



Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Hart Mine Marsh

2012 Annual Report



April 2013

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Lower Colorado River Multi-Species Conservation Program

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April 2013

Knowles, Jimmy, A. Calvert, and S. Kokos. 2013. Hart Mine Marsh, 2012 Annual Report. Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Lower Colorado Region, Boulder City, Nevada.

ACRONYMS AND ABBREVIATIONS

| | |
|--------------------|---|
| Cibola NWR | Cibola National Wildlife Refuge |
| ft ³ /s | cubic feet per second |
| FY | fiscal year |
| HCP | Habitat Conservation Plan |
| HMM | Hart Mine Marsh |
| LCR MSCP | Lower Colorado River Multi-Species Conservation Program |
| Reclamation | Bureau of Reclamation |
| USFWS | U.S. Fish and Wildlife Service |

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EXECUTIVE SUMMARY

The purpose of this annual report is to summarize all activities, including planning, designing, constructing, and management, that have occurred at Hart Mine Marsh (HMM) from October 1, 2011, through September 30, 2012. This document also contains sections describing the general background of the site, land and water ownership, current agreements, and constructed habitat areas as well as the past management of established land cover types. In addition, projected activities for fiscal year 2013, in terms of future development, management, and monitoring, will also be identified in this report. Adaptive management is expected to be a larger part of subsequent annual reports for this conservation area as more data regarding the effectiveness of management techniques and performance of the habitat become available.

Background

Hart Mine Marsh was a decadent wetland on the U.S. Fish and Wildlife Service's (USFWS) Cibola National Wildlife Refuge (Cibola NWR). The channelization of the lower Colorado River in the vicinity of HMM caused a drop in the water table, and the marsh became disconnected from the former flood plain. 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, 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 completely devoid of vegetation. In addition, the design of the marsh's infrastructure and the way it was managed may have contributed to the decadent state of the marsh by increasing the concentrations of salinity and nitrogen. Surface water inputs to HMM after the channelization of the lower Colorado River were supplied from three main sources: Arnett (drainage) Ditch, the refuge'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 percent) 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

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(LCR MSCP) conservation area. This area now comprises approximately 255 acres designated as the Hart Mine Marsh Conservation area, referred to hereafter as Hart Mine Marsh or HMM.

Hart Mine Marsh had been identified as a site with potential for marsh habitat restoration by the USFWS and the Bureau of Reclamation (Reclamation) before the implementation of the LCR MSCP. The USFWS's Lower Colorado River Refuges Comprehensive Management Plan and Ecological Assessment had also targeted the marsh 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 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. It was comprised of an interdisciplinary gathering of approximately 20 scientists and resource managers representing a range of Federal, State, non-governmental organizations, and private agencies. The intent of the review was to generate the integral components of a restoration plan that functioned within the abiotic and physical process constraints of the HMM, as well as within the administrative and political discretions that exist for the LCR MSCP and for the Cibola NWR. A number of desired features and approaches for the restoration of the site were produced and are discussed in more detail in the Hart Mine Marsh Conservation Area Restoration Development and Monitoring Plan, 2009 (Reclamation 2009), located on the LCR MSCP Web site. Reclamation determined that many of these approaches and practices could be incorporated into a restoration design and would ultimately improve habitat for the program's covered species. Using baseline information gathered and compiled by the USFWS in the Hart Mine Marsh – Existing Conditions Report, which is also located on the LCR MSCP Web site (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.

1.0 CONSERVATION AREA INFORMATION

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 in Arizona and California. It was established in 1964 as a refuge and breeding ground for migratory birds and other wildlife. The refuge is divided into six management units: Unit 1, Unit 2, Unit 3, Unit 4, Unit 5, and Unit 6. The Hart Mine Marsh Management Unit is part of Unit 2 (figure 1), 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 Engineer’s guidelines for wetland delineation. Approximately 255 acres within this area now make up the Hart Mine Marsh Conservation Area.

1.1 Purpose

The purpose of this project is to restore portions of the Hart Mine Marsh (HMM) to functional habitats that support species covered under the Lower Colorado River Multi-Species Conservation Program (LCR MSCP), specifically Yuma clapper rail (*Rallus longirostris yumanensis*), western least bittern (*Ixobrychus exilis hesperis*), and Colorado River cotton rat (*Sigmodon arizonae plenus*). It is likely that the creation of a mosaic of marsh habitat will also benefit a host of other species, including the California black rail (*Laterallus jamaicensis coturniculus*) as well as other wading birds and migratory waterfowl. This will be accomplished by installing control structures to manage water levels, providing sources of higher quality surface waterflows, making physical changes to the site’s topography, and by planting and supporting native wetland and marsh vegetation. The basic approach of this project is to remove a substantial amount of existing saltcedar from the site, deepen areas of existing open water and contour areas adjacent to these deeper areas, and manage water on the site at higher elevations to promote and sustain marsh cover type vegetation and wetland functions. The creation of habitat includes both the establishment of native plants and the management of water levels to meet performance standards for integrating emergent vegetation and open water at varying depths into a mosaic of marsh habitats.

1.2 Location

Hart Mine Marsh consists of approximately 255 acres on the Cibola NWR, located in Arizona between River Miles 90 and 93 (figures 2 and 3).

