Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Hart Mine Marsh

2018 Annual Report

October 2019

Work conducted under LCR MSCP Work Task E09

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

Federal Participant Group

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

Arizona Participant Group

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

Other Interested Parties Participant Group

QuadState Local Governments Authority
Desert Wildlife Unlimited

California Participant Group

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

Nevada Participant Group

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

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes
Chemehuevi Indian Tribe

Conservation Participant Group

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

Lower Colorado River Multi-Species Conservation Program

Hart Mine Marsh

2018 Annual Report

Prepared by:

Jessie Stegmeier, Restoration Group

Chris Dodge, Wildlife Group

Becky Blasius and Jimmy Knowles, Adaptive Management Group

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

October 2019

Stegmeier, J., C. Dodge, B. Blasius, and J. Knowles. 2019. Hart Mine Marsh, 2018 Annual Report. Prepared for the Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada.

ACRONYMS AND ABBREVIATIONS

ArcGIS	A geographic information system used to work with maps and geographic information
Cibola NWR	Cibola National Wildlife Refuge
FY	fiscal year
HCP	Habitat Conservation Plan
HMM	Hart Mine Marsh
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
lidar	light detection and ranging
NGVD29	National Geodetic Vertical Datum of 1929
pH	the acidity or basicity (alkalinity) of an aqueous solution
Reclamation	Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

Symbols

<	less than
%	percent

CONTENTS

Page

1.0 Introduction 1
1.1 Background 1
2.0 Conservation Area Information 2
2.1 Purpose 2
2.2 Location 3
2.3 Landownership 4
2.4 Water 4
2.5 Agreements 4
2.6 Public Use 4
2.7 Law Enforcement 4
2.8 Wildfire Management 5
3.0 Habitat Development and Management 5
3.1 Planting 5
3.2 Irrigation 5
3.3 Site Management 7
4.0 Monitoring 8
4.1 Abiotic Monitoring 8
4.1.1 Water Quality 8
4.2 Avian Monitoring 11
4.2.1 Marsh Bird Surveys 11
4.3 Small Mammal Monitoring 11
4.3.1 Rodent Monitoring 11
5.0 Habitat Creation and Conservation Measure Accomplishment 12
5.1 Vegetation Monitoring 12
5.2 Evaluation of Conservation Area Habitat 12
6.0 Adaptive Management Recommendations 13

Literature Cited 15

Tables

Table Page

1 Species-specific habitat creation conservation measure creditable total acres for 2018 13

Figures

Figure Page

1 General location of HMM. 3
2 Managed acreage at HMM through FY17. 6
3 HMM water quality monitoring locations. 9
4 Specific conductivity at HMM. 10
5 pH at HMM. 10
6 Dissolved oxygen at HMM. 11

1.0 INTRODUCTION

The purpose of this annual report is to summarize all activities that have occurred at Hart Mine Marsh (HMM) from October 1, 2017, through September 30, 2018, which is Federal fiscal year (FY) 2018, and projected activities for FY19. Water usage is presented for the calendar year, January 1 through December 31, 2018, consistent with the Colorado River Accounting and Water Use Report: Arizona, California, and Nevada, Calendar Year 2018 (Bureau of Reclamation [Reclamation] 2019).

1.1 Background

The Cibola National Wildlife Refuge (Cibola NWR) consists of about 16,600 acres of land located along approximately 12 miles of the lower Colorado River (LCR) in Arizona and California. It was established in 1964 as a refuge and breeding ground for migratory birds and other wildlife.

The Hart Mine Marsh Management Unit is a subunit of Unit 2, located on the southern end of the Cibola NWR in Arizona. The management unit encompasses approximately 646 acres, with approximately 523 acres that have wetland development potential and classify as "wetlands" according on the U.S. Army Corps of Engineers guidelines for wetland delineation with the Arid West supplement. Approximately 255 acres within this area now make up HMM.

HMM was a decadent wetland on the U.S. Fish and Wildlife Service's (USFWS) Cibola NWR. The channelization of the LCR in the vicinity of the marsh caused a drop in the water table, and the marsh became disconnected from the former floodplain. The river's hydrograph has been altered so that it no longer has large, dynamic overbank flow events that would have likely created and maintained HMM. Subsequently, the marsh was reduced to a much smaller area of open water and emergent vegetation (approximately 20 acres). The surrounding areas were colonized primarily by saltcedar (*Tamarix* spp.), an invasive, non-native species. For years, the remaining marsh was characterized by poor water quality, marginal wetland/marsh habitat, and saline soils, which included some areas being completely devoid of vegetation. In addition, the design of the marsh's infrastructure and the way it was managed may have contributed to its decadent state by increasing concentrations of salinity and nitrogen.

