Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Laguna Division Conservation Area Restoration Development and Monitoring Plan

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

August 2012

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 County Government Coalition
Desert Wildlife Unlimited

California Participant Group

California Department of Fish and Game
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

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Prepared by:

Restoration Group

Lower Colorado River
Multi-Species Conservation Program
Bureau of Reclamation
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ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
BLRA	California black rail
CESA	California Endangered Species Act
cfs	cubic feet per second
CLRA	Yuma clapper rail
CW	cottonwood-willow
Gila Basin	Gila Settling Basin
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
LCR MSCP HCP	*LCR MSCP Habitat Conservation Plan*
LDCA	Laguna Division Conservation Area
Mittry	Mittry Lake Wildlife Area
MMRP	Mitigation Monitoring and Reporting Program
NWR	National Wildlife Refuge
Permit	California Parties' California Endangered Species Act Incidental Take Permit No. 2081-2005-008-06
Reclamation	Bureau of Reclamation
SOP	Standing Operating Procedures
SWFL	Southwestern willow flycatcher
USFWS	U.S. Fish and Wildlife Service
YBCU	yellow-billed cuckoo

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INTRODUCTION

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a multi-stakeholder Federal and non-Federal partnership responding 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.

The LCR MSCP is a long-term (50-year) plan consisting of conservation measures that provide protection along the LCR from Lake Mead to the Southerly International Boundary with Mexico for 26 species currently threatened or endangered and 5 species on the verge of becoming threatened or endangered. The LCR MSCP anticipates development and/or protection of a minimum of 8,132 acres of habitat consisting of a mosaic of cottonwood-willow, honey mesquite, marsh, and backwater components. The program uses adaptive management principles to research and monitor species and habitats and to adjust and enhance management actions and science applications over the life of the program.

Development of the Laguna Division Conservation Area (LDCA) will be undertaken by the Bureau of Reclamation (Reclamation) as part of the *LCR MSCP Habitat Conservation Plan* (LCR MSCP HCP) and the California Parties' California Endangered Species Act (CESA) Incidental Take Permit No. 2081-2005-008-06 (Permit) by undeveloped ground dominated with salt cedar to native riparian and marsh habitat. The overall goal for LDCA is to develop and maintain as much riparian habitat as practical that will contribute to the habitat objectives for endangered and threatened species outlined in the LCR MSCP HCP and CESA Permit.

The LDCA is an example of how the habitat credit goals of the LCR MSCP are being carried out.

Purpose

The purpose of the project is to restore, enhance, and protect native riparian, wetland, and aquatic habitats within LDCA for the benefit of LCR MSCP covered species and other plants and wildlife. Target species include Southwestern willow flycatcher (*Epidonax trailii extimus*, SWFL), California black rail (*Laterallus jamaicensis coturniculus*, BLRA), Yuma clapper rail (*Rallus longirostris yumanensis*, CLRA), western least bittern (*Ixobrychus exilis hesperis*,), yellow-billed cuckoo (*Coccyzus americanus occidental*, YBCU), and the Yuma hispid cotton rat (*Sigmidon hispidus eremicus*,). The project will create a mosaic of marsh and riparian areas. Multiple meandering channels will be constructed, and the hydrology of the site will be managed to create and sustain four specific land

cover types: cottonwood-willow, honey mesquite, marsh, and backwater that meet LCR MSCP conservation criteria for target species of mammals and birds as outlined in the LCR MSCP HCP.

Location and Description

The LDCA is located on Reclamation withdrawn lands along the LCR, within the Laguna Division section of Reach 6. LDCA is downstream from Imperial Dam and upstream of Laguna Dam and encompasses approximately 1,200 acres of tamarisk shrub land and wetlands along the abandoned river channel between the Laguna Settling Basin and Mittry Lake Wildlife Area (Mittry) (figures 1 and 2).

Planning for LDCA began in 2007 when the Laguna Division Planning Group was formed to identify potential restoration projects within the division. The intent was to identify projects and combine resources to ensure any actions taken in the area would not affect other potential restoration projects or ongoing river operations. Current river operational requirements and constraints include: water delivery, sediment removal, and power generation. The Laguna Division Planning Group consists of representatives from the following organizations:

- Arizona Game and Fish Department
- California Department of Fish and Game
- Pacific Institute
- U.S. Fish and Wildlife Service
- U.S. Bureau of Land Management
- Bureau of Reclamation

In 2010, LDCA was brought before the Steering Committee and approved as a new start project for the LCR MSCP. Cultural compliance, an environmental assessment, and a Finding of No Significant Impact were also completed for LDCA that year. In 2011, the U.S. Army Corps of Engineers authorized a Section 404 of the Clean Water Act (33 U.S.C. 1344) and Section 10 of Rivers and Harbors Act of 1899 permit for the construction and rehabilitation of LDCA, which falls under Regional General Permit No. 22.

Landownership

LDCA is located on Reclamation withdrawn lands and is owned by Reclamation. Mittry is adjacent to LDCA to the east. Mittry is also located on Reclamation withdrawn lands and is managed by the Arizona Game and Fish Department and the Bureau of Land Management (BLM).

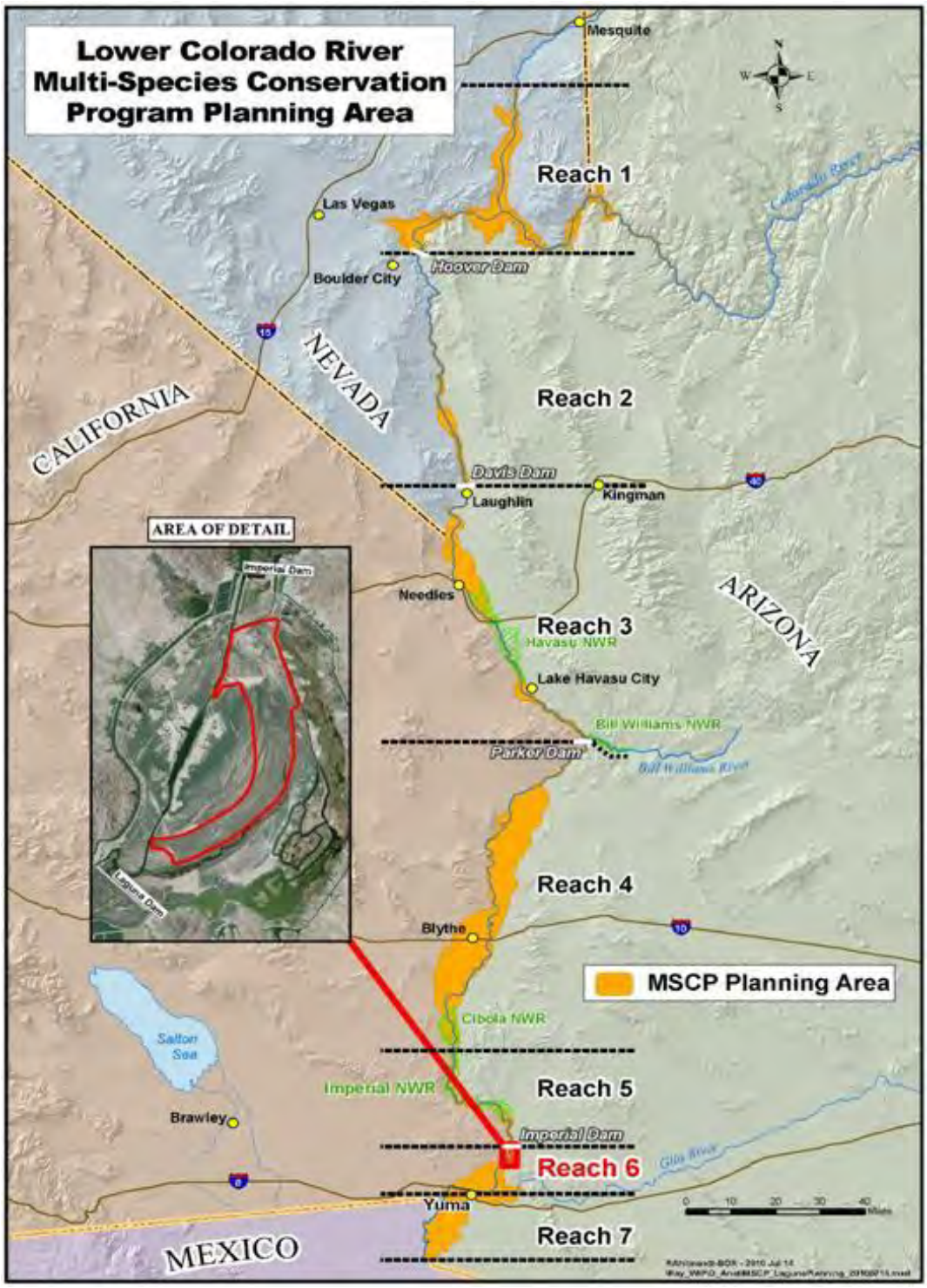

Figure 1.—Laguna Division Conservation Area location.