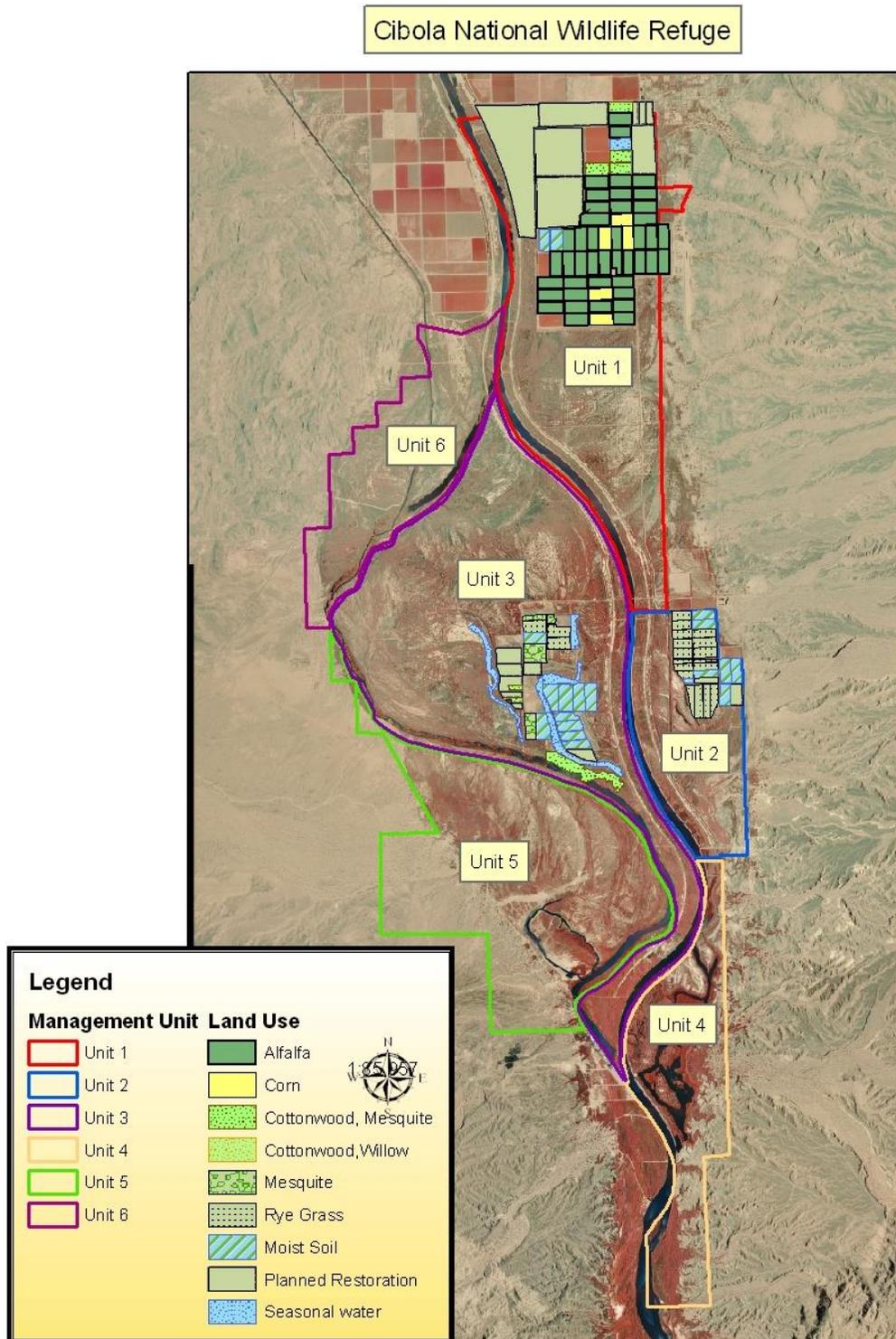


Figure 1.—Cibola NWR's six management units.

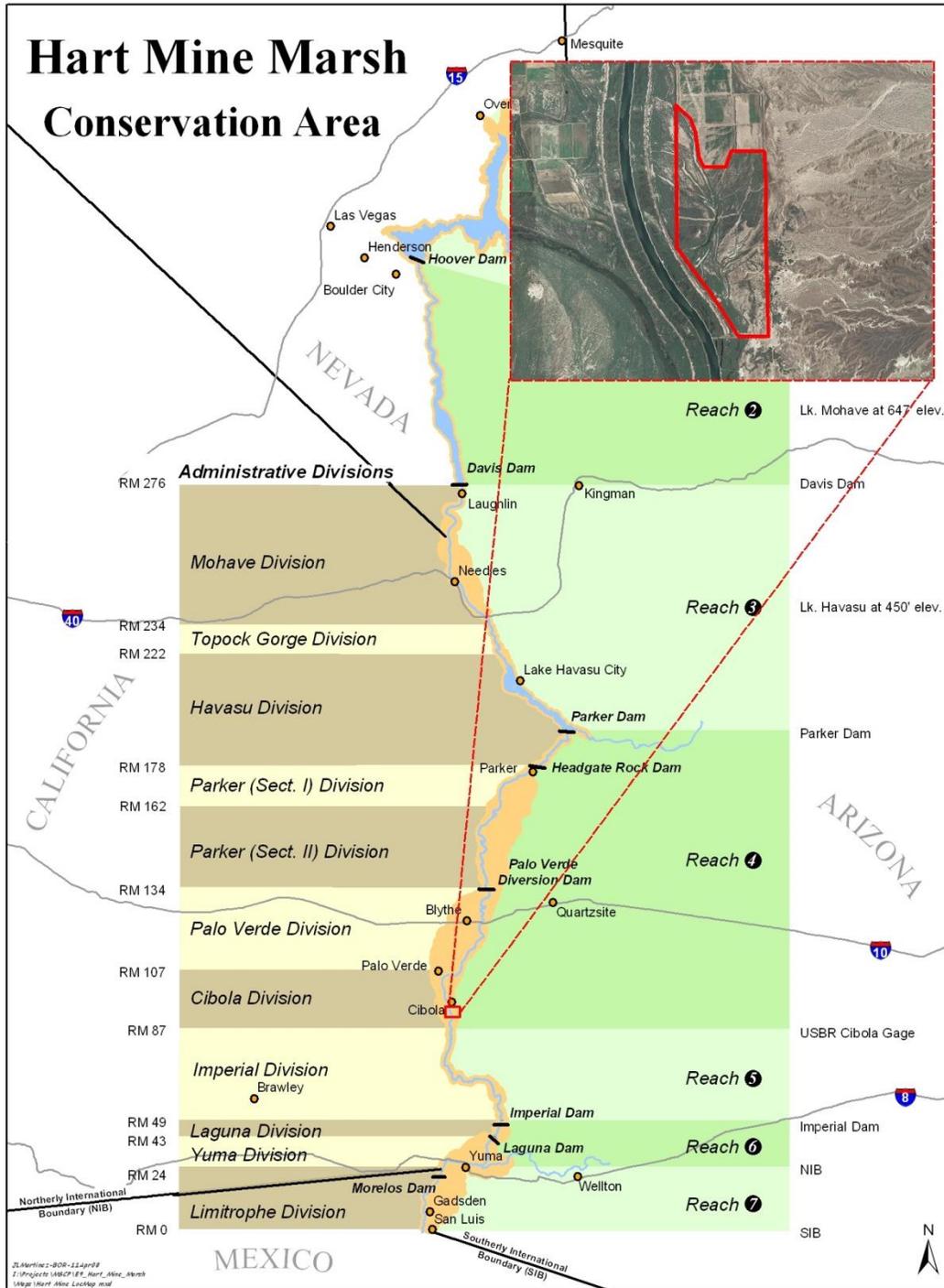


Figure 2.—General location of the Hart Mine Marsh Conservation Area.