Surface water inputs to HMM after the channelization of the LCR were supplied from three main sources: Arnett (drainage) Ditch, the Cibola NWR's Unit 2 irrigation ditch, and tributary inflows from adjacent alluvial fans. During this period of management, the surface water hydrology of the marsh was highly dependent upon irrigation practices in adjacent farming areas and episodic precipitation events in the uplands. Additionally, all three surface water sources terminated in the marsh, with only limited surface water outflows (Hautzinger et al. 2007).

Prior to restoration activities, there was little existing marsh cover type (open water and emergent vegetation) occupying this site. The majority of the site (80%) was dominated by various classes of saltcedar associations. A portion of the 646 acres defined as the Hart Mine Marsh Management Unit was selected for establishment as a Lower Colorado River Multi-Species Conservation Program (LCR MSCP) conservation area. This area now comprises approximately 255 acres designated as HMM.

HMM was identified as a site with potential for marsh habitat restoration by the USFWS and Reclamation) before the implementation of the LCR MSCP. The USFWS's Lower Colorado River Refuges Comprehensive Management Plan and Ecological Assessment also targeted HMM as a restoration priority (USFWS 1993). In the mid-1990s, a number of improvements were made, which included the extension of Arnett Ditch past the Hart Mine Marsh Management Unit, with the installation of a controlled outflow through the tie-back levee and a series of control structures along this ditch extension. These control structures were designed to allow for drain water from Arnett Ditch to be diverted into the Hart Mine Marsh Management Unit.

With the authorization of the LCR MSCP and the mutual desire for the USFWS and Reclamation to restore HMM, a partnership between the two agencies was formed. As part of the planning effort for the restoration partnership at HMM, the USFWS hosted a Wetland Review at the Cibola NWR. The participants in the review prepared a draft document that included a number of desired features and approaches for restoration of the site – many of which could be incorporated into a restoration design (these are discussed in more detail in the Hart Mine Marsh Restoration Development and Monitoring Plan [LCR MSCP 2009]). Using baseline information gathered and complied by the USFWS, in the Hart Mine Marsh – Existing Conditions Report (Hautzinger et al. 2007), and guided in part by the wetland review process, Reclamation developed an appropriate engineering design and approach that was intended to fulfill both the needs of the Cibola NWR and those of the LCR MSCP.

2.0 CONSERVATION AREA INFORMATION

2.1 Purpose

The purpose of this project is to restore portions of HMM to functional marsh habitats that support species covered under the LCR MSCP, specifically Yuma clapper rails (*Rallus longirostris yumanensis* [also known as Yuma Ridgway's rail = *R. obsoletus yumanensis*]), western least bitterns (*Ixobrychus exilis hesperis*), and Colorado River cotton rats (*Sigmodon arizonae plenus*). It is likely that the creation of a mosaic of marsh habitat will also benefit a host of other species, including California black rails (*Laterallus jamaicensis coturniculus*), as well as other wading birds and migratory waterfowl.

2.2 Location

HMM is located in Arizona in Reach 4, within the Cibola NWR, approximately 15 miles south of Blythe, California. It is within the historic floodplain of the LCR and adjacent to River Miles 90 to 93 on the Arizona side (figure 1).

