	$286,958.00	$1,788,574.00	$1,849,270.61
2020	$199,000	$199,000.00	$0.00	$199,000.00	1.501	$298,699.00	$0.00	$298,699.00	$2,087,273.00	$2,165,688.90
2021	$199,000	$199,000.00	$0.00	$199,000.00	1.518	$302,082.00	$0.00	$302,082.00	$2,389,355.00	$2,467,157.83
2022	$199,000	$199,000.00	$0.00	$199,000.00	1.565	$311,435.00	$0.00	$311,435.00		
2023	$199,000	$199,000.00	$0.00	$199,000.00	1.743	$346,857.00	$0.00	$346,857.00		
2024	$199,000	$199,000.00	$0.00	$199,000.00						
2025	$199,000	$199,000.00	$0.00	$199,000.00						
2026	$199,000	$199,000.00	$0.00	$199,000.00						
2027	$199,000	$199,000.00	$0.00	$199,000.00						
2028	$199,000	$199,000.00	$0.00	$199,000.00						
2029	$199,000	$199,000.00	$0.00	$199,000.00						
2030	$199,000	$32,419.45	$0.00	$32,419.45						
Program Total	**$3,317,500**	**$3,150,919.45**	**$166,580.55**	**$3,317,500.00**						

[1] Original inflation index.
[2] Underfunding makeup.
[3] Underfunding makeup additional.
[4] Underfunding overpay.

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	$0.00	$199,500.00	1.251[1]	$249,574.50	$0.00	$249,574.50	$249,574.50	$249,601.70
2014	$66,500	$66,500.00	$0.00	$66,500.00	1.276[1]	$84,854.00	$0.00	$84,854.00	$334,428.50	
2014[2]						$18,686.50		$18,686.50	$353,115.00	
2014[3]			$589,801.04	$589,801.04	1.347		$794,462.00	$794,462.00	$1,147,577.00	
2014[4]							$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	$199,000.00	$0.00	$199,000.00	1.387	$276,013.00	$0.00	$276,013.00	$1,513,897.00	$1,524,135.35
2017	$199,000	$199,000.00	$0.00	$199,000.00	1.393	$277,207.00	$0.00	$277,207.00	$1,791,104.00	$1,811,095.89
2018	$199,000	$199,000.00	$0.00	$199,000.00	1.410	$280,590.00	$0.00	$280,590.00	$2,071,694.00	$2,114,338.50
2019	$199,000	$199,000.00	$0.00	$199,000.00	1.442	$286,958.00	$0.00	$286,958.00	$2,358,652.00	$2,703,995.03
2020	$199,000	$199,000.00	$0.00	$199,000.00	1.501	$298,699.00	$0.00	$298,699.00	$2,657,351.00	$2,792,634.98
2021	$199,000	$199,000.00	$0.00	$199,000.00	1.518	$302,082.00	$0.00	$302,082.00	$2,960,153.00	$3,114,770.71
2022	$199,000	$199,000.00	$0.00	$199,000.00	1.565	$311,435.00	$0.00	$311,435.00		
2023	$199,000	$199,000.00	$0.00	$199,000.00	1.743	$346,857.00	$0.00	$346,857.00		
2024	$199,000	$199,000.00	$0.00	$199,000.00						
2025	$199,000	$199,000.00	$0.00	$199,000.00						
2026	$199,000	$199,000.00	$0.00	$199,000.00						
2027	$199,000	$199,000.00	$0.00	$199,000.00						
2028	$199,000	$7,198.96	$0.00	$7,198.96						
2029	$199,000	$0.00	$0.00	$0.00						
2030	$199,000	$0.00	$0.00	$0.00						
Program Total	**$3,317,500**	**$2,727,698.96**	**$589,801.04**	**$3,317,500.00**						

[1] Original inflation index.
[2] Underfunding makeup.
[3] Underfunding makeup additional.
[4] Underfunding overpay.