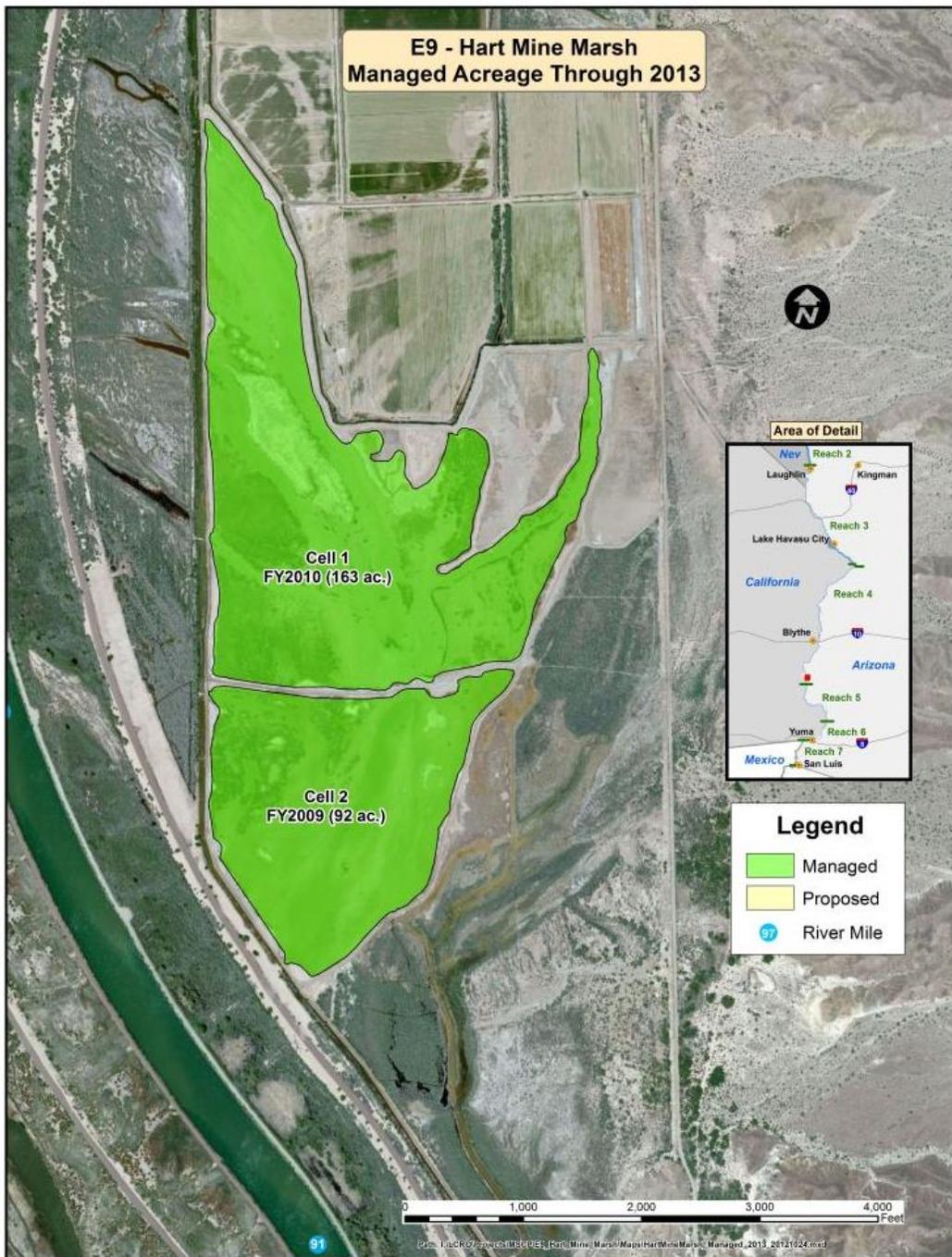


Figure 3.—Managed acres of HMM through 2013.

The legal description of this area is Gila and Salt River Base and Meridian, La Paz County, Arizona; Township 1 South, Range 23 West, Section 31, Township 2 South, Range 23 West, Sections 6 and 5, and Township 2 South, Range 23 West, Sections 7 and 8. The land and water resources will be provided by the USFWS.

1.3 Land Ownership

The property is owned and managed by the USFWS. They will dedicate land and water to Reclamation to develop and maintain native land cover types for the LCR MSCP.

1.4 Water Right Information

Cibola National Wildlife Refuge 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. The 174-acre 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.

1.5 Land Use Agreement

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 agreement, which specifies the activities at the HMM, has been finalized and secured the land and water resources at the HMM for the 50-year term of the LCR MSCP.

1.6 Public Use

Public use on HMM will be administered by the Cibola NWR and will be compatible with the goals of the LCR MSCP as defined in the Land Use Agreement. For 2012, duck hunting was permitted at HMM from 10 a.m. to 3 p.m. during the Arizona State waterfowl season. Other low-impact public use, such as wildlife watching, sport fishing, and education/outreach, is expected at HMM. However, these uses may be regulated depending on future occupation of listed species.

1.7 Law Enforcement

Law enforcement regulations are administered on the Cibola NWR through the USFWS. USFWS special agents and refuge officers have existing authority to enforce Federal and State regulations on refuge lands. Refuge officers have proprietary jurisdiction on refuges in Arizona. In addition, local law enforcement agreements are in place with the Bureau of Land Management, National Park Service, and Reclamation. Reclamation continues to work with the USFWS to ensure their activities do not conflict with the LCR MSCP Habitat Conservation Plan (HCP).