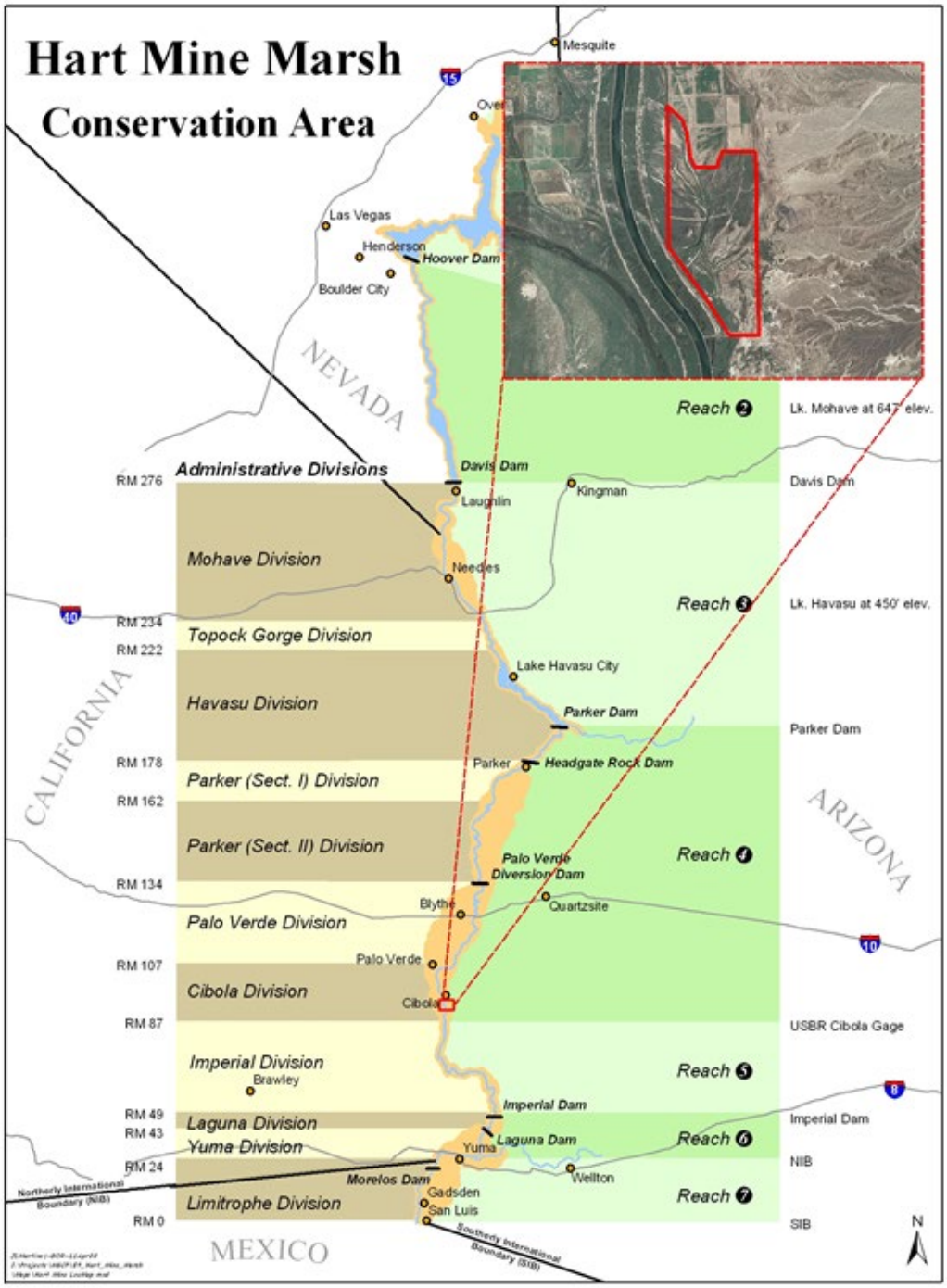


Figure 1.—General location of HMM.

2.3 Landownership

The property is owned by the USFWS. The USFWS dedicates land and water to Reclamation for habitat development and maintenance of land cover types for the LCR MSCP.

2.4 Water

The Cibola NWR has second priority water rights. These include a diversionary entitlement of 27,000 acre-feet per year and a consumptive use entitlement (diversion minus return flow) of 16,793 acre-feet per year. In addition, the refuge has a circulatory (circulation water with minimum consumptive use) water right of 7,500 acre-feet per year. HMM will have an average of 1,258 acre-feet per year (7.23 acre-feet per acre, per year) available when the conservation area has been fully developed.

2.5 Agreements

A Land Use Agreement for general restoration activities on the Cibola NWR has been executed and is on file. An attachment (2) to Exhibit B of the aforementioned Land Use Agreement, which specifies the activities at HMM, has been finalized, and it secured the land and water resources at HMM for the 50-year term of the LCR MSCP.

2.6 Public Use

Public use on HMM is managed by the USFWS. In cooperation with Reclamation, the USFWS coordinates its public use and related activities so they are compatible with management of the site for the LCR MSCP. Duck hunting is permitted at HMM from 10 a.m. to 3 p.m. during the Arizona State waterfowl season. Other low-impact public uses such as wildlife watching, sport fishing, and education/outreach are expected at HMM; however, these uses may be regulated depending on future occupation of listed species.