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	$399,000.00	$0.00	$399,000.00	1.251[1]	$499,149.00	$0.00	$499,149.00	$499,149.00	$501,926.51
2014	$133,000	$133,000.00	$0.00	$133,000.00	1.276[1]	$169,708.00	$0.00	$169,708.00	$668,857.00	$677,370.74
2015[2]						$37,373.00		$37,373.00	$706,230.00	
2015[3]			$892,398.95	$892,398.95	1.347		$1,202,061.38	$1,202,061.38	$1,908,291.38	
2015	$133,000	$133,000.00	$0.00	$133,000.00	1.358	$180,614.00	$0.00	$180,614.00	$2,088,905.38	$2,108,612.89
2016	$398,000	$398,000.00	$0.00	$398,000.00	1.387	$552,026.00	$0.00	$552,026.00	$2,640,931.38	$2,685,482.83
2017	$398,000	$398,000.00	$0.00	$398,000.00	1.393	$554,414.00	$0.00	$554,414.00	$3,195,345.38	$3,277,059.19
2018	$398,000	$398,000.00	$0.00	$398,000.00	1.410	$561,180.00	$0.00	$561,180.00	$3,756,525.38	$3,901,429.95
2019	$398,000	$398,000.00	$0.00	$398,000.00	1.442	$573,916.00	$0.00	$573,916.00	$4,330,441.38	$4,589,566.41
2020	$398,000	$398,000.00	$0.00	$398,000.00	1.501	$597,398.00	$0.00	$597,398.00	$4,927,839.38	$5,283,918.76
2021	$398,000	$398,000.00	$0.00	$398,000.00	1.518	$604,164.00	$0.00	$604,164.00	$5,532,003.38	$5,940,903.62
2022	$398,000	$398,000.00	$0.00	$398,000.00	1.565	$622,870.00	$0.00	$622,870.00		
2023	$398,000	$398,000.00	$0.00	$398,000.00	1.743	$693,714.00	$0.00	$693,714.00		
2024	$398,000	$398,000.00	$0.00	$398,000.00						
2025	$398,000	$398,000.00	$0.00	$398,000.00						
2026	$398,000	$398,000.00	$0.00	$398,000.00						
2027	$398,000	$398,000.00	$0.00	$398,000.00						
2028	$398,000	$301,601.05	$0.00	$301,601.05						
2029	$398,000	$0.00	$0.00	$0.00						
2030	$398,000	$0.00	$0.00	$0.00						
Total	**$6,635,000**	**$5,742,601.05**	**$892,398.95**	**$6,635,000.00**						

[1] Original inflation index.
[2] Underfunding makeup.
[3] Underfunding makeup additional.

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	$9,730,000	$5,670,000
2020	$0	$0	$5,670,000
2021	$0	$0	$5,670,000
2022	$0	$0	$5,670,000
2023	$0	$0	$5,670,000

D-4: Cumulative Program Accomplishment, FY04 – FY05, FY06 –FY10, FY11 – FY15, FY16 – FY20, FY21, FY04 – FY21