1.8 Fire Management

The USFWS (who is the cooperating land management agency) will provide an appropriate management response to all wildfires that occur within the Cibola NWR. The full range of suppression strategies is available to managers provided that selected options do not compromise firefighter or public safety and are cost effective.

Federal and State agencies in Arizona have entered into a Wildland Fire Management Joint Powers Master Agreement whereby they agreed to work cooperatively to improve efficiency by facilitating the coordination and exchange of personnel, equipment, supplies, services, and funds among the agencies for management of wildland fires, Presidential declared emergencies and disasters, or other emergencies under the Federal Emergency Management Agency's authority. The State of Arizona also has agreements in place with the Federal agencies.

2.0 HABITAT DEVELOPMENT AND MANAGEMENT

2.1 Design and Construction

Minor construction and maintenance activities were completed in fiscal year (FY) 2012 and included improving access to one of the large islands in cell 1 to permit more efficient vegetation management and the expansion of one of the parking areas in the northeast corner of cell 1.

Major infrastructure repair is planned for FY13, which will involve the replacement of the leaking water delivery lines from the Unit 2 pumps and the installation of a dedicated water line for HMM (figure 4). An additional water

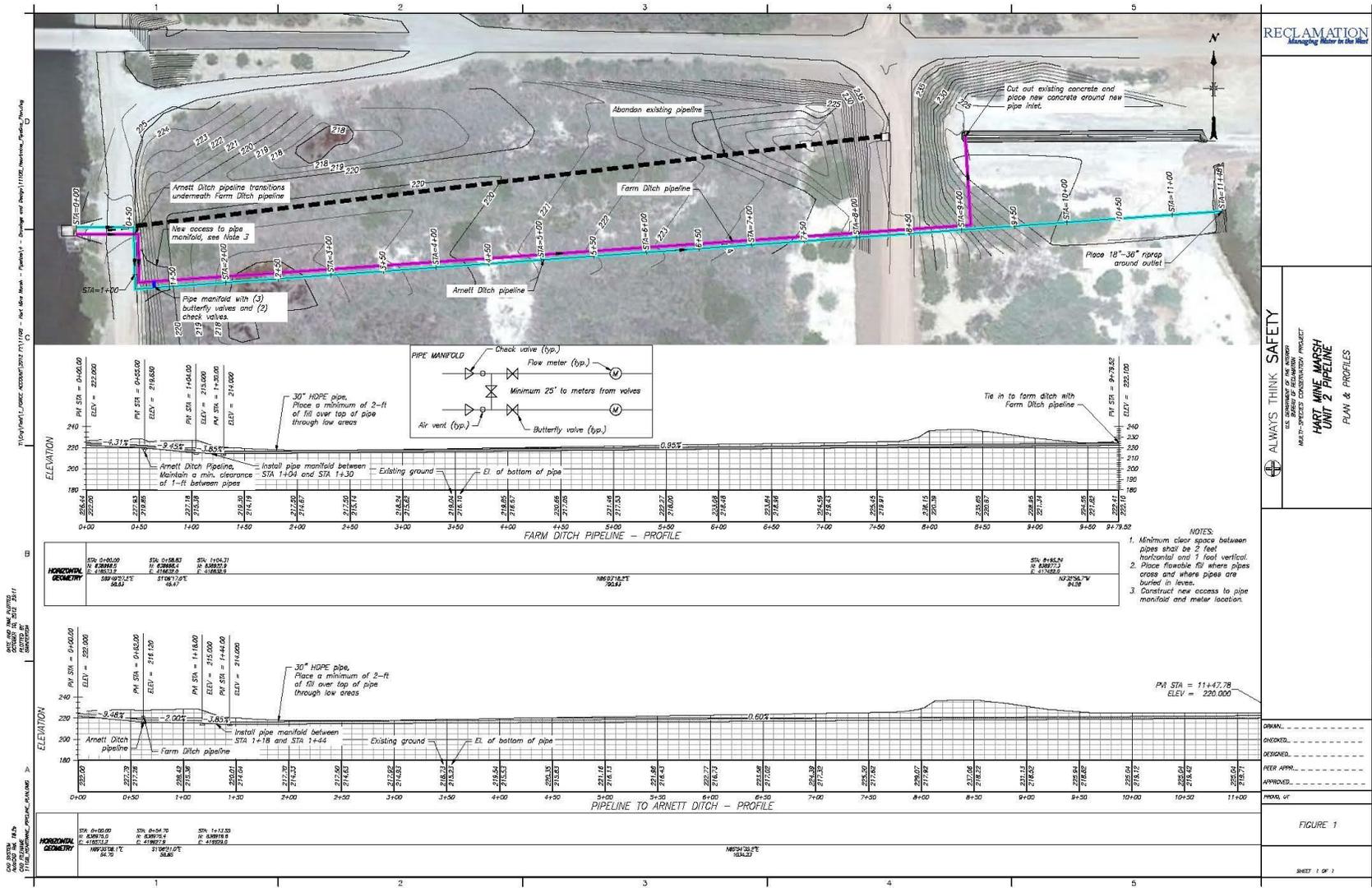


Figure 4.—Preliminary engineering design for Unit 2 pipe replacement, including a dedicated line for HMM.

inlet will be also constructed in the northwest corner of cell 1 to allow pumped (unmixed with drain water) Colorado River water into cell 1 via the Unit 2 irrigation infrastructure. This addition was part of the original plan for HMM; however, due to time and resource constraints, it was not implemented during previous construction phases. The combination of this water inlet and the other upgrades to the water delivery infrastructure at HMM are expected to increase the efficiency and flexibility at HMM in terms of water management.

2.2 Habitat Development

Creating marsh habitat for LCR MSCP covered species can be achieved by providing the appropriate combination of emergent vegetation and water depths. At HMM, the design and construction of cells 1 and 2 sought to meet these requirements by providing a variety of water depths without substantially altering the existing natural geomorphic features. In most cases, these features, such as historic river meander scrolls, were incorporated into the design and construction of HMM. The vegetation aspect of this habitat requirement is being achieved through the establishment of native emergent vegetation. This establishment occurs in two ways: (1) through planting desired vegetation species and (2) by natural occupation and colonization of native emergent plant species. Both of these methods are being employed at HMM. Additional transitional and upland plant species are also being used within the boundaries of HMM to stabilize the ground surrounding the marsh cells, inhibit establishment of other invasive species, and to provide a more diverse habitat mosaic to the conservation area.