2.7 Law Enforcement

Law enforcement activities are performed primarily by the USFWS's Law Enforcement Officer, under the LCR MSCP's site-specific Fire Management &

Law Enforcement Strategy (LCR MSCP 2010). Additional local law enforcement assistance is available through the La Paz County Sheriff's Office and the Bureau of Land Management's Yuma Field Office.

2.8 Wildfire Management

Federal, State, and local fire agencies, either by existing management agreements or mutual aid agreements, provide wildland fire suppression, incident dispatch, fire investigation, fuels reduction, and potential fire restrictions. The full range of suppression strategies are available to managers provided that selected options do not compromise firefighter or public safety, are cost effective, consider the benefits of suppression and the values to be protected, and are consistent with resource objectives (LCR MSCP 2010).

3.0 HABITAT DEVELOPMENT AND MANAGEMENT

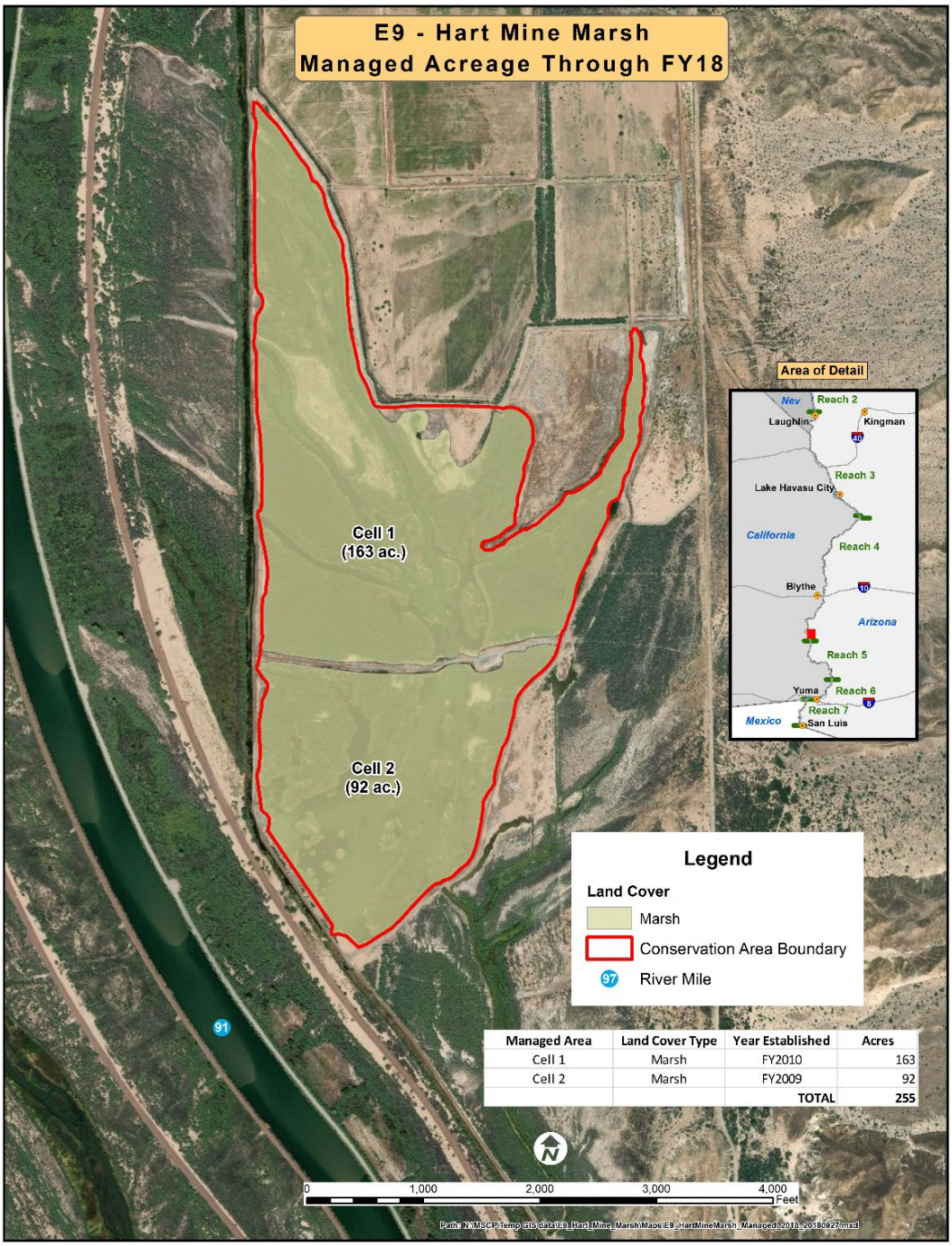
Established land cover types that are being managed for LCR MSCP covered species are shown on figure 2.

