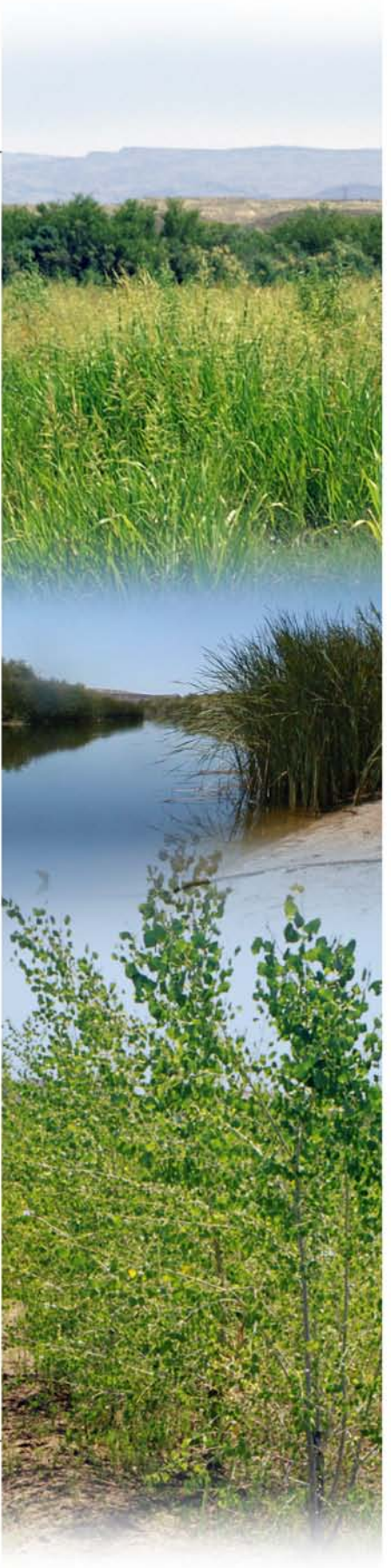
LOWER COLORADO RIVER
Multi-Species Conservation Program

Final
Habitat Conservation Plan

Volume II



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Volume II: Habitat Conservation Plan

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Exhibit A Draft Final Funding and Management Agreement

Exhibit B Draft Final Implementation Agreement

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Volume V Lower Colorado River Multi-Species Conservation Program Responses to Comments on Volumes I–IV [Separate Volume]

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Chapter 1

Introduction

1.1 Background

The Colorado River Basin encompasses approximately 244,000 square miles located in portions of seven states (i.e., Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming—collectively referred to as the Basin States[1]). The Colorado River starts in the Rocky Mountains and traverses more than 1,400 miles to its terminus in the delta regions of the upper Gulf of California (Sea of Cortez) in Mexico. The Colorado River provides the water supply for over 25 million people and about 3.5 million acres of agricultural lands in the United States and Mexico (Water Education Foundation 2001). A significant amount of the water demand (particularly for municipal use) is physically located outside the Colorado River Basin and is served by transbasin diversions and conveyances. Collectively, hydroelectric generation facilities in the Colorado River Basin can provide about 12 billion kilowatt hours of energy annually.

The Colorado River also serves as a significant source of water for recreational and environmental resources in the Basin States. The riverine corridor and associated historical floodplain compose a significant portion of the remaining aquatic, marsh, and riparian habitat that is vital to many different resident and migratory species.