As part of an effort to increase vegetation species diversity at HMM, supplemental planting occurred in FY12. Approximately 500,000 saltgrass plugs were planted along the margin of the northeastern side of cell 1 at elevation 217 feet. The saltgrass planted in 2012 had high establishment and survival. By the end of the season, the planted marsh species had noticeably filled in and expanded from the planted areas.

Saltgrass has been successful in establishing and expanding on the wetted edges of HMM. Because of its effectiveness at preventing the colonization of saltcedar, we intend to continue to plant saltgrass along the margin of the marsh to reduce long-term costs for saltcedar removal (figure 5).

In subsequent years, additional marsh and upland plant species may be established within and adjacent to both cells 1 and 2 to fill in non-vegetated areas, stabilize ground, inhibit invasion of non-native species, and to promote vegetation diversity as necessary.



Figure 5.—Noticeable difference in saltcedar presence at marsh margin with (background) and without established saltgrass (foreground), HMM 2012.

2.3 Operation and Management

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 stop log-type control structures located on Arnett Ditch and between the cells. HMM is supplied with water from Arnett Ditch by checking up water at a series of control structures and routing this water source through the marsh cells using gravity flow. 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 Arnett 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. It is shared by the refuge, contract farmers, adjacent private landowners, and HMM. Currently, the LCR MSCP shares the electrical costs from pumping water through this infrastructure and would also share in the cost of maintenance and repair to the system as is provided for in the existing Land Use Agreement. After 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.

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

Because 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 (National Geodetic Vertical Datum 27) for cells 1 and 2, respectively.

Through FY12, both cells 1 and 2 have been managed at 217 feet. This was done primarily to ensure success in establishment of planted marsh species and to facilitate water management across the site. Using the available 20-cubic-foot-per-second (ft^3/s) pump, refuge personnel were able to supplement Arnett Ditch to compensate for high evapotranspiration loss and maintain water levels within 0.2 inch throughout the clapper rail breeding season. The original intent for marsh management in FY11 and FY12 was to slowly draw down cell 2 to reach the target design water surface elevation of 216.5 feet after the clapper rail breeding season had ended and after the installation of the new 40 ft^3/s pump. Unfortunately, the aging water delivery infrastructure, specifically the Unit 2 water delivery lines, could not handle the volume of water generated by the newly installed 40 ft^3/s pump, and it developed substantial leaks. Without an operable 40 ft^3/s pump, having separate water levels for the two cells was deemed too difficult to manage due to the control structure configuration and the volume of water required to manage the cells independently. In order to not overtax the system, the 40 ft^3/s pump was not used for regular operation in FY11–FY12 and will not be used until the infrastructure repairs and upgrades take place in winter of FY13.

Based on some observations later in FY11, 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, 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. We expect 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. Attempts to establish two separate water levels in the marsh cells are expected to commence after the installation of the new Unit 2 water delivery lines in FY13.

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, this method has been able to keep salinities below marsh thresholds (see figure 6 in the “Abiotic Monitoring” section below). Additional future water management actions to control salinities and long-term salinization may also include the 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 rail and would likely be conducted for one cell at a time to allow some flooded habitats to remain for resident Yuma clapper rail and other species during this management activity.

Long-term management activities may also include the removal of decadent emergent vegetation to improve habitats for Yuma clapper rail. This is also 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. An adaptive management plan for the site has been drafted and is currently in review.

2.4 General Site Maintenance

The majority of maintenance on the site is expected to be controlling invasive and non-native species invasion. Currently, the majority of this work is being performed through contracted services and has been accomplished by frequent site visits to assess the occupation and spread of weedy 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 it. The USFWS is responsible for the adjacent areas outside the HMM Conservation Area.

Other site maintenance includes the upkeep of access roads and the water delivery infrastructure. Access roads specific to the HMM Conservation Area will be maintained by the LCR MSCP.

3.0 MONITORING

3.1 Avian Monitoring

3.1.1 Marsh Bird Surveys

Four marsh bird surveys were conducted at eight points by USFWS biologists between March and May 2012 using the National Marsh Bird Monitoring

Protocol (Conway 2008). Least bitterns were detected during all four surveys, and Yuma clapper rails were detected during the third survey (April 18) at a single point. One additional survey point will be added for FY13 surveys to cover an area that was not being surveyed adequately.

4.0 HABITAT CREATION CONSERVATION MEASURE ACCOMPLISHMENT

4.1 Vegetation Monitoring

Vegetation monitoring is not conducted for HMM; rather, the remote sensing and ArcGIS techniques described below are used to assist in the evaluation of the marsh.

4.2 Abiotic Monitoring

Extensive pre-construction abiotic baseline site conditions were recorded by the USFWS and presented in the Hart Mine Marsh – Existing Conditions Report (Hautzinger et al. 2007). The USFWS will continue to be responsible for monitoring and reporting on many abiotic parameters of the site. Water quality parameters, including pH, dissolved oxygen, and specific conductivity (as a measurement of total salinity) were measured from October 13, 2011, through September 26, 2012. Figure 6 shows the locations (sites) where water quality parameters were measured.

In general, water quality varied from site to site and across seasons. Bar graphs that depict the average values for each parameter across the sites (6–10) relevant to HMM can be found on figures 7–9. An additional monitoring site (site 15) was added in late FY12 in order to be more representative of the northeastern section of the marsh. These data will be included in the FY 13 annual report should this additional site prove necessary.

Because very high salinities can affect vegetation and, in turn, impact wildlife species, management activities at this time only targeted specific conductivity as described in the “Operation and Management” section above. Salinities were effectively controlled and held below 15,000 microsiemens per centimeter by pumping Colorado River water into HMM via Arnett Ditch. Figure 10 illustrates the variation in specific conductivity throughout the year and shows the drop in salinities at each site when management action (pumping) has occurred. Figures 11 and 12 depict the values recorded at each sampling site through FY12 and show the fluctuations in water quality between these sampling intervals. A complete water quality dataset for FY12 is posted internally on the LCR MSCP SharePoint site and is available upon request.