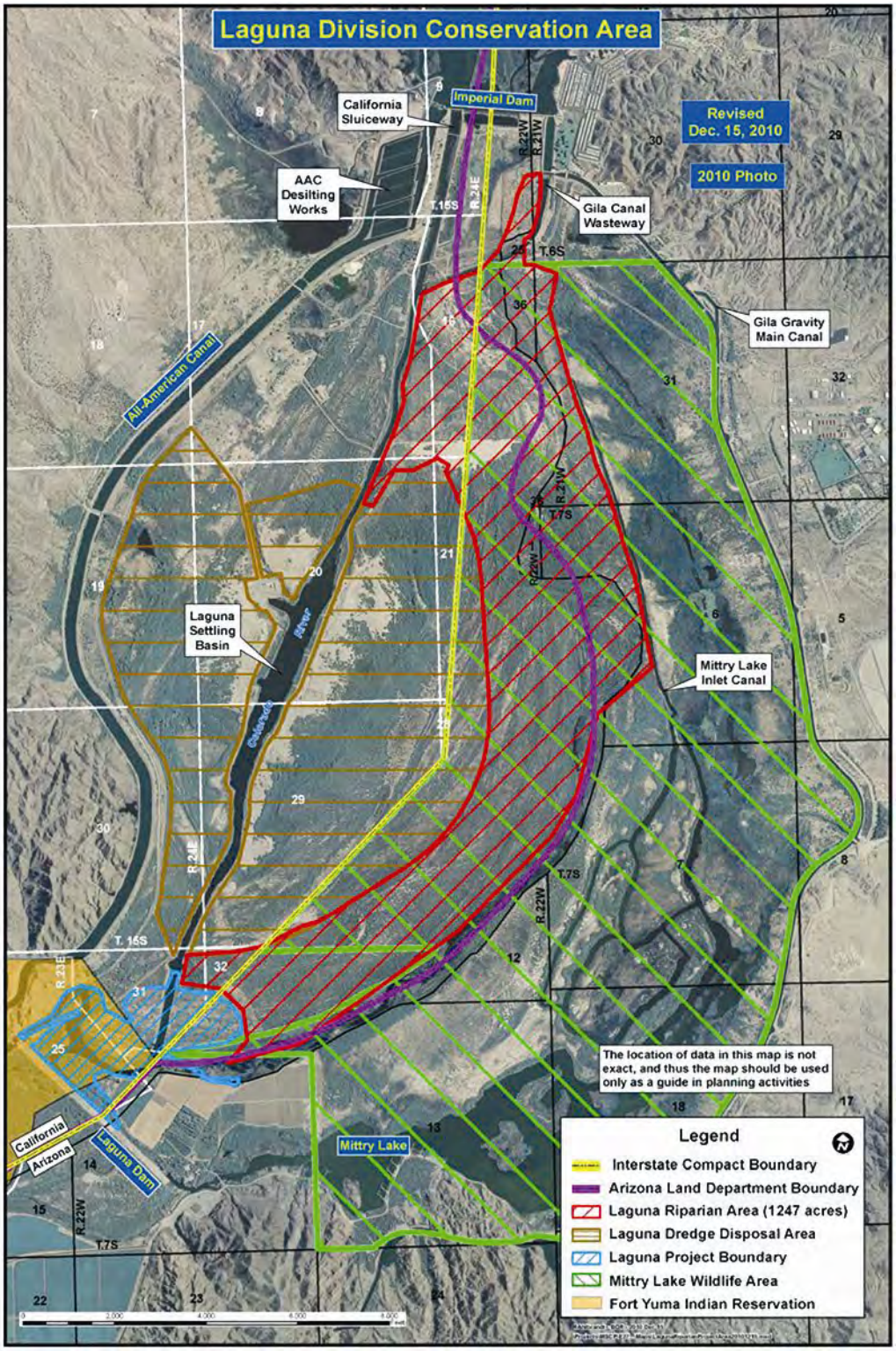

Figure 2.—Site map.

Water

A maximum continuous flow of 100 cubic feet per second (cfs), or approximately 72,000 acre-feet per year, of water is anticipated to be used by LDCA. Water is available to LDCA for the purpose of habitat restoration based on interpretation item numbers 10 and 11 of the *LCR MSCP Water Accounting Agreement*, which was signed in March 2010 (LCR MSCP 2010).

RESTORATION AND DEVELOPMENT PLAN

The goals of the LCR MSCP HCP (LCR MSCP 2004) include creation, development, and maintenance of 5,940 acres of cottonwood-willow (CW) for riparian habitat, 1,320 acres of honey mesquite for upland habitat, 512 acres of marsh, and 360 acres of backwater. This restoration plan is intended to partially fulfill those commitments. Approximate target habitat goals for LDCA are the following:

- Open water/marsh: 180 acres
- Cottonwood-willow: 450 acres
- Upland (mesquites): 400 acres

Table 1 below depicts the approximate acreage by land cover type in California. However, the actual values may change slightly based on clearing and contouring elevation changes.

Table 1.—Laguna acreage of planting areas in California

Planting areas	Mesquite (acres)	Cottonwood (acres)	Willow (acres)	Marsh (acres)
Reach 1	30.17	22.0	12.33	40.25
Reach 2	0.36	0.53	1.0	6.25

LDCA will be managed for BLRA, CLRA, SWFL, YBCU, and other LCR MSCP covered species. The plan generally will be used as a guide to create and manage 50 percent of CW in structural type I. The other 50 percent will be created and managed in structural types III and IV. The area will be designed and planted to create presently known preferred conditions necessary for the target covered species. Areas of clearing and contouring with primary and secondary channels, along with mosaics of vegetation, comprise the basis for the creation of habitat.

Transitional zones, consisting of shallow marsh plants, will also be incorporated into LDCA to act as fire breaks and create a smooth transition from deep marsh to CW habitat.

LDCA will be operated as a flow-through system with a large portion of the water diverted returning to the river and being utilized by downstream users. To accomplish this goal, the project boundary will be raised to act as earthen dikes around the perimeter and through the interior to create reaches. Each reach will be created to take advantage of the existing topography and to operate somewhat independently of one another. Water control structures will be used to manage water levels within the cells to mimic periodic flooding events (figure 3). Within the reaches, habitats will be created through excavated wetland channels. These channels are designed to provide planting platforms for native wetland and riparian vegetation that have suitable soil moistures for survival (figure 4). Channels will be created following the existing flood channels to minimize excavation, provide water conveyance, and allow the reaches to drain and fill efficiently.

Site Preparation

Land-based clearing will be done to remove existing vegetation and allow for contouring, infrastructure construction, and planting of native species. Currently, the majority of LDCA is composed of wetland scrub/shrub and upland dominated by salt cedar (*Tamarix ramosissima*) and arrowweed (*Pluchea sericea*), with smaller areas of open water/emergent marsh wetland containing cattail (*Typha latifolia*), giant reed (*Arundo donax*), and common reed (*Phragmites australis*) (BIO-WEST 2010).