3.1 Planting

No planting occurred at HMM in 2018, as it is fully developed.

3.2 Irrigation

Operation and management of the conservation area primarily relates to the control, manipulation, and management of water on the site. Cells 1 and 2 can be operated independently in terms of surface elevations and inlets and outlets. This is accomplished through a series of gated and/or stoplog-type controls structures located on Arnett Ditch and between the cells. HMM is supplied with water from Arnett Ditch through a series of control structures and by using gravity flow through the marsh cells. Currently, this source of water in Arnett Ditch can also be supplemented with Colorado River water by using the Unit 2 pumps and infrastructure. To provide water for HMM using a source other than the ditch (drain water), the conservation area relies on the water conveyance infrastructure associated with the refuge's Unit 2 management area. This infrastructure includes two electric pumps and a series of buried pipe and concrete-lined supply canals,



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

Figure 2.—Managed acreage at HMM through FY17.

which is shared by the refuge, contract farmers, adjacent private landowners, and HMM. Currently, the LCR MSCP shares the electrical costs of pumping water through this infrastructure and may also share in the cost of maintenance and repair to the system as is provided for in the existing Land Use Agreement. Since the completion of Phase 3, Colorado River water, unmixed with drain water from Arnett Ditch, will be able to be supplied to HMM using the Unit 2 delivery canals.

The outlet works for HMM also allow for flexibility in where the water exiting the marsh and Arnett Ditch can be discharged. Water draining from the marsh and ditch can be routed through Cibola Lake or directly back to the Colorado River through a pair of gated control structures located along Arnett Ditch south of HMM.

3.3 Site Management

Since one of the targeted species for the conservation area is the Yuma clapper rail, water elevations will be strictly controlled in Cells 1 and 2. Elevations will be managed in a static condition prior to, and during, the breeding season for this species. These water surface elevations will be held relatively constant from about March 1 through August 31. The projected managed elevations are 217 and 216.5 feet (NGVD29) for Cells 1 and 2, respectively.

The management goal for the marsh is 217 feet elevation for the benefit of LCR MSCP covered species in Cell 1. Using the available 20-cubic-foot-per-second pump, the refuge was able to supplement Arnett Ditch to compensate for high evapotranspiration loss and maintain water levels within 0.2 inch throughout the Yuma clapper rail breeding season. Based on past observations, it is doubtful that Cell 2 will be able to be managed at its target design elevation of 216.5 feet. At elevation 216.5 feet, a large portion of Cell 2 would be exposed, increasing weed management intensity. In addition, much of the established habitat would be left without standing water, resulting in the death of much of the planted marsh vegetation. The LCR MSCP expects that a target depth of 216.8 feet may be more practical for sustaining established marsh habitat in Cell 2 and for maximizing ideal water depths.

Management at HMM also includes the management of water quality parameters. Most of these parameters have not been problematic to date, with the exception of rising salinities throughout the summer months. This has been effectively controlled through regular pumping of Colorado River water into the marsh via Arnett Ditch. Although there appears to be a lag before salinities fall, pumping has been able to keep salinities below marsh thresholds (see figures 4–6). Additional future water management actions to control salinities and long-term salinization may also include dewatering and flushing (refilling

with Colorado River water) of Cells 1 and 2. This would also occur outside of the breeding season for Yuma clapper rails and would likely be conducted for one cell at a time to allow some flooded habitats to remain for resident Yuma clapper rails and other species during this management activity.

Long-term management activities may also include the removal of decadent emergent vegetation to improve habitat for Yuma clapper rails. This is expected to be conducted one cell at a time, with a longer interval between vegetation removals at each cell to maintain usable emergent marsh habitats. Vegetation removal may be accomplished through controlled burning or by mechanical means. This management action is expected to be driven and supported by data from monitoring activities, or past relevant research, and prescribed using the adaptive management process of the LCR MSCP.