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 – FY20 Expenditures	FY21 Obligations	FY21 Expenditures	FY04 – FY21 Expenditures
A1	$403,953.57	$5,449,608.25	$5,141,558.77	$6,124,670.46	$1,322,129.24	$1,322,129.24	$18,441,920.29
G2	$0.00	$130,535.22	$0.00	$0.00	$0.00	$0.00	$130,535.22
Total A	**$403,953.57**	**$5,580,143.47**	**$5,141,558.77**	**$6,124,670.46**	**$1,322,129.24**	**$1,322,129.24**	**$18,572,455.51**
B1	$170,868.72	$1,066,391.84	$921,401.81	$981,242.06	$218,481.80	$218,481.80	$3,358,386.23
B2	$145,568.04	$1,659,561.45	$1,605,411.67	$1,439,544.77	$620,968.81	$291,110.89	$5,141,196.82
B3	$14,527.30	$417,611.27	$812,275.52	$688,049.93	$187,778.10	$249,095.73	$2,181,559.75
B4	$9,857.95	$845,339.56	$1,287,567.57	$1,342,830.41	$275,538.95	$195,490.26	$3,681,085.75
B5	$40,720.81	$1,115,649.42	$1,583,166.66	$2,175,756.00	$152,995.78	$164,643.74	$5,079,936.63
B6	$25,878.76	$234,358.80	$390,860.55	$1,566,053.56	$605,254.96	$504,784.77	$2,721,936.44
B7	$186,003.61	$862,848.38	$1,001,518.88	$809,338.91	$155,162.63	$150,662.63	$3,010,372.41
B8	$124,792.00	$316,603.38	$437,409.68	$727,183.73	$21,585.07	$109,218.07	$1,715,206.86
B9	$3,073.11	$534.14	$0.00	$0.00	$0.00	$0.00	$3,607.25
B10	$0.00	$537,148.73	$17,672.96	$0.00	$0.00	$0.00	$554,821.69
B11	$0.00	$250,664.96	$178,289.49	$62.19	$0.00	$0.00	$429,016.64
B12	$0.00	$0.00	$0.00	$285,071.30	$78,527.29	$112,350.22	$397,421.52
Total B	**$721,290.30**	**$7,306,711.93**	**$8,235,574.79**	**$10,015,132.86**	**$2,316,293.39**	**$1,995,838.11**	**$28,274,547.99**
C1	$45,276.00	$101,382.15	$0.00	$0.00	$0.00	$0.00	$146,658.15
C2	$0.00	$50,000.00	$65,851.18	$50,060.43	$12,337.13	$12,337.13	$178,248.74
C3	$0.00	$225,763.98	$52,899.88	$0.00	$0.00	$0.00	$278,663.86
C4	$0.00	$64,782.41	$50,050.43	$4,898.43	$0.00	$0.00	$119,731.27
C5	$0.00	$319,598.56	$234,278.88	$0.00	$0.00	$0.00	$553,877.44
C6	$0.00	$101,441.68	$0.00	$0.00	$0.00	$0.00	$101,441.68
C7	$0.00	$546,964.77	-$2,315.00	$0.00	$0.00	$0.00	$544,649.77
C8	$136,060.00	$444,257.78	$0.00	$0.00	$0.00	$0.00	$580,317.78
C9	$43,816.00	$69,039.62	$0.00	$0.00	$0.00	$0.00	$112,855.62
C10	$0.00	$576,061.87	$488,660.39	$31,450.75	$0.00	$0.00	$1,096,173.01
C11	$0.00	$548,492.74	$578,795.96	$27,562.06	$0.00	$0.00	$1,154,850.76
C12	$0.00	$813,567.37	$222,699.50	$0.00	$0.00	$0.00	$1,036,266.87
C13	$99,996.80	$1,131,690.20	$463,921.41	$232,180.41	$0.00	$0.00	$1,927,788.82
C14	$0.00	$85,336.94	$202,650.17	$1,290.00	$0.00	($321.75)	$288,955.36
C15	$22,255.00	$450,245.67	$23,239.78	$0.00	$0.00	$0.00	$495,740.45
C16	$0.00	$55,332.60	$0.00	$0.00	$0.00	$0.00	$55,332.60
C17	$9,750.00	$0.00	$0.00	$0.00	$0.00	$0.00	$9,750.00
C18	$41,981.82	$0.00	$0.00	$0.00	$0.00	$0.00	$41,981.82
C19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C20	$53,779.96	$0.00	$0.00	$0.00	$0.00	$0.00	$53,779.96
C21	$70,000.00	$0.00	$0.00	$0.00	$0.00	$0.00	$70,000.00
C22	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
C23	$0.00	$356,826.42	$0.00	$0.00	$0.00	$0.00	$356,826.42
C24	$0.00	$618,939.19	$1,088,443.70	$875,097.69	$0.00	$0.00	$2,582,480.58
C25	$0.00	$592,084.80	$1,052,356.76	$389,697.60	$0.00	$0.00	$2,034,139.16
C26	$0.00	$50,111.40	$78,699.67	$0.00	$0.00	$0.00	$128,811.07