The Colorado River Compact of 1922 divided the Colorado River into Upper and Lower Divisions and Upper and Lower Basins. The Upper Division States are Colorado, New Mexico, Utah, and Wyoming, and the Lower Division States are Arizona, California, and Nevada. The Lower Basin extends from Lee Ferry to the Southerly International Boundary (SIB) and is generally referred to as the lower Colorado River (LCR) (see Figure 1-1). Hoover Dam is the northernmost U.S. Department of the Interior, Bureau of Reclamation (Reclamation) facility on this portion of the river. LCR operations are determined by various laws, treaties, and court decisions collectively referred to as *The Law of the River* (see Appendix A). The Law of the River includes, but is not limited to, the Colorado River Compact of 1922, the Boulder Canyon Project Act of 1928, the

[1] As defined in the Colorado River Compact of 1922, the phrase *Lower Basin* describes the geographic area where waters naturally drain in the Colorado River below Lee Ferry, approximately 1 mile downstream from the confluence of the Paria River (the Lower Basin includes portions of Arizona, California, and Nevada); *Upper Basin* describes the area upstream of the Paria River (the Upper Basin includes portions of Arizona, Colorado, New Mexico, Utah, and Wyoming). As defined in the Colorado River Compact of 1922, the phrase *Lower Division States* (or *Lower Division*) used in this document refers to Arizona, California, and Nevada, and *Upper Division States* (or *Upper Division*) refers to Colorado, New Mexico, Utah, and Wyoming.

California Seven Party Agreement of 1931, the *Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande—Treaty between the United States of America and Mexico*, dated February 3, 1944 (1944 Water Treaty), the Upper Colorado River Basin Compact of 1948, the 1956 Colorado River Storage Project Act, the Supreme Court Decree of 1964 in *Arizona v. California* (376 U.S. 340) (Decree), and the Colorado River Basin Project Act of 1968. The Law of the River encompasses discretionary and nondiscretionary actions by Reclamation, acting for the Secretary of the Interior (Secretary) in her role as watermaster, related to its operation and maintenance (O&M) of the LCR.

In 1967, the Yuma clapper rail, an endemic bird of the LCR, was listed as endangered under the precursor to the Federal Endangered Species Act (ESA). In 1980, the bonytail, a native fish of the LCR, was listed as endangered under the ESA. In 1991, the razorback sucker, a native fish of the LCR, was listed as endangered. In 1994, areas of the LCR were designated as critical habitat for these two endangered fish species. In 1995, the southwestern willow flycatcher, a native bird of the LCR region, was listed as endangered. The U.S. Fish and Wildlife Service (USFWS) proposed critical habitat for the southwestern willow flycatcher including areas in the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) planning area on October 12, 2004.

In 1995, U.S. Department of the Interior agencies; water, power, and wildlife resources agencies from Arizona, California, and Nevada; Native American tribes; environmental interests; and recreational interests agreed to form a partnership to develop and implement a long-term endangered species compliance and management program for the historical floodplain of the LCR. To facilitate the development of an ecosystem-based habitat conservation plan (HCP) and coordination with the various LCR MSCP Federal partners, the Director of the USFWS designated the LCR MSCP Steering Committee as the Ecosystem Conservation Recovery Implementation Team for the LCR. The parties designated the program the LCR MSCP. The potentially affected parties and other interested parties established a public process for developing the required documents and plans. Various public agencies and other non-governmental groups have participated, at their discretion and at various times, in developing the various components of the LCR MSCP.

Reclamation issued a final biological assessment (BA) for LCR O&M from Lake Mead to the SIB in August 1996 (Bureau of Reclamation 1996). That BA served two purposes: as documentation for the ESA section 7 consultation between Reclamation and the USFWS for discretionary operations of the LCR and as a reference for development and implementation of the LCR MSCP by LCR stakeholders pursuant to ESA section 7 (for Federal actions) and ESA section 10(a)(1)(B) (for non-Federal actions). On April 30, 1997, the USFWS issued its final biological opinion (BO) (U.S. Fish and Wildlife Service 1997) (1997 BO). The 1997 BO identified Reclamation's participation in developing the LCR MSCP as the long-term plan to address the impacts of Reclamation's continued O&M activities on the LCR. Consultation on the 1997 BO was reinitiated at Reclamation's request in March 2002, and another BO was issued by the USFWS in April 2002 (U.S. Fish and Wildlife Service 2002a) (2002 BO). This BO identified minor modifications to the provisions of the 1997 BO and extended ESA coverage for Reclamation's discretionary actions on the LCR for 3 years to April 30, 2005.