The majority of maintenance on the site is controlling invasive and non-native vegetation species. Currently, the majority of this work is being performed through contracted services. Work is accomplished by frequent site visits to assess the occupation and spread of invasive species, followed by control actions, if necessary. Control is performed using crews that employ hand pulling of weeds, using mechanical removal techniques, and through limited herbicide treatments, when appropriate. The area that this contract covers includes the perimeter of the entire marsh complex from the wetted edge of the marsh to the tops of the perimeter road surrounding the marsh. The Cibola NWR is responsible for the adjacent areas outside HMM. Other site maintenance includes the upkeep of access roads and the water delivery infrastructure. Access roads specific to HMM are maintained by the LCR MSCP.

The USFWS, in cooperation with LCR MSCP, performed marsh habitat manipulation using mechanical means in February 2017. Further details and results of this effort can be found in “3.3 Site Management” above.”

4.0 MONITORING

4.1 Abiotic Monitoring

4.1.1 Water Quality

The USFWS was responsible for monitoring and reporting on many abiotic parameters of the site as part of the interagency agreement with Reclamation. Cibola NWR staff continued monthly water quality monitoring at specific points throughout the marsh. Water quality parameters including pH, dissolved oxygen, and specific conductivity (as a measurement of total salinity) were measured throughout the FY. Figure 3 shows the locations (sites) where water quality parameters are measured and collected.

Figure 3.—HMM water quality monitoring locations.

In general, water quality varied from site to site and across seasons. Because very high salinities can affect vegetation and, in turn, impact wildlife species, management activities at this time only targeted specific conductivity. Salinities were effectively controlled by pumping Colorado River water into HMM via Arnett Ditch. Figures 4–6 illustrate the variation in specific conductivity throughout the year and show the drop in salinities at each site when management action (February pumping, flushing, and refilling) has occurred. They also depict the values for pH and dissolved oxygen at each sampling site and show the fluctuations in water quality between these sampling intervals. A complete water quality dataset for the FY is posted internally on the LCR MSCP SharePoint site and is available upon request.

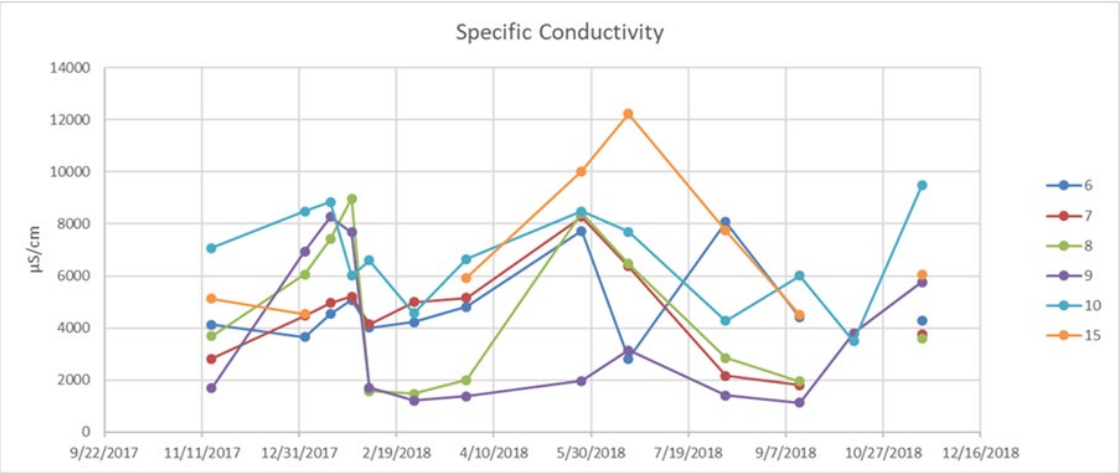


Figure 4.—Specific conductivity at HMM.