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 – FY20 Expenditures	FY21 Obligations	FY21 Expenditures	FY04 – FY21 Expenditures
C27	$0.00	$258,044.64	$180,660.54	$19,148.00	$0.00	$0.00	$457,853.18
C28	$0.00	$121,555.67	$31,527.07	$0.00	$0.00	$0.00	$153,082.74
C29	$0.00	$106,526.28	$100,000.00	$0.00	$0.00	$0.00	$206,526.28
C30	$0.00	$153,121.71	$186,897.58	$0.00	$0.00	$0.00	$340,019.29
C31	$0.00	$140,518.71	$509,512.62	$563,090.32	$0.00	$29,918.69	$1,243,040.34
C32	$0.00	$173,121.81	$517,835.16	$209,591.71	$0.00	$0.00	$900,548.68
C33	$0.00	$81,186.05	$450,438.52	$0.00	$0.00	$0.00	$531,624.57
C34	$0.00	$111,714.31	$12,304.81	$0.00	$0.00	$0.00	$124,019.12
C35	$0.00	$10,688.46	$510,228.60	$0.00	$0.00	$0.00	$520,917.06
C36	$0.00	$93,004.96	$158,863.99	$0.00	$0.00	$0.00	$251,868.95
C37	$0.00	$113,822.56	$177,340.58	$0.00	$0.00	$0.00	$291,163.14
C38	$0.00	$6,250.70	$0.00	$0.00	$0.00	$0.00	$6,250.70
C39	$0.00	$170,403.17	$1,000,552.97	$0.00	$0.00	$0.00	$1,170,956.14
C40	$0.00	$2,106.76	$758,341.60	$1,044,090.94	$0.00	$17,473.27	$1,822,012.57
C41	$0.00	$5,885.67	$180,615.94	$0.00	$0.00	$0.00	$186,501.61
C42	$0.00	$49,236.73	$410,961.44	$0.00	$0.00	$0.00	$460,198.17
C43	$0.00	$0.00	$110,099.63	$57,581.02	$0.00	$0.00	$167,680.65
C44	$0.00	$0.00	$242,133.66	$0.00	$0.00	$0.00	$242,133.66
C45	$0.00	$0.00	$717,366.60	$0.00	$0.00	$0.00	$717,366.60
C46	$0.00	$0.00	$296,058.13	$0.00	$0.00	$0.00	$296,058.13
C47	$0.00	$0.00	$717,535.15	$0.00	$0.00	$0.00	$717,535.15
C48	$0.00	$0.00	$101,084.94	$0.00	$0.00	$0.00	$101,084.94
C49	$0.00	$0.00	$249,235.78	$0.00	$0.00	$0.00	$249,235.78
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	$42,560.10
C52	$0.00	$0.00	$513,269.60	$318,723.60	$0.00	$0.00	$831,993.20
C53	$0.00	$0.00	$410,889.16	$278,165.20	$0.00	$0.00	$689,054.36
C54	$0.00	$0.00	$9,110.44	$0.00	$0.00	$0.00	$9,110.44
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	$22,208.29
C57	$0.00	$0.00	$541,878.93	$154,454.99	$0.00	$0.00	$696,333.92
C58	$0.00	$0.00	$30,179.14	$0.00	$0.00	$0.00	$30,179.14
C59	$0.00	$0.00	$110,385.45	$500,102.27	$10,167.92	$128,684.32	$739,172.04
C60	$0.00	$0.00	$120,067.55	$748,805.55	$165,932.83	$148,987.71	$1,017,860.81
C61	$0.00	$0.00	$209,893.35	$489,563.09	$3,421.37	$6,957.21	$706,413.65
C62	$0.00	$0.00	$251,387.83	$277,047.67	$0.00	$0.00	$528,435.50
C63	$0.00	$0.00	$102,751.51	$260,563.16	$0.00	$22,462.67	$385,777.34
C64	$0.00	$0.00	$502,874.59	$2,324,447.04	$474,730.77	$420,197.28	$3,247,518.91
C65	$0.00	$0.00	$20,738.26	$278,450.72	$0.00	$0.00	$299,188.98
C66	$0.00	$0.00	$0.00	$144,578.17	$0.00	$0.00	$144,578.17
Total C	**$522,915.58**	**$8,799,108.34**	**$15,108,022.22**	**$9,280,640.82**	**$666,590.02**	**$786,696.53**	**$34,497,383.49**