Approximately 1,200 acres of LDCA would be cleared of existing vegetation through land-based mechanical and hydraulic equipment. Removed material will be used to build levee roads and as fill where needed to minimize cuts and fills. Removal and clearing will be phased to allow time for site infrastructure construction and weed maintenance to occur. Once clearing is completed, contouring will be done, followed by infrastructure construction. This process will repeat for each phase of clearing and contouring of the site. After contours have been established, light detection and ranging will be flown to allow for refinements to the planting plan.

Site Construction

Pipeline

Water will be supplied through a buried 2,300-foot-long, 48-inch-diameter high-density polyethylene pipeline. The pipeline will be routed around various

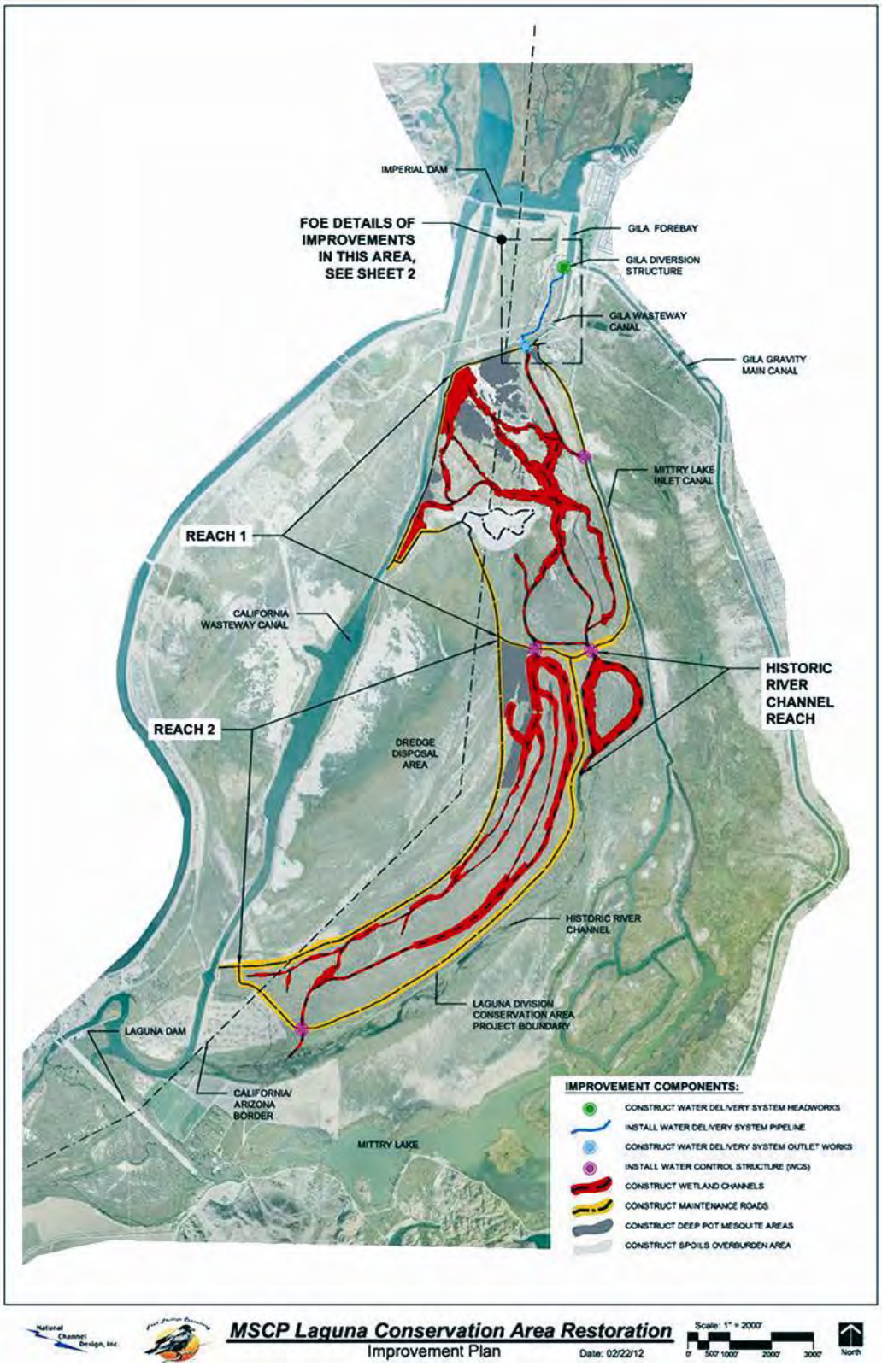

Figure 3.—LDCA improvement plan.

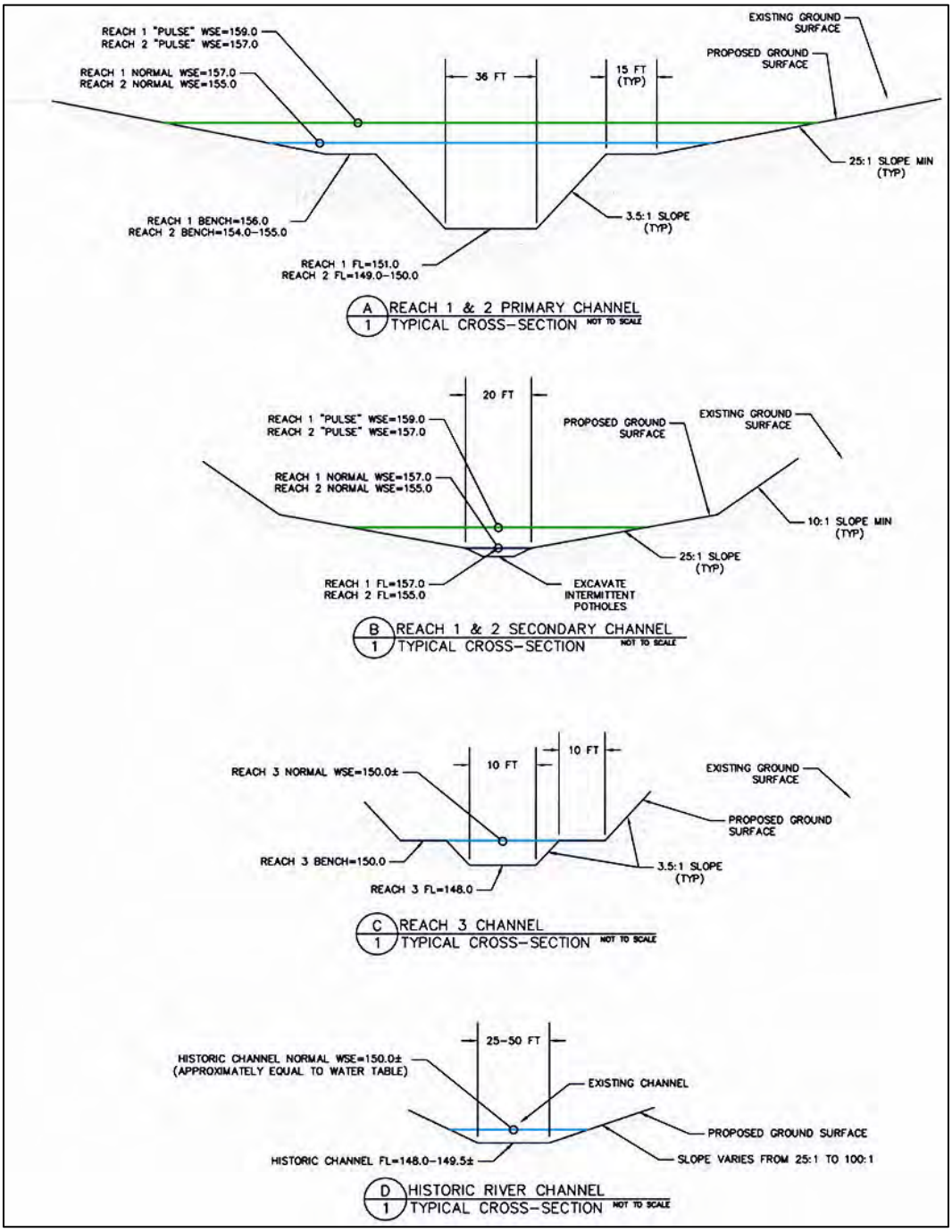

Figure 4.—Typical channel cross sections.