N

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Miles

Figure 1-1
Lower Colorado River MSCP
Planning Area and River Reaches

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LCR MSCP participants and stakeholders now seek to establish a long-term framework for compliance with the ESA for ongoing, proposed, and potential future projects. At present, compliance with ESA is achieved on a project-by-project and species-by-species basis. The LCR MSCP is a partnership responding to the need to balance the legal use of LCR water resources and the conservation of threatened and endangered species and their habitats in compliance with the ESA. The Steering Committee will operate, as defined under the Funding and Management Agreement (FMA) that has been prepared among Federal, state, local, and tribal parties, and will provide oversight to the LCR MSCP Program Manager (Program Manager) (see Exhibit A). The Program Manager is the position to be established by Reclamation, as described in the FMA, that will be responsible for implementing the LCR MSCP.

1.2 LCR MSCP Goal

The overall goal of the LCR MSCP is to develop and implement a plan that will:

- conserve habitat and work toward the recovery of threatened and endangered species, as well as reduce the likelihood of additional species being listed;
- accommodate present water diversions and power production and optimize opportunities for future water and power development, to the extent consistent with the law; and
- provide the basis for incidental take authorizations.

1.3 Purpose and Need for the LCR MSCP HCP and Regulatory Context

1.3.1 Need for the LCR MSCP HCP

Section 9(a)(1)(B) of the ESA prohibits the take by any person of any listed endangered fish or wildlife species, and section 9(a)(1)(G) of the ESA prohibits the take of any listed threatened fish or wildlife species in violation of any regulation promulgated by the USFWS. The ESA prohibits the take of listed endangered or threatened fish or wildlife species by any person unless otherwise specifically authorized or permitted, pursuant to the provisions of section 7 or section 10(a)(1)(B) of the ESA. The take prohibition for listed plants is more limited than for listed fish and wildlife. Under section 9(a)(2)(B) of the ESA, endangered plants are protected from removal, reduction to possession, and malicious damage or destruction in areas that are under Federal jurisdiction. Section 9(a)(2)(B) of the ESA also provides protection to plants from removal, cutting, digging up, damage, or destruction where the action takes place in violation of any state law or regulation or in violation of a state criminal trespass law. Thus, the ESA does not prohibit the incidental take of Federally listed plants on private or other non-Federal lands unless the take or action resulting in take requires Federal authorization or is in violation of state law. The section 7(a)(2) prohibition against jeopardy, however, applies

to plants, and the USFWS may not issue a section 10(a)(1)(B) incidental take permit if the issuance of that permit would result in jeopardy to a listed plant species.

Private individuals, corporations, state or local governments, or other non-Federal entities who wish to conduct otherwise lawful activities that might incidentally take a listed species must first obtain an incidental take permit from the USFWS. A non-Federal entity is required to develop an HCP in order to be granted an incidental take permit under section 10(a)(1)(B) of the ESA. Under the ESA section 10(a)(2)(A) and USFWS section 10 regulations (50 Code of Federal Regulations [C.F.R.] §17.22(b)(1)), the permit application and the HCP submitted in support of the incidental take permit application must detail the following information:

- a complete description of the activity sought to be authorized;
- the common and scientific names of species sought to be covered by the permit, as well as the number, age, and sex of such species, if known;
- the impact that will likely result from such taking;
- what steps the applicant will take to monitor, minimize, and mitigate such impacts;
- the funding that will be available to implement such steps;
- the procedures to be used to deal with unforeseen circumstances;
- what alternative actions to such taking the applicant considered and the reasons why such alternatives are not proposed to be used; and
- such other measures that the Regional Director of the USFWS may require as being necessary or appropriate for purposes of the plan.

This HCP is intended to meet all the regulatory requirements necessary for the USFWS to issue a section 10(a)(1)(B) permit to allow incidental take of threatened and endangered species affected by specified non-Federal agency activities (covered activities) within the LCR MSCP planning area (see description of the LCR MSCP planning area under section 1.4.1, “Geographic Scope,” and Chapter 2, “Description of Covered Activities”).