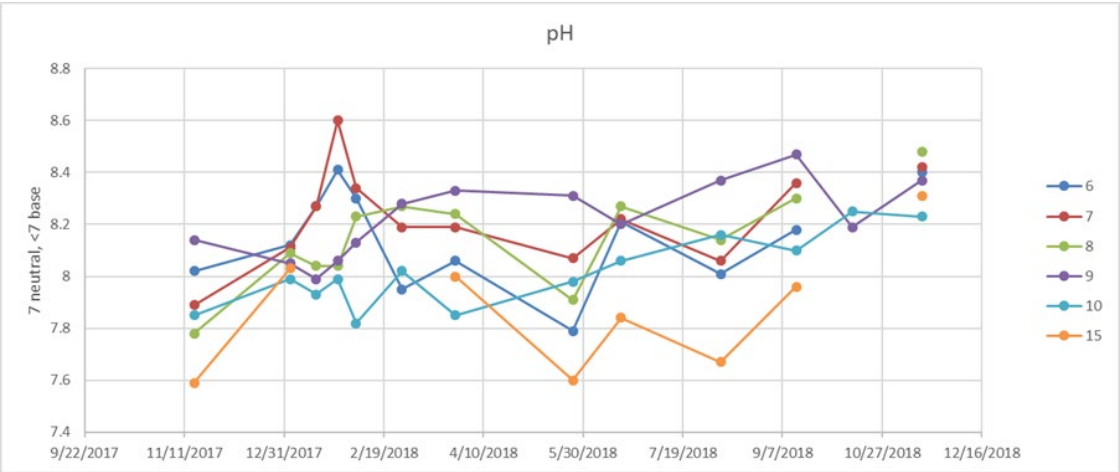


Figure 5.—pH at HMM.

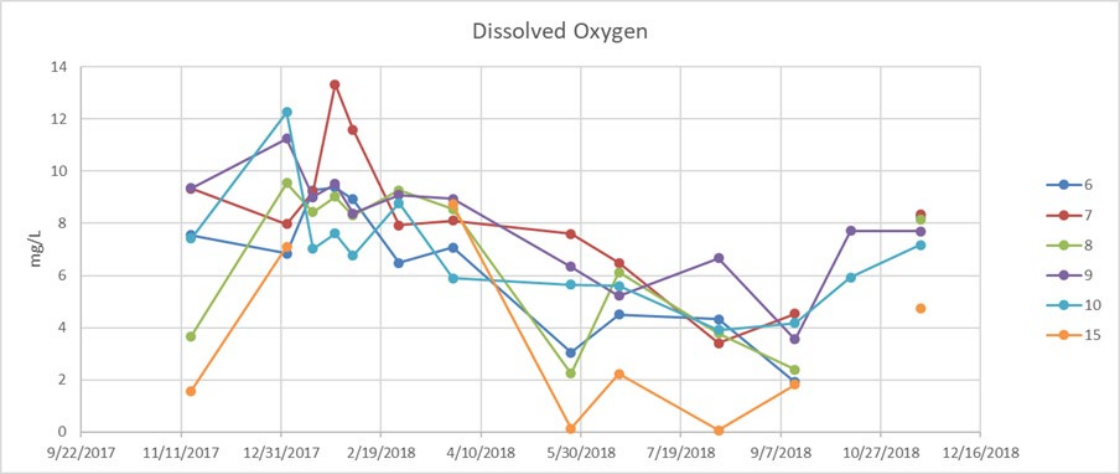


Figure 6.—Dissolved oxygen at HMM.

4.2 Avian Monitoring

Avian monitoring in FY18 at HMM was conducted for marsh birds.

4.2.1 Marsh Bird Surveys

Presence surveys for the California black rails, western least bitterns, Virginia rails (*Rallus limicola*), and Yuma clapper rails were conducted in marsh habitat at HMM in three survey sessions during March and April on March 23, April 7, and April 22, 2018. Two LCR MSCP covered marsh bird species were detected: western least bitterns and Yuma clapper rails. Four western least bitterns and five Yuma clapper rails were detected during the first survey session (March 23). There were 11 detections of the western least bitterns and 18 detections of Yuma clapper rails during the second survey session (April 7). There were 13 detections of western least bitterns and 25 detections of the Yuma clapper rails during the third survey session (April 22) (Kahl, Jr. 2018).

4.3 Small Mammal Monitoring

4.3.1 Rodent Monitoring

Live trapping was conducted on April 9–10, 2018, in order to determine the presence of Colorado River cotton rats. Forty traps were placed each night for a total of 80 trap-nights. Twenty-one Colorado River cotton rats were captured. This is the first time that this species has been captured at HMM (Hill and Lyon 2019).