sensitive historical foundations within the original Yuma Proving Grounds, under County Highway S24, and pass under the Gila Wasteway through an inverted siphon before entering the upstream end of the project area (figure 5). The water source will be supplied via the Gila Settling Basin (Gila Basin) by constructing a

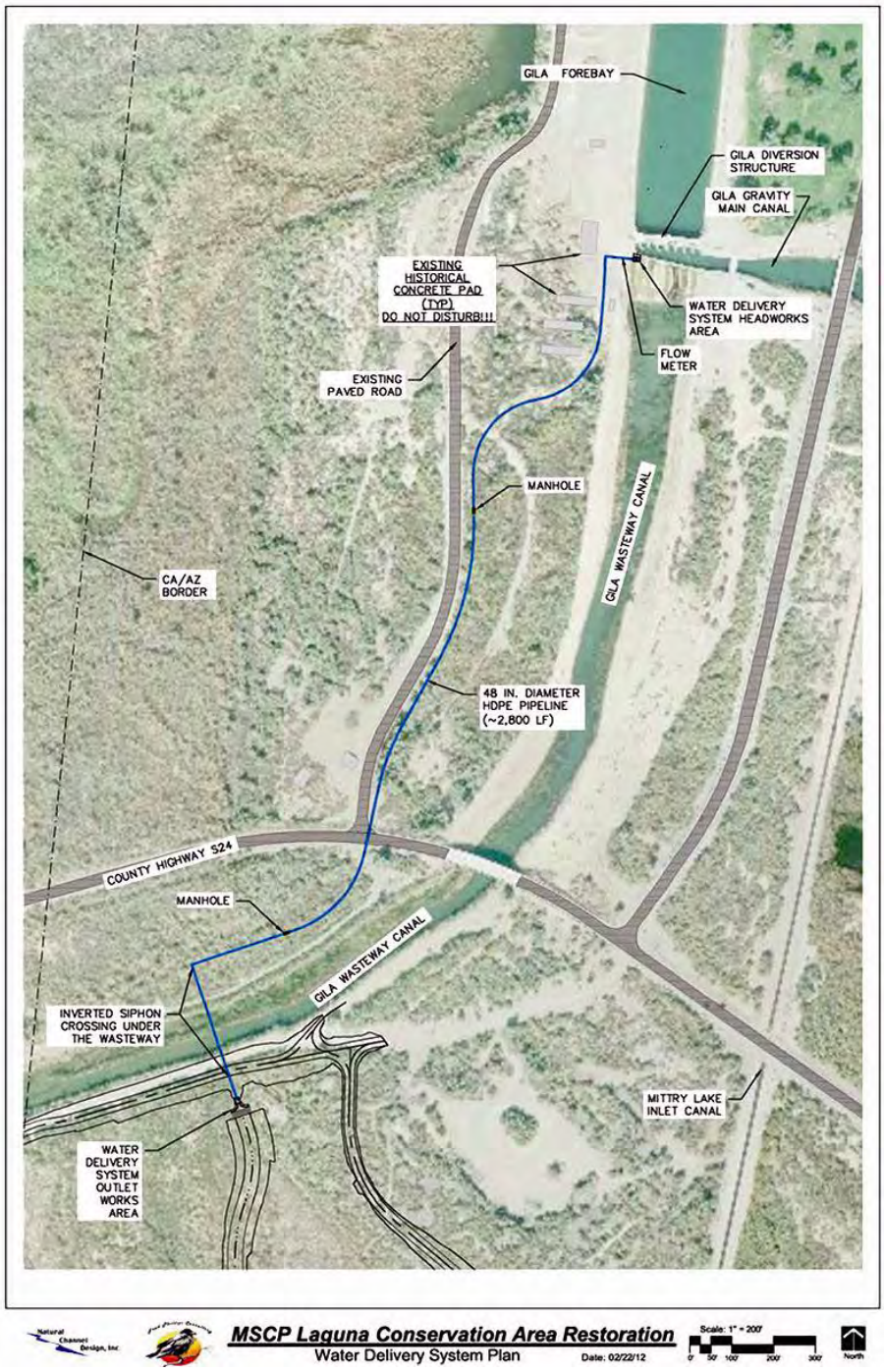

Figure 5.—LDCA pipeline alignment.

concrete structure for the pipeline in one of the rarely used sluicing raceways just south of the Gila Basin. A pinch valve may be used to control flows through the pipeline, which will terminus through a concrete outfall structure.

Water Control Structures

A total of four water control structures will be used within LDCA consisting of three main overshot gates and one smaller turnout gate. Locations will be at the outfall of Reach 1 into Reach 2, Reach 1 into the Historic River Channel, Reach 2 into Reach 3, and a smaller gate from Reach 1 into Mittry. The main overshot gates will be set in concrete boxes with a box culvert outlet and will be monitored using distributed control systems, allowing precise control of water surface elevations (figure 6). Additionally, the main overshot gates can be lowered completely to allow site drainage and/or passage of debris. The smaller turnout gate is anticipated for future use to pass flow into Mittry for maintenance activities.

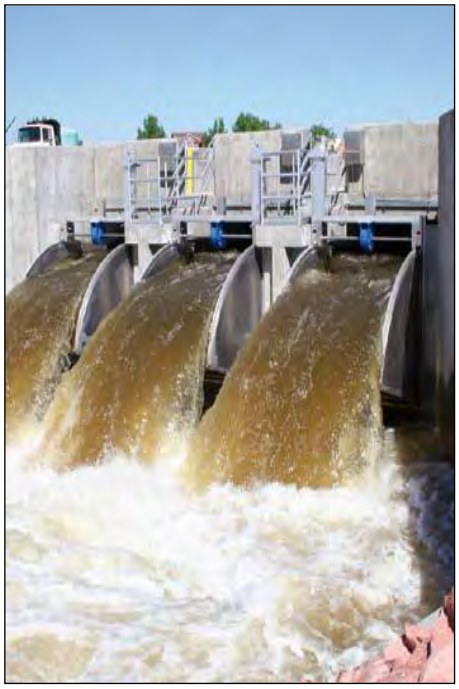

Figure 6.—Main overshot gate.

Planting Plan

Once contouring and infrastructure construction is complete, test flooding will begin to accurately depict elevation locations along the site and fill time of each reach. Vegetation will be planted after test flooding is complete. The conceptual planting design incorporates native LCR wetland, wetland transition, and upland species into a mosaic of created habitats (figure 7). Species have been stratified according to water demand and depth to develop an appropriate and functional mosaic of native marsh and marsh-associated species (figures 8 and 9). Planting will take place using both hand labor and mass planting techniques. The hand labor method will be used to plant deep-potted mesquites and deep marsh. Mass planting, wherever possible, will be utilized for CW and shallow marsh areas. Wetland marsh areas will be planted first and allowed to establish before CW and mesquite habitats are planted. This will be done to allow marsh plants to not be uprooted or drowned by pulse flows used to irrigate each reach.