The LCR MSCP Permit Applicants (Applicants) (see Table 1-1) are submitting this HCP to the USFWS as part of the application package for an incidental take permit under section 10(a)(1)(B) of the ESA (16 U.S.C. §1539). Additional permittees may be added by certificates of inclusion after the final permit has been issued[2]. The permit is to address the incidental take of Federally listed species and other nonlisted covered species associated with the Applicants’ ongoing and future activities (listed in Chapter 2) along the LCR. The issuance of a permit to the Applicants would authorize under the ESA the incidental take of listed species resulting from the Applicants’ otherwise lawful activities described in Chapter 2 pursuant to section 10(a)(1)(B) of the ESA of 1973, as amended.

The LCR MSCP Conservation Plan as described in Chapter 5 of this HCP provides measures to avoid, minimize, and mitigate, to the maximum extent practicable, the

[2] Appendix G provides a list of water contractors in Arizona, California, and Nevada with entitled rights to Colorado River water. The LCR MSCP provides coverage for each state’s full entitlement in addition to surplus. The water contractors listed in Appendix G that are currently not included as Applicants may become permittees to the section 10(a)(1)(B) permit in accordance with the provisions of the FMA.

potential effects from covered activities on listed and other covered species and their habitat and to ensure that incidental take of listed species will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. If the permit is granted, the Applicants will ensure sufficient funding to implement the LCR MSCP, as required under section 10(a)(1)(B) of the ESA.

Table 1-1. Endangered Species Act Section 10(a)(1)(B) Permit Applicants Covered under the LCR MSCP

Permit Applicants[3] Covered under the LCR MSCP
Arizona
Arizona Department of Water Resources
Arizona Game & Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Mohave County Water Authority
North Gila Valley Irrigation and Drainage District
Salt River Project Agricultural Improvement and Power District
Wellton-Mohawk Irrigation and Drainage District
Yuma County Water Users Association
Yuma Mesa Irrigation and Drainage District
Yuma Irrigation District
California
Bard Water District
Coachella Valley Water District
Colorado River Board of California
Imperial Irrigation District
The Metropolitan Water District of Southern California
Palo Verde Irrigation District
San Diego County Water Authority
Southern California Public Power Authority

[3] This list includes additional Applicants whose applications for an incidental take permit have been submitted to the USFWS since the publication of the draft LCR MSCP documents. Inclusion of additional applicants has not added new covered activities or modified the scope of such covered activities. Accordingly, the effects of the covered activities of all such additional Applicants, for which take coverage is being sought, have been fully evaluated in both the draft and final versions of the LCR MSCP HCP and EIS/EIR.

Permit Applicants[3] Covered under the LCR MSCP
Nevada
Basic Water Company
Colorado River Commission of Nevada
Nevada Department of Wildlife
Southern Nevada Water Authority

1.3.2 Relationship between LCR MSCP HCP and LCR MSCP BA

The Applicants (see Table 1-1) and Reclamation have developed conservation measures for species and their habitats designed to achieve specific species goals for minimizing and mitigating impacts on HCP-covered species (see description of covered species below). Reclamation has prepared the LCR MSCP BA as a companion document to the LCR MSCP HCP in compliance with section 7 of the ESA to address specified Federal agency activities ("covered actions") associated with ongoing operations and maintenance of the LCR and specific activities proposed by the National Park Service (NPS), the Bureau of Indian Affairs (BIA), the USFWS, the Western Area Power Administration (Western), and the Bureau of Land Management (BLM).