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 – FY20 Expenditures	FY21 Obligations	FY21 Expenditures	FY04 – FY21 Expenditures
D1	$29,367.09	$130,308.25	$130,797.53	$185,834.82	$43,779.61	$43,779.61	$520,087.30
D2	$370,174.62	$3,602,160.66	$3,649,573.42	$3,120,098.26	$430,713.56	$412,115.96	$11,154,122.92
D3	$0.00	$427,612.12	$310,908.17	$0.00	$0.00	$0.00	$738,520.29
D4	$60,520.00	$200,571.38	$0.00	$0.00	$0.00	$0.00	$261,091.38
D5	$247,118.33	$1,245,689.80	$1,358,964.39	$1,193,405.19	$202,872.97	$202,872.97	$4,248,050.68
D6	$0.00	$761,484.19	$1,555,281.71	$1,170,936.28	$474,485.94	$451,614.70	$3,939,316.88
D7	$0.00	$2,309,256.14	$3,019,380.04	$1,753,448.28	$61,146.32	$61,146.32	$7,143,230.78
D8	$134,246.08	$2,089,212.74	$3,500,095.26	$5,129,358.35	$1,204,857.53	$1,201,587.33	$12,054,499.76
D9	$0.00	$477,001.13	$1,193,232.34	$921,866.35	$89,994.14	$90,033.86	$2,682,133.68
D10	$0.00	$51,830.67	$160,396.07	$132,430.15	$0.00	$0.00	$344,656.89
D11	$269,097.12	$0.00	$0.00	$0.00	$0.00	$0.00	$269,097.12
D12	$0.00	$7,730.12	$429,684.25	$56,310.05	$0.00	$0.00	$493,724.42
D13	$0.00	$0.00	$29,381.98	$0.00	$0.00	$0.00	$29,381.98
D14	$0.00	$0.00	$0.00	$26,721.25	$13,155.83	$13,155.83	$39,877.08
D15	$0.00	$0.00	$0.00	$141,817.24	$509,651.81	$255,943.52	$397,760.76
Total D	**$1,110,523.24**	**$11,302,857.20**	**$15,337,695.16**	**$13,832,226.22**	**$3,030,657.71**	**$2,732,250.10**	**$44,315,551.92**
E1	$1,223,657.72	$948,680.39	$1,815,137.41	$2,645,599.95	$855,285.15	$846,441.14	$7,479,516.61
E2	$147,333.85	$508,005.30	$140,060.18	$0.00	$0.00	$0.00	$795,399.33
E3	$484,011.77	$325,862.80	$61,353.62	$0.00	$0.00	$0.00	$871,228.19
E4	$17,278.54	$3,952,533.88	$5,351,078.84	$2,658,088.42	$1,046,340.90	$934,548.10	$12,913,527.78