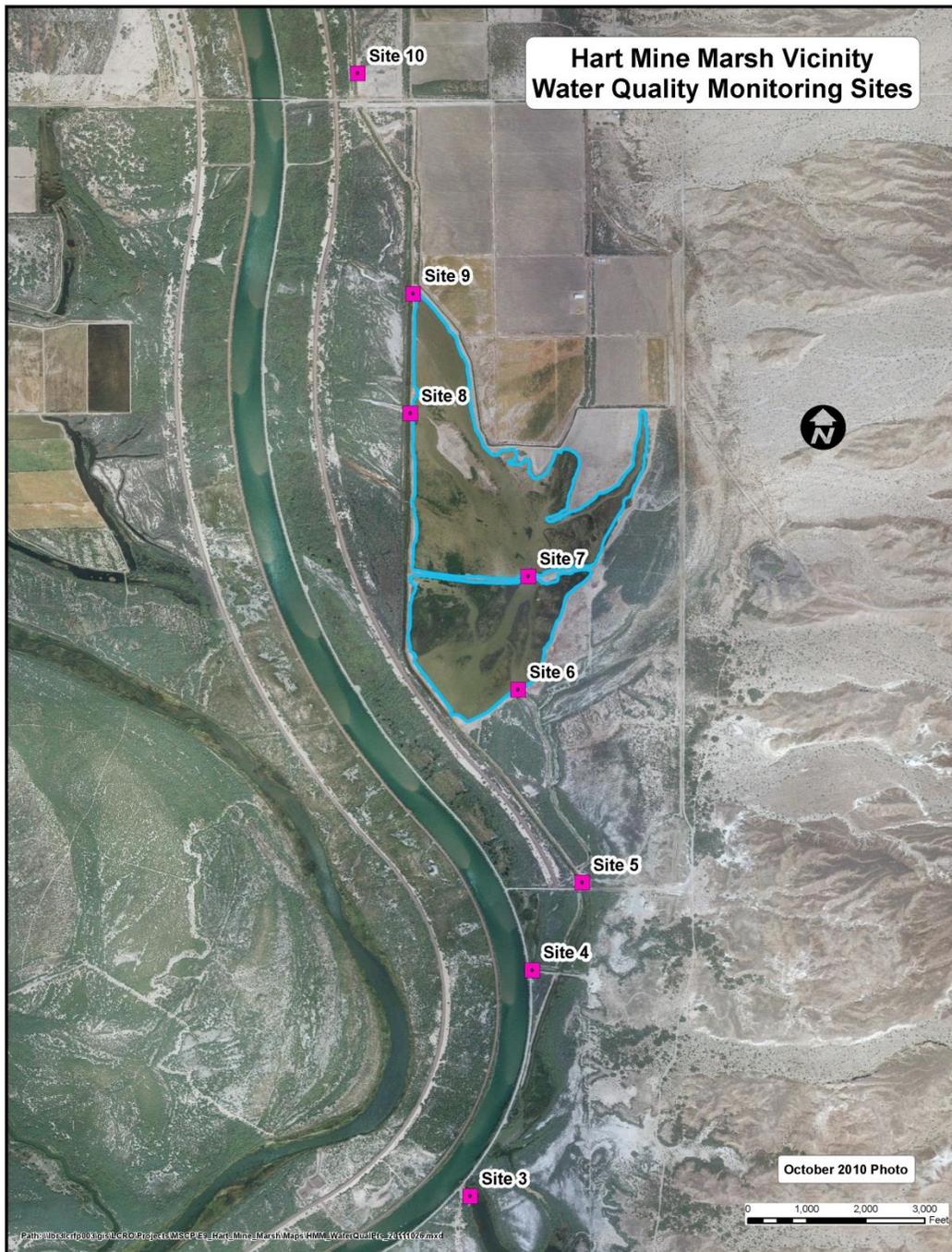


Figure 6.—HMM vicinity – water quality monitoring sites, FY12.

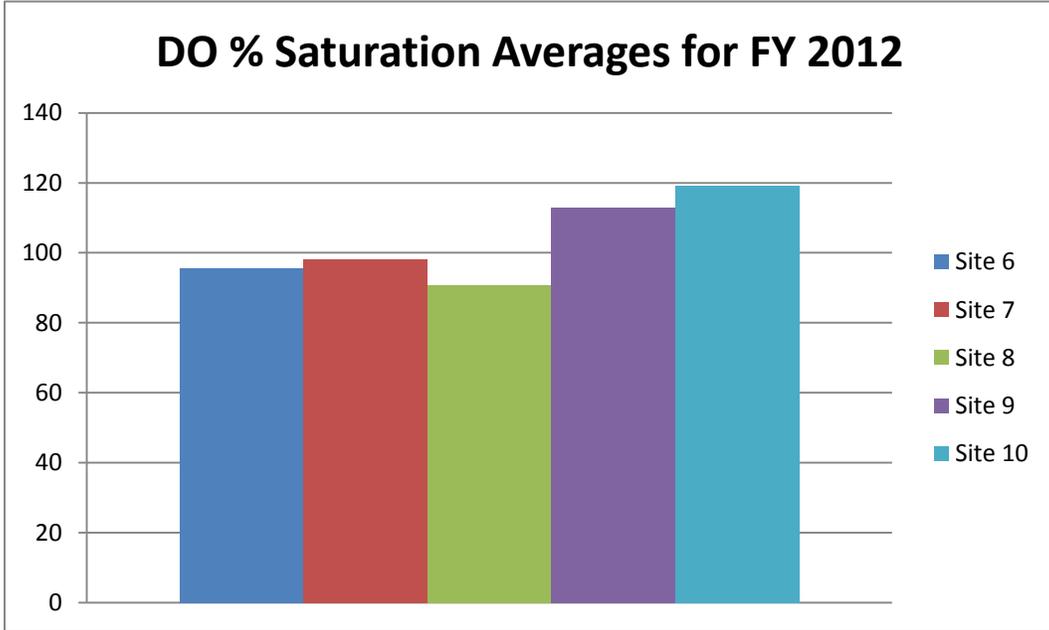


Figure 7.—Average percent saturation of dissolved oxygen at HMM sites 6–10, FY12.