This LCR MSCP HCP describes the LCR MSCP Conservation Plan (see Chapter 5) that provides long-term mitigation to offset incidental take of listed threatened and endangered species resulting from covered activities along the LCR as discussed in Chapter 2. In addition, the LCR MSCP Conservation Plan provides for conservation of covered species to address all Federal actions along the LCR described in Chapter 2 of the LCR MSCP BA. The covered activities addressed in the LCR MSCP HCP and the LCR MSCP BA are divided into flow-related and non-flow-related activities. Although the effects on covered species of non-flow-related activities by non-Federal and Federal agencies could be distinguished and are addressed separately in the LCR MSCP HCP and LCR MSCP BA, as discussed more fully within the LCR MSCP BA the effects on covered species of flow-related activities could not be distinguished between Federal and non-Federal components. Hence, both the LCR MSCP HCP and LCR MSCP BA address the same flow-related covered activities.[4] Many of the Federal actions on the LCR are nondiscretionary; see Section 2.1.1 for a discussion of the relationship between non-Federal covered activities and Federal nondiscretionary actions.

This LCR MSCP HCP includes conservation measures for nonlisted species, thereby providing early protection for species not listed at the time the LCR MSCP HCP was developed, and the LCR MSCP is seeking no-surprises assurances for these species (see Chapter 8, "Assurances"). In addition to conservation measures to minimize and mitigate incidental take of listed species that may result from non-Federal and Federal covered

[4] Based on ESA compliance completed in January 2001, there is one distinction to the coverage addressed in the LCR MSCP HCP and the LCR MSCP BA related to proposed changes in points of diversion of LCR water. See discussion at Section 4.2 of this HCP and Chapter 2 and Table 2-13 of the LCR MSCP BA.

activities, the LCR MSCP Conservation Plan in Chapter 5 of the LCR MSCP HCP includes conservation measures that will contribute to the recovery of listed species and reduce the likelihood for future listing of nonlisted species.

In summary, the LCR MSCP Conservation Plan, as described in Chapter 5 of this document, has been designed as a robust approach to covered species conservation that addresses all adverse effects on covered species that may result from any and all non-Federal and Federal actions, projects, and activities described in Chapter 2 of this LCR MSCP HCP and Chapters 2 and 3 of the companion LCR MSCP BA.

1.3.3 Relationship with the 1997 and 2002 Biological Opinions

The LCR MSCP Steering Committee has overseen the development of this LCR MSCP HCP and the companion LCR MSCP BA to comply with ESA section 10(a)(1)(B) and section 7, respectively. With the approval of the LCR MSCP and issuance of the section 10(a)(1)(B) incidental take permit and section 7 BO in response to the LCR MSCP HCP and LCR MSCP BA, these new authorizations will supersede the 2002 BO. When the new BO on the LCR MSCP takes effect, the following obligations of Reclamation under the 1997 BO and 2002 BO will continue.

- If any of the 1,400 acres of southwestern willow flycatcher habitat acquired and protected under the provisions of the 1997 BO Reasonable and Prudent Alternative (RPA) 5 should lose its protected status in the future, the affected habitat acreage will be replaced by southwestern willow flycatcher habitat created under the LCR MSCP.
- Completion and ongoing maintenance of native fish impoundments by Reclamation that were a condition of the 1997 BO RPA 3, as amended by the 2002 BO, will be included under the LCR MSCP.

1.3.4 Relationship with the 2001 Biological Opinion

In 2001, Reclamation and USFWS completed section 7 consultation regarding potential effects to Yuma clapper rail, southwestern willow flycatcher, bonytail, and razorback sucker from an annual change in point of diversion totaling 400,000 afy and implementation of specific surplus guidelines through year 2016. The 2001 BO will not be superseded by the LCR MSCP; however, as described in Section 2.3.2 and 4.2, the 400,000 af annual change in point of diversion is being included for coverage under the LCR MSCP as part of the total potential 1.574 million acre-feet per year (mafy) change in points of diversion. Accordingly, the following conservation measures identified in the 2001 BO, when implemented by Reclamation in accordance with the requirements of the LCR MSCP HCP, will also be counted as LCR MSCP conservation measure requirements:

- funding and support for razorback sucker studies at Lake Mead beyond 2005;

- rearing and stocking of 20,000 razorback suckers between Parker and Imperial Dams (Reaches 4 and 5);
- restoration or creation of 44 acres of backwaters as habitat for native fish;
- $50,000 in funding to provide for the capture of wild-born bonytail from Lake Mohave;
- monitoring of 372 acres of existing occupied southwestern willow flycatcher habitat; and
- restoration and maintenance of 372 acres of southwestern willow flycatcher habitat.