The Historic River Channel reach will be managed differently than the fluctuating flows found in Reaches 1–3. This area is expected to be managed for the BLRA and CLRA and will be planted to take advantage of the stable water surface

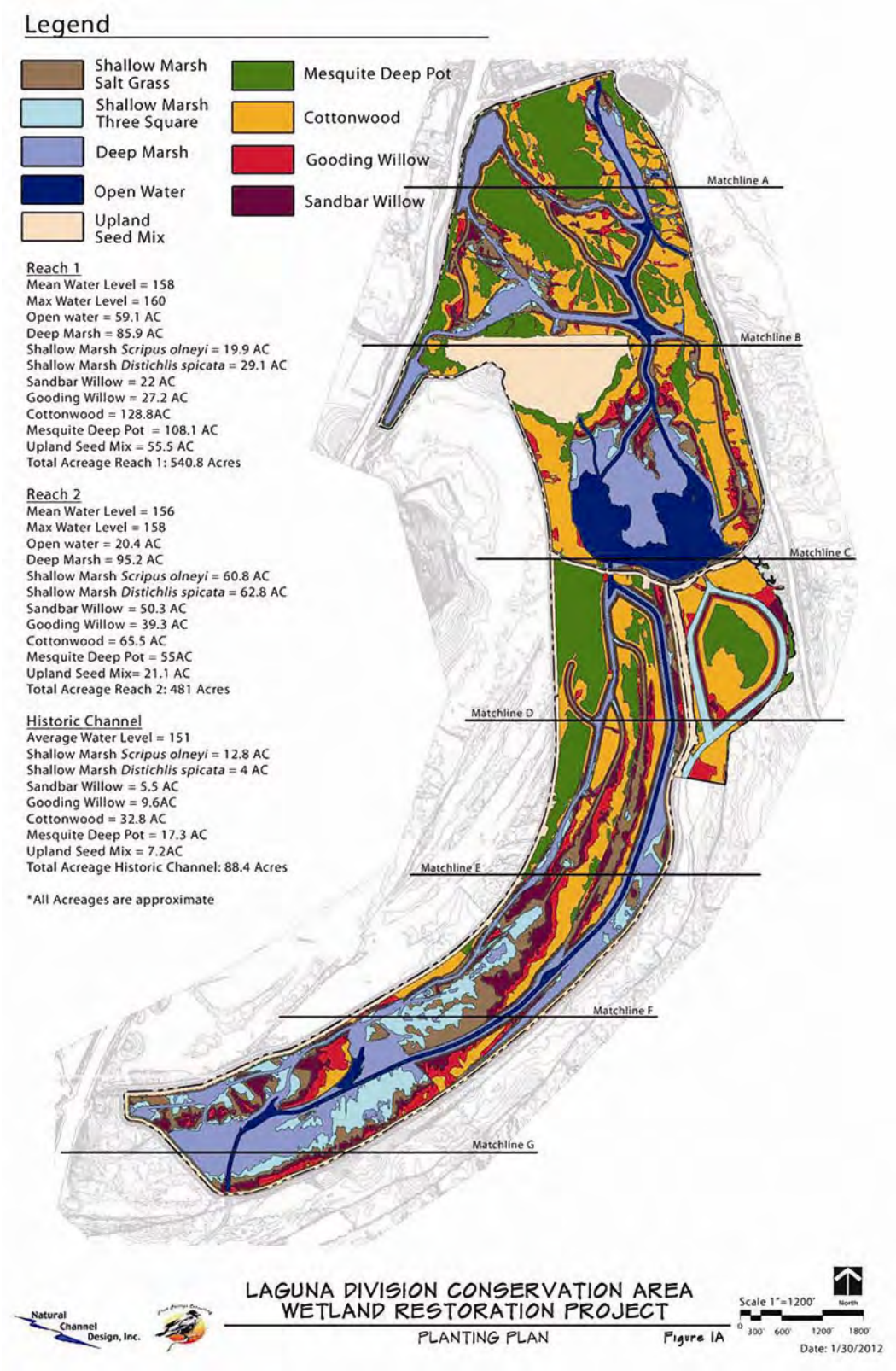

Figure 7.—LDCA conceptual planting plan.

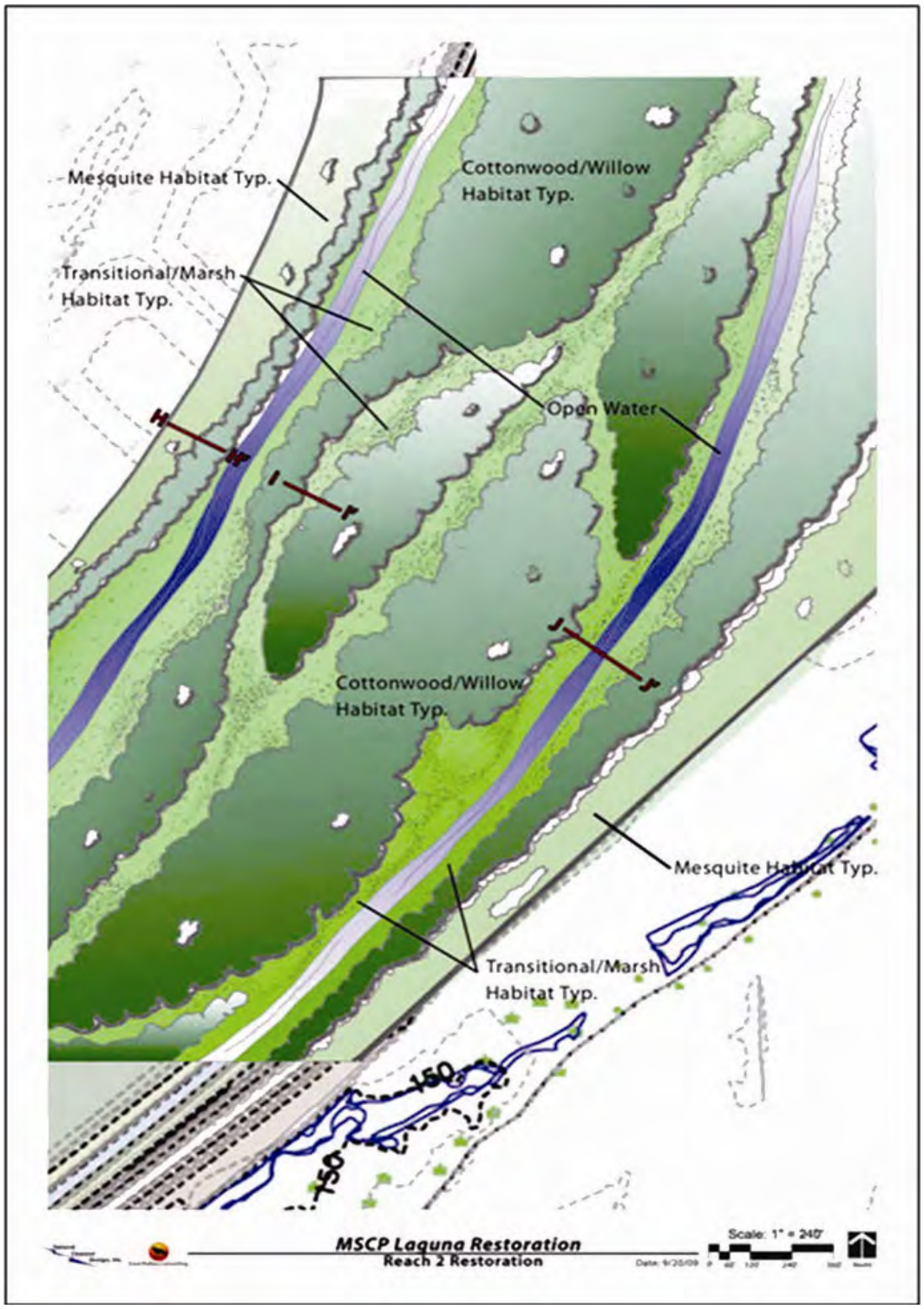

Figure 8.—Conceptual LDCA Reach 2 restoration.