5.0 HABITAT CREATION AND CONSERVATION MEASURE ACCOMPLISHMENT

5.1 Vegetation Monitoring

Vegetation data were collected in FY18 using light detection and ranging (lidar). Lidar measures the vegetation structure and provides the ability to identify structural diversity and successional growth stages. Conservation area vegetation will be evaluated on a periodic basis using lidar to ensure the habitat is meeting species' requirements. A procedure to analyze and provide vegetation structure metrics will be developed, and the results will be presented in future reports.

Preliminary analyses suggest that airborne lidar may not provide the necessary detail for evaluating marsh habitat. Alternative techniques will be explored.

Baseline vegetation data were collected using unmanned aerial systems equipped with multispectral and photographic sensors. The data from the sensors will be used to create three-dimensional models of the vegetation to describe structure and species composition.

5.2 Evaluation of Conservation Area Habitat

The Final Habitat Creation Conservation Measure Accomplishment Tracking Process was finalized in October 2011 (LCR MSCP 2011). All areas within HMM were designed to benefit covered species at the landscape level. The water depths are managed during the breeding season for Yuma clapper rails and to meet the species conservation measure as defined in the Habitat Conservation Plan (HCP) (LCR MSCP 2004).

In 2018, the percent of open water and marsh was delineated using aerial imagery in ArcGIS. The marsh continues to fill in the open water as expected by design.

To meet species habitat creation requirements, the HCP provides goals for habitat creation based on land cover types. Four species with habitat creation goals have creditable acres at HMM. These species, including their corresponding conservation measure acronyms, are: Yuma clapper rail (CLRA1), California black rail (BLRA1), western least bittern (LEBI1), and Colorado River cotton rat (CRCR2) (table 1).

Table 1.—Species-specific habitat creation conservation measure creditable total acres for 2018

Species-specific habitat creation conservation measure	CLRA1	BLRA1	LEBI1	CRCR2
Creditable acres in 2018	0	0[1]	0	0
Total, including previous years	255	0	255	255

[1] Reclamation is in the process of determining the land and water interface and the method for delineating California black rail marsh habitat at < 1 inch deep. Once this has been determined, HMM will be evaluated.

6.0 ADAPTIVE MANAGEMENT RECOMMENDATIONS

Adaptive management relies on the initial receipt of new information, the analysis of that information, and the incorporation of the new information into the design and/or direction of future project work (LCR MSCP 2007). The Adaptive Management Program's role is to ensure habitat creation sites are biologically effective and fulfill the conservation measures outlined in the HCP for 27 covered species and to determine if they potentially benefit 5 evaluation species. Post-development monitoring and species research results will be used to adaptively manage habitat creation sites after initial implementation. Once monitoring data are collected over a few years, and then analyzed for HMM, recommendations may be made through the adaptive management process for site improvements in the future.

There are no adaptive management recommendations for HMM at this time.

LITERATURE CITED

Bureau of Reclamation. 2019. Colorado River Accounting and Water Use Report: Arizona, California, and Nevada, Calendar Year 2018. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

Hautzinger, A., D. Kundargi, and P. Donnelly. 2007. Hart Mine Marsh – Existing Conditions Report. U.S. Fish and Wildlife Service, National Wildlife Refuge System, Region 2. April 30, 2007.

Hill, J. and J. Lyon. 2019. Post-Development and System-Wide Monitoring of Rodent Populations, 2018 Annual Report. Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada.

Kahl, Jr., J. 2018. Marsh Bird Surveys at Conservation Areas, 2018 Annual Report. Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada.

LCR MSCP (see Lower Colorado River Multi-Species Conservation Program).

Lower Colorado River Multi-Species Conservation Program (LCR MSCP). 2004. Lower Colorado River Multi-Species Conservation Program, Volume II: Habitat Conservation Plan, Final. December 17 (J&S 00450.00). Sacramento, California.

_____. 2007. Final Science Strategy. Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2009. Hart Mine Marsh Restoration Development and Monitoring Plan 2009. Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

_____. 2010. Lower Colorado River Multi-Species Conservation Program Fire Management & Law Enforcement Strategy. Bureau of Reclamation, Boulder City, Nevada.

_____. 2011. Final Habitat Creation Conservation Measure Accomplishment Tracking Process. Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

U.S. Fish and Wildlife Service. 1993. Lower Colorado River Refuges Comprehensive Management Plan and Ecological Assessment.