1.3.5 Relationship between the LCR MSCP HCP and Other Federal and State Regulations

Federal and California agencies have prepared a joint LCR environmental impact statement/environmental impact report (EIS/EIR) in compliance with the:

- National Environmental Policy Act (NEPA) for issuance of the section 10(a)(1)(B) permit by the USFWS and implementation of the LCR MSCP by Reclamation and
- California Environmental Quality Act (CEQA) for implementation of the LCR MSCP by the California agencies.

The LCR MSCP provides ESA compliance for implementation of covered activities by non-Federal and Federal partners. Implementation of covered activities, however, may require compliance with other appropriate Federal and state laws and regulations, including, but not limited to, the Clean Water Act, Fish and Wildlife Coordination Act (FWCA), Migratory Bird Treaty Act (MBTA), NEPA, and CEQA (with respect to participating California agencies). Compliance with these laws and regulations may include mitigation in addition to that provided in the LCR MSCP.

1.3.6 Conservation Initiatives for the Colorado River

Over the past decade, significant species and habitat conservation initiatives have been developed throughout the Colorado River Basin. In the Upper Colorado River Basin, the U.S. Department of the Interior, Colorado, New Mexico, Utah, Wyoming, water users, power customers, and environmental groups developed recovery programs for several native endangered fish species (i.e., the Upper Colorado River Recovery Implementation Program and the San Juan River Recovery Implementation Program). The U.S. Department of the Interior is engaged in the Glen Canyon Adaptive Management Program, pursuant to the Grand Canyon Protection Act of 1992. This Act required the Secretary to complete an EIS evaluating alternative operating criteria, consistent with existing law, that would determine how Glen Canyon Dam would be operated to both meet the purposes for which the dam was authorized and to meet the goals for protection of Glen Canyon National Recreation Area and Grand Canyon National Park. Local,

state, and Federal interests in the Las Vegas metropolitan region completed and are presently implementing a regional multiple species HCP for the Mojave Desert in Clark County, Nevada, that addresses terrestrial species and habitats common to Clark County and the Lake Mead and Lake Mohave portions of the Colorado River. Binational efforts are underway to address species conservation and the ecological condition of the Colorado River and its delta in Mexico. Efforts by state and Federal agencies to restore native fish species to the river and the large reservoirs in the LCR have been ongoing since the early 1990s.

The National Fish and Wildlife Foundation's Partners in Flight program has resulted in the development of ecoregion-based bird conservation plans, primarily focused on the management and conservation of the nation's neotropical migratory bird species. In the Partners in Flight plans developed for Arizona, California, and Nevada, recognition is given to the ecological value and importance of the LCR to neotropical migratory and resident bird species that rely on and use the associated aquatic, marsh, and riparian habitats.

1.4 Scope of the LCR MSCP HCP

1.4.1 Geographic Scope

The LCR MSCP planning area comprises areas up to and including the full-pool elevations of Lakes Mead, Mohave, and Havasu and the historical floodplain of the Colorado River from Lake Mead to the SIB. The historical flood plain is defined as all lands that are or have been affected by the meandering or regulated flows of the Colorado River, which historically have been defined by the change in elevation that forms the adjoining uplands. The full-pool elevation of Lake Mead is defined by water surface elevation 1,229 feet National Geodetic Vertical Datum (NGVD). The full-pool elevation of Lake Mohave is defined by surface water elevation 647 feet NGVD. The full-pool elevation of Lake Havasu is defined by surface water elevation 450 feet NGVD. The full-pool elevation at Lake Mead is 8 feet above the spillway gates in the raised position. The full-pool elevations for Lakes Mohave and Havasu correspond to the top of their respective spillway gates (Bureau of Reclamation 1981).