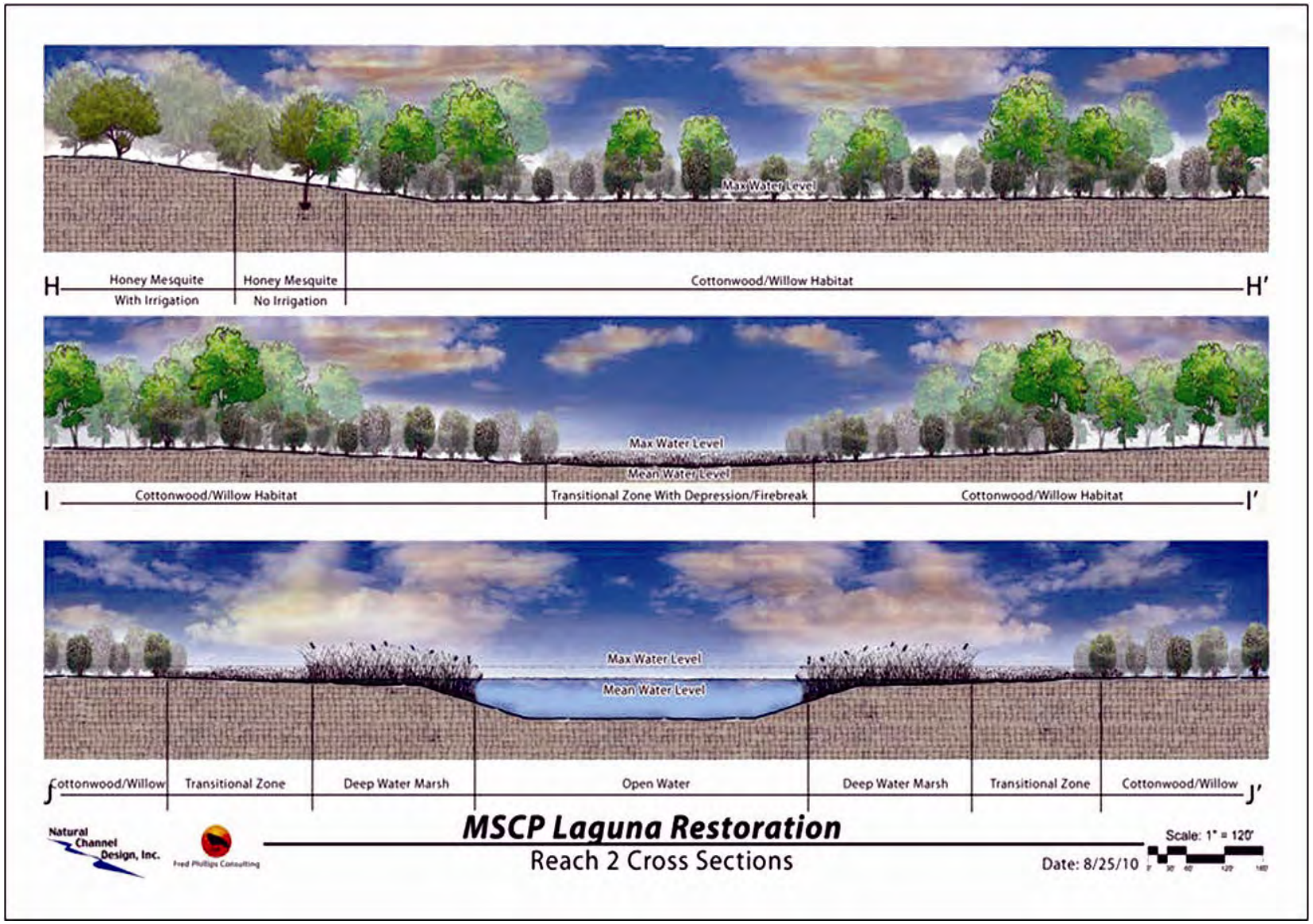

Figure 9.—Conceptual LDCA Reach 2 restoration cross sections.

elevation. Plantings will still be arranged by elevation above surface water to accommodate the preferred depth to water for CW, mesquite, and marsh (figure 10).

The creation of habitat under the program is designed to create cottonwood-willow stands that exceed the habitat value of existing stands by supporting (1) a greater density of cottonwood-willow trees than the 10 percent identified in the Anderson-Ohmart classification system, (2) a greater diversity of plant species, (3) a greater abundance of insect prey production, and (4) a greater structural diversity associated with the creation of multiple layers of vegetation and seral stages (LCR MSCP 2004). These concepts also apply to mesquite and marsh habitat creation.

Incorporation of research into the planting plan from the beginning will allow a comprehensive approach to document the ecological functions that are being restored at LDCA. For example, seeding in small patches throughout the site to establish a seed source for natural recruitment of herbaceous and shrub species is one of a variety of techniques that may be included and integrated into research projects. Planned high water flood irrigations can be timed to coincide with manual seeding of cottonwoods and willows or during the natural seed dispersal period to allow for self seeding (LCR MSCP 2004). Monitoring plant diversity, insect prey production, and structural plant diversity can be done in concert with monitoring for covered species. Species diversity at all trophic levels within the site can then be correlated with data on reproductive success and other population parameters already being measured for covered species.

Table 2 includes, but is not limited to, native species that may be integrated into a mosaic of habitat types being planted at LCDA. Each reach plan will include the specific plant species and estimated quantities that will be planted and study plans for research to be undertaken. Each habitat type (CW, honey mesquite, marsh, etc.) within each reach will have a suite of appropriate grass, herbaceous, and shrub species that naturally occur under the same conditions. Other factors that will determine species selected are those well documented to affect success: soil texture, irrigation/moisture level, shade tolerance, etc. These factors will all be taken into consideration when preparing planting and research plans for each reach. Species of plants, especially those from seed, will first be limited to their availability at the time they are ordered from the vendor and, therefore, may include species not listed in table 2.

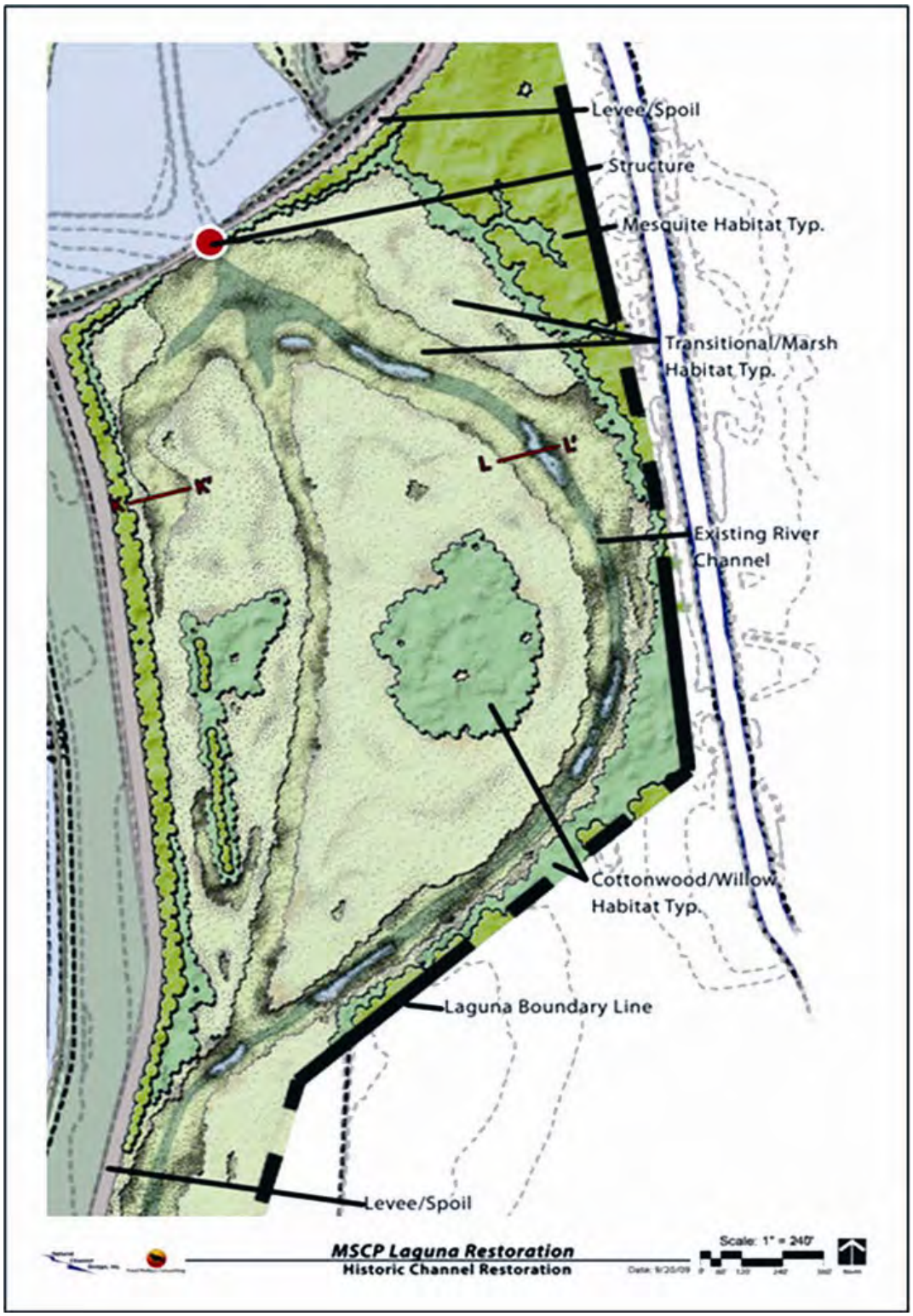

Figure 10.—Conceptual LDCA Historic River Channel restoration.