E5	$100,548.43	$8,981,972.21	$2,269,193.14	$2,700,195.74	$518,424.23	$486,189.56	$14,538,099.08
E6	$79,586.39	$39,474.36	$0.00	$0.00	$0.00	$0.00	$119,060.75
E7	$312,199.68	$18,421.87	$0.00	$0.00	$0.00	$0.00	$330,621.55
E8	$1,035.50	$837,004.58	$22,143.98	$0.00	$0.00	$0.00	$860,184.06
E9	$53,320.19	$4,226,506.44	$2,543,130.10	$1,034,566.81	$737,069.16	$752,283.11	$8,609,806.65
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	$76,211.53
E13	$25,912.33	$101,424.49	$0.00	$133,456.81	$46,684.37	$46,684.37	$307,478.00
E14	$84,309.07	$7,171,901.60	$2,413,003.65	$2,223,042.13	$522,726.25	$468,651.79	$12,360,908.24
E15	$0.00	$1,265,224.57	$428,756.47	$0.00	$0.00	$0.00	$1,693,981.04
E16	$5,392.59	$993,317.46	$1,955,608.78	$5,743,377.56	$153,665.56	$158,515.39	$8,856,211.78
E17	$0.00	$37,724.66	$1,102,894.00	$275,662.77[1]	$0.00	$343,331.22	$1,759,612.65
E18	$0.00	$372,729.14	$1,236,035.62	$1,008,482.18	$194,614.85	$177,600.97	$2,794,847.91
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	$35,000.00
E21	$19,739.97	$109,196.40	$215,275.85	$20,391,202.30	$1,548,340.64	$1,857,189.02	$22,592,603.54
E22	$4,028.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,028.00
E23	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E24	$0.00	$2,020,229.12	$2,458,779.14	$4,115,140.61	$1,302,182.98	$600,277.96	$9,194,426.83
E25	$0.00	$201,394.44	$115,873.76	$116,445.72	$17,318.58	$9,318.58	$443,032.50
E25 In-Kind	$0.00	$436,000.00	$436,000.00	$0.00	$0.00	$0.00	$872,000.00
E26	$0.00	$147.62	$0.00	$0.00	$0.00	$0.00	$147.62
E27	$0.00	$295,869.31	$25,958,686.14	$1,565,771.31	$173,665.85	$172,728.57	$27,993,055.33
E28	$0.00	$156,905.74	$1,538,805.52	$1,503,087.23	$202,970.50	$205,684.04	$3,404,482.53