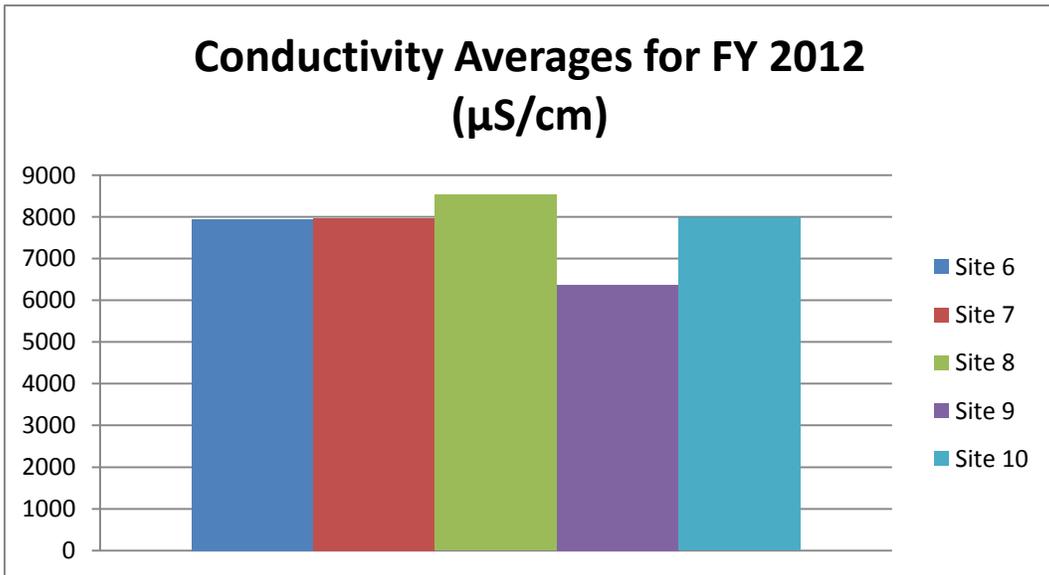


Figure 8.—Average conductivity at HMM sites 6–10, FY12.

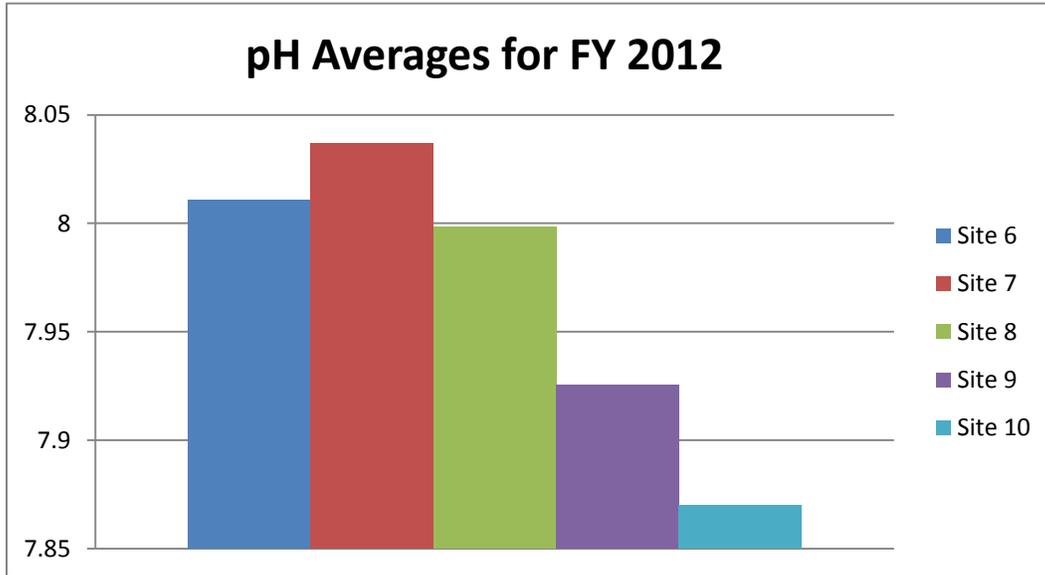


Figure 9.—Average pH at HMM sites 6–10, FY12.

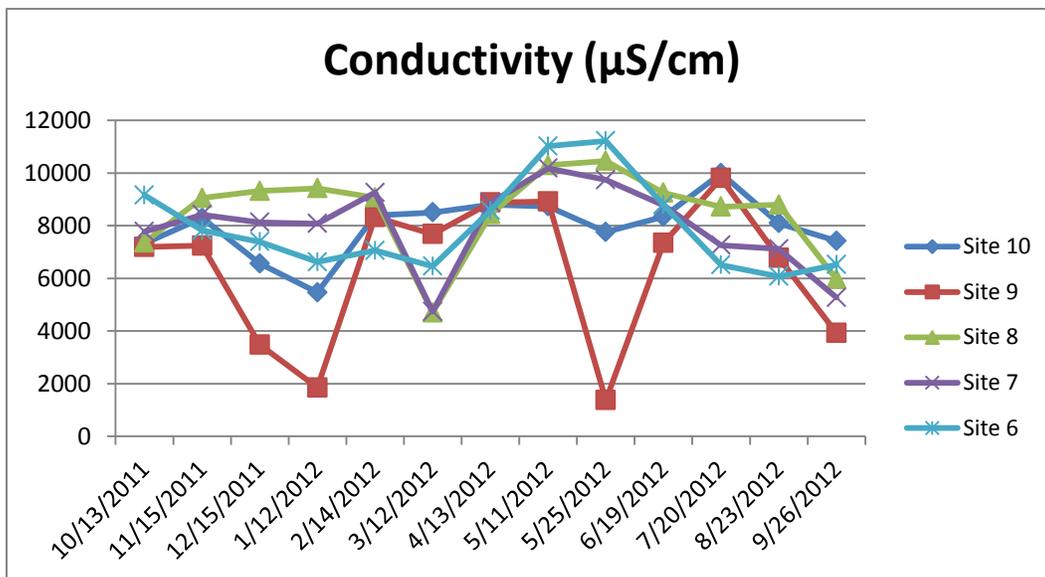


Figure 10.—Specific conductivity in $\mu\text{S}/\text{cm}$ at HMM sites 6–10, FY12.