Table 2.—Potential native plant species list

Scientific name	Common name
Populus fremontii	Fremont cottonwood
Salix gooddingii	Goodding willow
Salix exigua	Coyote willow
Prosopis glandulosa v. torreyanna	Honey mesquite
Atriplex lentiformis	Qualbush
Atriplex canescens	4-wing saltbush
Distichlis spicata	Inland salt grass
Schoenoplectus americanus	Three square (i.e., Chairmaker's) bulrush
Schoenoplectus californicus	California bulrush
Anemopsis californica	Yerba mansa
Allenrolfea occidentalis	Iodine bush
Achnatherum hymenoides	Indian rice grass
Achnatherum speciosum	Desert needlegrass
Aristida purpurea (several varieties)	Purple threeawn
Bouteloua curtipendula var. caespitosa	Sideoats grama
Bouteloua gracilis	Blue grama
Muhlenbergia asperifolia	Scratchgrass
Muhlenbergia rigens	Deer grass
Panicum hirticaule ssp. hirticaule	Mexican panic grass; Roughstalked witchgrass
Panicum hirticaule ssp. sonorum	Sagui/sonoran panic grass
Paspalum distichum	Knotgrass
Sporobolus cryptandrus	Sand dropseed
Chloracantha spinosa var.spinosa	Spiny goldenbush
Dieteria asteroides var. asteroides	Fall tansyaster
Heliotropium curassavicum	Heliotrope
Lotus humistratus	Bird's foot lotus
Lotus rigidus	Deervetch
Lotus saluginosus (var.brevivexillus)	Humble trefoil
Senecio flaccidus var. douglasii	Douglas' groundsel
Sesuvium verrucosum	Verrucose seapurslane
Xylorhiza tortifolia var. tortifolia	Mojave woody-aster
Scirpus acutus	Hardstem bulrush
Eleocharis palustris	Spikerush
Boboschoenus maritimus	Alkali bulrush
Sphaeralcea ambigua	Globe mallow
Encelia farinosa	Brittlebush
Baileya multiradiata	Desert marigold

Planting Material/Planting Techniques

Plant material for the project would be delivered via a contractor or collected from an established LCR MSCP nursery along the LCR and from areas that are ecologically similar. As explained above, planting techniques that may be used onsite, which have been proven successful include:

- Automated mass transplanting
- Dormant pole cutting/planting
- Planting poles, potted plants, or slips with a conventional tree planter or by hand
- Seeding (manual and natural)
- Perimeter planting of poles, potted plants, or slips

Planting techniques may include a combination of the above or any planting techniques that have been researched or demonstrated to be successful and/or cost effective. The specific planting technique will be included in each individual reach plan prior to implementation.

Herbicide/Fertilizer/Pesticide Application

To ensure the total eradication of non-native plant species before planting and to maintain healthy stands of native vegetation species, the application of herbicides, fertilizer, or pesticides may be required. All herbicide, fertilizer or pesticide application would be applied or supervised by a current Certified Pesticide Applicator for the chemical being applied and in compliance with the rules, regulations, and laws set by the State of California, Imperial County, and the State of Arizona, Yuma County.

All records and associated chemical application documents will be stored by the land manager and will include:

- Training records of all employees handling pesticides and herbicides
- Material Safety Data Sheets for all pesticides, herbicides, and fertilizers
- Location map of herbicide and pesticide storage site
- Use of California and Arizona approved herbicide, pesticides, and fertilizers
- Record of herbicide, pesticide, or fertilizer use

MANAGEMENT OVERVIEW

Land Manager

Reclamation will be responsible for ensuring long-term operation and maintenance of LDCA throughout the 50-year term of the LCR MSCP. The details of operation and maintenance of LDCA will be agreed upon between Reclamation and other agencies such as BLM to include law enforcement, public use, wildfire management, research, and monitoring.

Soil Management

Since LDCA is located within the LCR flood plain, sands and silts have been deposited over time by numerous flood events. Several soil samples have been taken within LDCA at various depths. Most of the soils found with the sample points were well-drained sand and loamy sand textures that are favorable for the conceptual restoration plan (Fred Phillips Consulting, LLC 2011). A small number of samples found dense clay within the site. The location of the dense clay samples was at least 5 feet below the soil surface, and does not appear to occupy large areas.

Soil salinity samples were also taken within LDCA. All samples were found to be suitable for native salt-tolerant species. With the combination of well-drained soils, ground water depths ranging from 2–10+ feet within LDCA, and a low-salinity water source, it is expected that salt should be flushed from the site after test flooding. Ground water wells will be installed at several locations before planting to ensure proper salinity and water quality levels can be reached for native vegetation survival. In addition, organic materials to soil would likely increase water-holding capacity and add nutrients to the soil for plant growth. Following is a list of methods that may be used to manage soil water-holding capacity, nutrients, and to prevent salinity buildup:

- Leaves, vegetation debris, and branches will be left onsite to decay
- Appropriate irrigation schedules to flush salts from soil
- Fertilizer

Soil management may include a combination of the above or any other techniques that have been researched or demonstrated to be successful and cost effective.

Water Management

Irrigation System

The primary water management at LDCA will be an efficient pulse flow irrigation system and schedule. To establish and maintain the native land cover types, a maximum continuous flow rate of 100 cfs is to be used. Water for LDCA will be delivered using the Gila Basin, just below Imperial Dam. Water will be controlled at the inlet water control structure installed in the sluiceway bay of the Gila Basin. A flow meter will be installed to measure the amount of water passing into LDCA. Primary and secondary channels will be excavated using existing topography to convey water through the site. Water control structures will be constructed at the end of each reach and programmed to maintain specific water elevations within LDCA to pass water through the site and irrigate vegetation efficiently. When irrigation of the plants is necessary, water controls will be programmed to raise and increase the water elevations, holding water within each reach and allowing irrigation to upland plants. Once the desired pulse elevation has been reached and plants are sufficiently irrigated, the water control structures will return to the base flow water elevation and allow water to pulse into channels below and repeat the irrigation cycle in the next reach. After water has passed into Reach 3, it will be returned into the LCR. Flow measurement and water elevations will be collected using data loggers installed within the water controls structures.

It is anticipated that a contractor would be responsible for inspecting gates and channels and the results reported to Reclamation. In addition, visual inspection will be performed by the irrigator each time the reaches are pulsed. Reclamation will be responsible for the cost of repairs and/or replacement of the irrigation system.

The pipeline, valves, and gates will be inspected and serviced according to the manufacturer's recommendations or yearly, whichever is more frequent.

Irrigation water will be ordered in advance through the Gila Gravity Watermaster (Yuma Mesa Irrigation and Drainage District) per the Gila Gravity Standing Operating Procedures (SOP). The outlet will be operated by the Gila Gravity ditch rider. Water will only be delivered when ordered ahead per the SOP.

Irrigation Practices

It is anticipated that all CW and upland cover will be pulse irrigated on a regular basis within the reaches. Irrigation will be managed through the Historic River Channel to maintain shallow water elevations with little fluctuations during breeding and nesting season (March–September) of the BLRA and CLRA. Creating stable shallow water conditions is considered to be beneficial for other marsh bird species as well.

Irrigation management may include a combination of the above techniques or any techniques that have been researched or demonstrated to be successful and/or cost effective. A Maintenance and Irrigation Plan will be prepared prior to planting. This plan will provide irrigation, weed management, and vegetation maintenance recommended procedures for LDCA.