Work Task	FY04 – FY05 Expenditures	FY06 – FY10 Expenditures	FY11 – FY15 Expenditures	FY16 – FY20 Expenditures	FY21 Obligations	FY21 Expenditures	FY04 – FY21 Expenditures
E29	$0.00	$173,512.57	$59,683.31	$0.00	$0.00	$0.00	$233,195.88
E30	$0.00	$0.00	$255,733.98	$0.00	$0.00	$0.00	$255,733.98
E31	$0.00	$0.00	$440,441.26	$150,028.22	$36,977.87	$40,506.06	$630,975.54
E32	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E33	$0.00	$0.00	$1,268,018.44	$563,506.98	$8,094.25	$8,094.25	$1,839,619.67
E34	$0.00	$0.00	$133,159.02	$123,684.47	$0.00	$0.00	$256,843.49
E35	$0.00	$0.00	$324,968.99	$10,176,868.14	$125,170.92	$108,010.92	$10,609,848.05
E36	$0.00	$0.00	$0.00	$25,837.30	$5,386.23	$13,386.23	$39,223.53
E37	$0.00	$0.00	$0.00	$418,303.16	$1,072.08	$72,534.87	$490,838.03
E38	$0.00	$0.00	$0.00	$345,284.05	$5,480.20	$5,480.20	$350,764.25
E39	$0.00	$0.00	$0.00	$12,628,553.05	$1,539,051.45	$1,718,889.98	$14,347,443.03
E40	$0.00	$0.00	$0.00	$1,877,683.64	$568,674.42	$1,798,361.85	$3,676,045.49
E41	$0.00	$0.00	$0.00	$97,928.06	$750,756.07	$265,901.88	$363,829.94
Total E	**$2,625,781.46**	**$33,217,823.05**	**$52,543,821.20**	**$72,521,796.61**	**$10,359,952.51**	**$11,090,610.06**	**$171,999,832.38**
F1	$199,492.67	$1,338,304.56	$2,741,582.10	$3,119,126.78	$602,741.41	$632,924.72	$8,031,430.83
F2	$65,235.81	$558,948.29	$1,023,786.96	$1,921,778.31	$432,732.94	$415,962.06	$3,985,711.43
F3	$23,023.55	$178,096.37	$224,767.11	$309,303.49	$58,264.96	$58,264.96	$793,455.48
F4	$0.00	$370,759.30	$683,041.46	$443,028.71	$93,405.85	$85,411.79	$1,582,241.26
F5	$0.00	$508,229.54	$1,013,665.04	$1,820,433.78	$402,431.42	$388,527.99	$3,730,856.35
F6	$0.00	$58,283.91	$389,433.51	$142,726.05	$16,780.81	$16,780.81	$607,224.28
F7	$0.00	$0.00	$78,366.68	$137,813.35	$7,751.71	$7,751.71	$223,931.74
F8	$0.00	$0.00	$0.00	$12,238.75	$5,774.47	$5,774.47	$18,013.22
F9	$0.00	$0.00	$0.00	$722,321.39	$337,494.58	$331,922.20	$1,054,243.59
F10	$0.00	$0.00	$0.00	$1,842,645.53	$664,003.61	$575,963.41	$2,418,608.94
Total F	**$287,752.03**	**$3,012,621.97**	**$6,154,642.86**	**$10,471,416.14**	**$2,621,381.76**	**$2,519,284.12**	**$22,445,717.12**
G1	$0.00	$1,124,098.20	$3,436,647.91	$5,097,478.85	$1,071,735.77	$1,053,634.40	$10,711,859.36
G3	$0.00	$1,478,396.05	$991,137.22	$422,715.06	$20,015.09	$7,305.59	$2,899,553.92
G4	$0.00	$217,908.07	$919,478.57	$1,952,998.85	$172,221.62	$263,122.22	$3,353,507.71
G6	$0.00	$0.00	$0.00	$215,817.22	$25,404.07	$28,474.20	$244,291.42
Total G	**$0.00**	**$2,820,402.32**	**$5,347,263.70**	**$7,689,009.98**	**$1,289,376.55**	**$1,352,536.41**	**$17,209,212.41**
H1	$0.00	$2,948,000.00	$29,518,770.00	$0.00	$0.00	$0.00	$32,466,770.00
H2	$0.00	$0.00	$3,994,595.38	$5,677,868.00	$1,208,328.00	$1,208,328.00	$10,880,791.38
Total H	**$0.00**	**$2,948,000.00**	**$33,513,365.38**	**$5,677,868.00**	**$1,208,328.00**	**$1,208,328.00**	**$43,347,561.38**
I1	$0.00	$35,376.14	$473,628.79	$586,979.13	$118,884.54	$118,884.54	$1,214,868.60
G5	$0.00	$61,059.68	$0.00	$0.00	$0.00	$0.00	$61,059.68
Total I	**$0.00**	**$96,435.82**	**$473,628.79**	**$586,979.13**	**$118,884.54**	**$118,884.54**	**$1,275,928.28**
GRAND Totals	**$5,672,216.18**	**$75,084,104.10**	**$141,855,572.87**	**$136,199,740.22**	**$22,933,590.72**	**$23,126,557.11**	**$381,938,190.48**