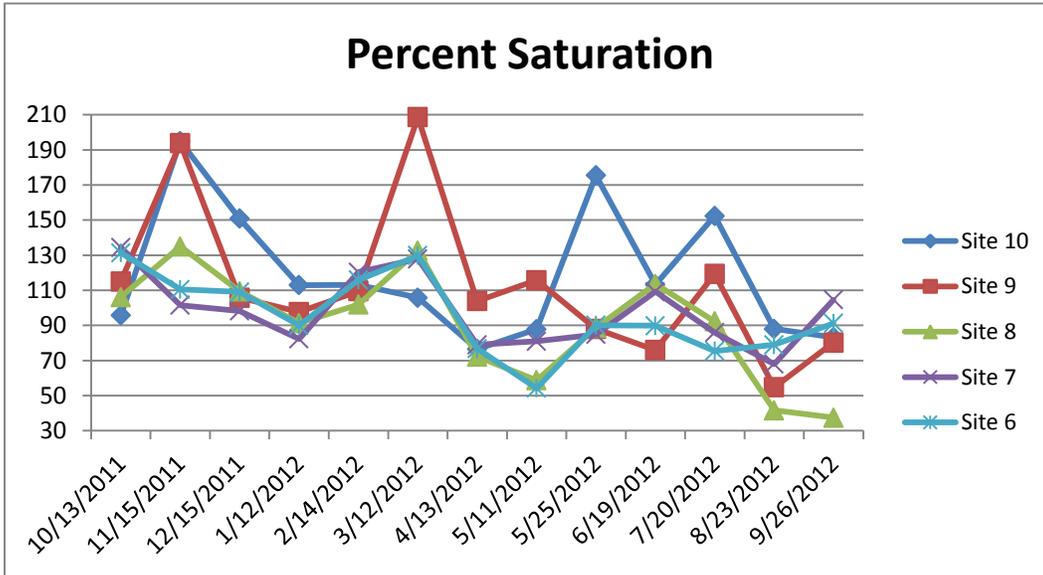


Figure 11.—Dissolved oxygen in percent saturation at HMM sites 6–10, FY12.

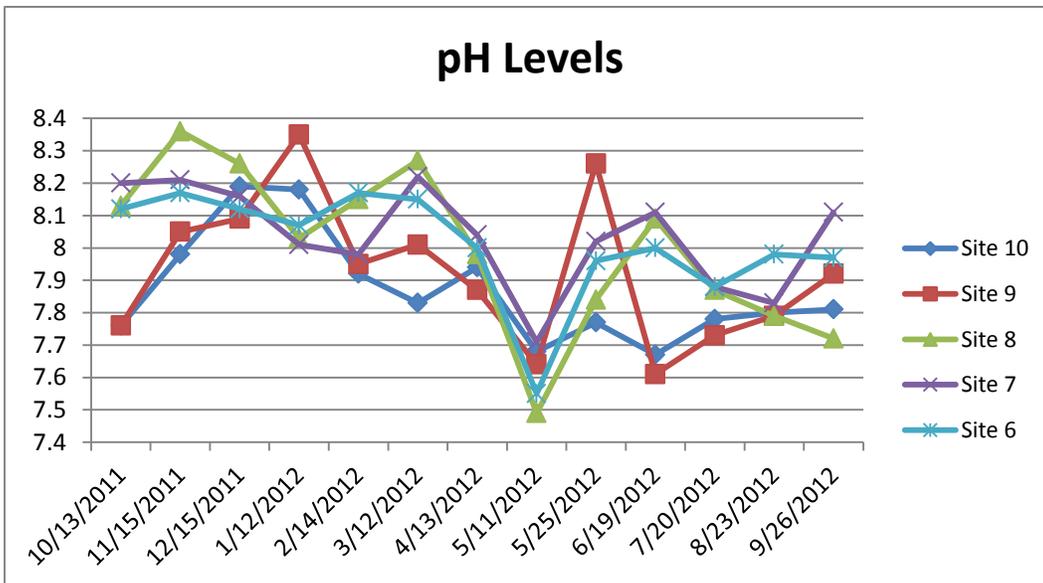


Figure 12.—pH at HMM sites 6–10, Y12.

4.3 Evaluation of Hart Mine Marsh

The Final Habitat Creation Conservation Measure Accomplishment Tracking Process was finalized in October 2011 (Reclamation 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 HCP.

In 2012, the percent of open water and marsh was delineated using aerial imagery in ArcGIS. Additionally, the site as-builts were used for water depths and then overlaid with the imagery. In 2012, the site matured, with the vegetation filling in more open waters and attributing to an additional 142 creditable acres.

To meet species habitat creation requirements, the HCP provides goals for habitat creation based on land cover types. These land cover types are described using the Anderson and Ohmart vegetation classification system (Anderson and Ohmart 1976, 1984a, 1984b). In 2012, two species with habitat creation goals have creditable acres this year at HMM. These species (including their corresponding conservation measure acronym) are: Yuma clapper rail (CLRA1) and least bittern (LEBI1). The species-specific conservation measure creditable total acres are provided in table 1.

Table 1.—Species-specific habitat creation conservation measure creditable total acres for 2012

| Species-specific habitat creation conservation measure | CLRA1 | BLRA1 ¹ | LEBI1 | CRCR2 ² |
|--|-------|--------------------|-------|--------------------|
| Creditable acres in 2012 | 142 | 0 | 142 | 0 |
| Total, including previous years | 255 | 0 | 255 | 0 |

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. Once this has been determined, HMM will be evaluated.

² The preliminary data suggest the Colorado River cotton rat uses both cottonwood-willow and fringe marsh habitats. Reclamation is in the process of evaluating data collected to determine marsh and cottonwood-willow habitat uses by this species.

5.0 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 (Reclamation 2007). Under the Adaptive

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Management Program, habitat creation sites will be assessed for biological effectiveness and whether they fulfill the conservation measures outlined in the Habitat Conservation Plan for 26 covered species and 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.

At this time, there are no adaptive management recommendations for the site.

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