Structural Management

Selective harvesting within the CW habitat may be used to mimic a succession of stages to create the targeted structurally diverse habitat. Resetting of marsh habitat may be performed when marsh becomes decadent. The intent is to mimic the habitat type structure preferred by the LCR MSCP covered species.

Created habitats would be managed to support CW types I, III, and IV for SWFL and CW types I and III for YBCU. The structural types are based on Anderson and Ohmart (1984) proportional distribution of vegetation. Marsh will be managed to support CLRA and BLRA. LDCA will be assessed annually at the end of each growing season to identify structural types. The following methods may be modified, and new methods may be added depending on research and demonstration, through the adaptive management plan:

- Planting appropriate riparian vegetation that matures to recommended heights
- Manually maintaining the three distinct heights or layers of vegetation
- Planting designed so canopy trees do not shade out mid and bottom foliage and integrates open areas (areas planted with only ground covers)
- Selective removal of intermediate vegetation (pruning and thinning)
- Creating open areas with shrubs and grasses
- Prescribed fire to reset decadent marsh vegetation

Structural management may include a combination of the above or any techniques that have been researched or demonstrated to be successful and/or cost effective.

Law Enforcement

BLM is responsible for law enforcement at LDCA. Reclamation will work with BLM to ensure these activities do not conflict with the LCR MSCP HCP.

Public Use

BLM has the authority to regulate recreation uses pursuant to BLM statutes, regulations, and policies. In cooperation with Reclamation, BLM will coordinate its public use and related activities so they are consistent with and do not adversely affect restoration activities at LDCA.

Wildfire Management

As guided by commitments in the LCR MSCP HCP, wildfire management practices on LDCA would:

- Reduce the risk of loss of related habitat to wildfire by providing resources to suppress wildfires (e.g., contributing to and integrating with local, State, and Federal agency fire management plans)

- Implement land management and habitat creation measures to support the re-establishment of native vegetation that is lost to wildfire

LDCA wildfire management may include the rapid response of irrigating the affected reaches and Mittry if immediately adjacent to the wildfire. Specific fire management will be developed as is described in the LCR MSCP Law and Fire Strategy and the LCR Conservation Area Law and Fire Strategy.

MONITORING

Habitat/species monitoring is designed to determine whether each reach within LDCA is providing the habitat requirements needed for the targeted covered species, if any covered species is utilizing the habitat, and if there are differences in wildlife use of the habitat depending on planting design, composition, and watering regimes. The monitoring is divided into habitat and covered species and will be analyzed incorporating both categories:

- Habitat Monitoring
    - Abiotic Conditions
    - Water Quality
        - Water quality may be measured and may include temperature, salinity (as specific conductivity), dissolved oxygen, pH, turbidity, and selenium.

        - Ground and Surface Water Levels
            - Water levels will be monitored in connection with marsh bird surveys.
        - Soils
            - Soils may be monitored to determine salinity, texture, moisture content, micro-organisms, and nutrients.
        - Microclimate
            - As part of other monitoring (SWFL, YBCU, etc.), temperature and humidity may be monitored at specific locations.
    - Biotic Conditions
        - Vegetation
            - Vegetation will be monitored once per year in both marsh and riparian habitat. Marsh habitat monitoring protocols are being developed. Riparian habitat will be monitored using methods detailed in the report entitled *Post-development Habitat Monitoring, Field Methods - 2011 Monitoring Season,* Updated November 2011.

- Covered Species Monitoring
    - MacNeill's Sootywing Skipper
        - If the planting of quailbush is successful, surveys will be conducted when quailbush shrubs exceed 1.5 meters in height. Presence/absence of sootywings will be determined while walking transects through quailbush habitat when the skipper flies between April and October. A minimum of three surveys will be conducted per year.
    - Marsh Birds
        - Monitoring will be conducted using the multi-species survey from the Standardized North American Marsh Bird Monitoring Protocol (Conway 2005) after all construction is complete and marsh vegetation has been planted. This

protocol incorporates playing calls of marsh bird species at designated survey points to elicit responses in order to determine presence of the target species.

- Neo-tropical Birds
    - A standardized, double-sampling, rapid-intensive, area-search survey will be utilized as detailed in the Great Basin Bird Observatory (2012). Surveys will be conducted annually during the breeding season (April–June) beginning the second week of April.
    - If covered species are observed, species-specific surveys, nest searches, and mist-netting/banding may be conducted.
- Cavity Nesting Birds
    - Elf owl presence/absence surveys will be conducted once habitat-containing cavities excavated by woodpeckers are present or if nest boxes have been installed. Any installed nest boxes will be monitored during the breeding season. If elf owls are detected during the breeding season, nest searches and mist-netting/banding may be conducted.
    - Gilded flickers and Gila woodpeckers will be surveyed as part of the system-wide neo-tropical bird monitoring effort. Once suitable nesting habitat (snags with cavities) develops on the site, more directed presence/absence surveys may be conducted for gilded flicker or Gila woodpeckers. If gilded flickers or Gila woodpeckers are detected during breeding season, nest searches and mist-netting/banding may be conducted.
- Southwestern Willow Flycatchers will be surveyed and, if found, monitored beginning at least two growing seasons after planting. Cottonwood and willow habitat will be surveyed for flycatchers according to standardized presence/absence surveys (Sogge et al. 2010).
- Yellow-billed Cuckoos will be surveyed and, if found, monitored beginning at least two growing seasons after planting. Cottonwood and willow habitat will be surveyed for cuckoos according to standardized presence/absence surveys (Halterman et al. 2008.

- Small Mammals
    - If the seeding and planting of the transition zone between the marsh and upland is successful and potential cotton rat habitat (dense grassy/weedy vegetation) occurs in large enough patches, then standardized presence/absence surveys will be conducted at least once annually during fall and/or spring. Trapping will be conducted overnight using Sherman live traps. Traps will be placed in linear transects within the transition zone.
- Bats
    - Presence/absence surveys may be conducted utilizing active/passive Anabat bat detectors and mist-netting.

ADAPTIVE MANAGEMENT

Role

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 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.

If it is determined through the monitoring results that additional information is needed to better define covered species habitat requirements, these data will be collected using the procedures outlined in the LCR MSCP Science Strategy (LCR MSCP 2007). The Science Strategy provides for an adaptive management process for improving the effectiveness of HCP implementation and identification of monitoring and research priorities. Alterations or changes to habitat creation sites can be accomplished through management activities; these activities will be initiated through the adaptive management process. Habitat creation sites may be manipulated and/or maintained for covered species using the best available science throughout the term of the HCP.

Another role of the Adaptive Management Program is to determine whether the site is meeting the management guidelines for each targeted species. This is

accomplished through analysis of all monitoring data and comparison with other relevant studies. Annual reports will summarize each created habitat land cover type, acreage, and any adaptive management activities conducted on the site.

Monitoring Analysis and Evaluation

The LCR MSCP has determined the process for covered species conservation measurement accomplishment, including the identification of species-specific management guidelines. Species-specific conservation measurement accomplishments will be reported annually in the LCR MSCP Implementation, Work Plan and Budget, and Accomplishment Report, or as appropriate in the LDCA annual reports.

Species-specific management guidelines will be used to manage the site to meet the targeted species conservation measurement goals. All relevant data, including species, vegetation, and abiotic monitoring will be used to determine whether the site is meeting the management guidelines as appropriate. Species-specific management guidelines may be updated through the adaptive management process and then revised in the conservation area management plans and annual reports.

If it is determined that the site does not meet any of the management guidelines, recommendations for site modifications may be made by the following means:

- Comparison of monitoring results with management guidelines to identify those guidelines not being met that can be remedied by site manipulations (plant removal, additional plantings, site contouring, etc.) or changes to the watering regime.

- Comparison of LDCA results with previous successful and unsuccessful habitat restoration projects to assess differences in site characteristics, baseline conditions, planting design, plant and animal species composition, watering regimes, and abiotic conditions that may help explain why the site has not met the management guidelines.

- Review of other studies that may provide insight into additional covered species habitat requirements or different restoration techniques to achieve the desired conditions.

These recommendations on how to move toward achieving species-specific management guidelines will be included in the annual report as appropriate. These recommendations will also be used to improve future project designs where appropriate.

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