[1] E17 expenditures in FY16 revised to account for accrual at end of FY16 that was reversed in FY17.

Attachment E – Reports Published in Fiscal Year 2021

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 – Lake Mead National Recreation Area, 2020 Annual Report
C31	Razorback Sucker Genetic Diversity Assessment, 2016 Annual Report
C64	Population Status and Distribution of Razorback Sucker and Bonytail Downstream from Palo Verde Dam, 2020 Annual Report
D1	Marsh Bird Surveys in Topock Gorge, 2021 Annual Report
D2	Southwestern Willow Flycatcher Surveys and Monitoring Along the Lower Colorado River and Tributaries, 2020 Annual Report
D6	Gilded Flicker Surveys on the Lower Colorado River and Tributaries, 2020 Annual Report
D8	Demographics and Monitoring of Repatriated Razorback Suckers in Lake Mohave, 2020 Annual Report
D8	Razorback Sucker Studies on Lake Mead, Nevada and Arizona, 2019–2020
D9	System-Wide Acoustic Monitoring of LCR MSCP Bat Species, 2019 Annual Report
D9	Summary of California Leaf-nosed Bat Banding at Mines Along the Lower Colorado River: 1958–2016
D14	Monitoring of the MacNeill's Sootywing Skipper and its Habitats, 2020 Annual Report
E1	Beal Lake Conservation Area, 2019 Annual Report
E4	Palo Verde Ecological Reserve, 2019 Annual Report
E5	Cibola Valley Conservation Area, 2019 Annual Report
E24	Cibola National Wildlife Refuge Unit #1 Conservation Area, 2019 Annual Report
E25	Big Bend Conservation Area, 2019 Annual Report
E27	Laguna Division Conservation Area, 2019 Annual Report

Work Task	Report Title
E28	Yuma East Wetlands, 2019 Annual Report
E31	Hunters Hole, 2019 Annual Report
E33	Pretty Water Conservation Area, 2019 Annual Report
E35	Mohave Valley Conservation Area, 2019 Annual Report
E36	Parker Dam Camp, 2019 Annual Report
E39	Dennis Underwood Conservation Area, 2019 Annual Report
F2	Riparian Bird Surveys at Conservation Areas in the Lower Colorado Region, 2019 Annual Report
F2	Riparian Bird Surveys at Conservation Areas in the Lower Colorado Region, 2020 Annual Report
F3	Post-Development and System-Wide Monitoring of Rodent Populations, 2020 Annual Report
F4	2019 Post-Development Acoustic Monitoring of LCR MSCP Bat Species
F6	Monitoring of MacNeill's Sootywing Skipper and its Habitats, 2020 Annual Report
F7	Marsh Bird Surveys at Conservation Areas, 2020 Annual Report
F10	Yellow-billed Cuckoo Surveys in Conservation Areas on the Lower Colorado River and Bill Williams River, 2020 Annual Report
G6	2019 Updates to Gila Woodpecker (*Melanerpes uropygialis*) (GIWO) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Elf Owl (*Micrathene whitneyi*) (ELOW) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Sonoran Yellow Warbler (*Dendroica = Setophaga petechia sonorana*) (YWAR) Basic Conceptual Ecological Model for the Lower Colorado River
G6	Desert Pocket Mouse (*Chaetodipus penicillatus sobrinus*) (DPMO) Basic Conceptual Ecological Model for the Lower Colorado River
G6	Northern Mexican Gartersnake (*Thamnophis eques megalops*) (NMGS) Basic Conceptual Ecological Model for the Lower Colorado River

Work Task	Report Title
G6	2019 Updates to Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) (YBCU) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Arizona Bell's Vireo (*Vireo bellii arizonae*) (BEVI) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Yuma Clapper Rail (*Rallus longirostris yumanensis Dickey*) (CLRA) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Colorado River Cotton Rat (*Sigmodon arizonae plenus*) (CRCR) Basic Conceptual Ecological Model for the Lower Colorado River
G6	Colorado River Toad (*Bufo = Incilius alvarius*) (CRTO) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Gilded Flicker (*Colaptes chrysoides*) (GIFL) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Least Bittern (*Ixobrychus exilis*) (LEBI) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Summer Tanager (*Piranga rubra*) SUTA Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (SWFL) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Vermilion Flycatcher (*Pyrocephalus rubinus*) (VEFL) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Western Yellow Bat (*Lasiurus xanthinus*) (WYBA) Basic Conceptual Ecological Model for the Lower Colorado River
G6	2019 Updates to Yuma Hispid Cotton Rat (*Sigmodon hispidus eremicus*) (YHCR) Basic Conceptual Ecological Model for the Lower Colorado River