For use in the analysis of impacts and conservation measures in this HCP, the LCR MSCP planning area is divided into discrete reaches:

- Reach 1—from Separation Canyon in the lower end of the Grand Canyon to Hoover Dam, including Lake Mead up to full-pool elevation;
- Reach 2—from Hoover Dam to Davis Dam (river mile [RM] 276), including Lake Mohave up to full-pool elevation;
- Reach 3—from Davis Dam (RM 276) to Parker Dam (RM 192.3), including Lake Havasu up to full-pool elevation;
- Reach 4—from Parker Dam (RM 192.3) to Adobe Ruin and Reclamation Cibola Gage (RM 87.3) at the lower end of Reclamation's maintenance Cibola Division;

- Reach 5—from Reclamation Cibola Gage (RM 87.3) to Imperial Dam (RM 49.2);
- Reach 6—from Imperial Dam (RM 49.2) to the Northerly International Boundary (NIB) (RM 23.1); and
- Reach 7—portion of the LCR from NIB (RM 23.1) to SIB (RM 0.0) within the United States.

Water surface elevation and river miles were determined from LCR Maps, Colorado River Frontwork & Levee System, Arizona-California (Bureau of Reclamation 1976). The LCR MSCP planning area and river reaches are shown on Figure 1-1. It should be noted that the above-described LCR MSCP planning reaches do not fully correspond with Reclamation's maintenance divisions.

1.4.2 Covered and Evaluation Species

Species proposed for coverage are those for which incidental take authorization may be required under the ESA during the 50-year term of the LCR MSCP. These "covered species" are fully addressed in the LCR MSCP HCP and are expected to be included in the ESA section 10(a)(1)(B) incidental take permit. These species were identified based on an initial assessment of how implementing proposed covered activities and conservation measures could affect listed species or species that could become listed during the term of the LCR MSCP.

One hundred forty-nine special-status species with the potential to occur in the LCR MSCP planning area were evaluated for coverage in the LCR MSCP HCP. The LCR MSCP Steering Committee developed, adopted, and applied two criteria for selecting covered species from among the special-status species considered. Species proposed for coverage are those that meet one of the following selection criteria:

- species that are listed or that are proposed or candidates for listing under the ESA or species that are protected under Arizona, California, or Nevada law that could be affected by covered activities and would require take authorization; or
- species that could become listed during the term of the LCR MSCP under the ESA or species that could become protected under Arizona, California, or Nevada law that could be affected by covered activities and could require future take authorization. Factors considered to determine potential for future listing during the term of the LCR MSCP are:
  - ongoing or likely future destruction, modification, or curtailment of a species' habitat or range of sufficient magnitude that could warrant future listing;
  - the inadequacy of existing regulatory mechanisms to protect a species from ongoing decline of sufficient magnitude that could warrant future listing; or
  - other natural or artificial factors that may affect a species' continued existence.

Based on the application of the selection criteria, 27 of the species considered are proposed for coverage under the ESA section 10(a)(1)(B) incidental take permit (see Table 1-2). The LCR MSCP Conservation Plan (see Chapter 5) includes a full range of

Table 1-2. Proposed Covered and Evaluation Species under the LCR MSCP HCP and Their Status

Common and Scientific Name	Federal Status[1]	Arizona Status[2]	California Status[3]	Nevada Status[4]	Selection Criteria[5]
Threatened and Endangered Species					
Yuma clapper rail *Rallus longirostris yumanensis*	FE	ASC	CT/FP	–	1
Southwestern willow flycatcher *Empidonax trailii extimus*	FE	ASC	CE	–	1
Desert tortoise (Mojave population) *Gopherus agassizii*	FT	ASC	CT	NT	1
Bonytail *Gila elegans*	FE	ASC	CE	NE	1
Humpback chub *Gila cypha*	FE	ASC	–	–	1
Razorback sucker *Xyrauchen texanus*	FE	ASC	CE/FP	NE	1
Other Covered Species					
Western red bat *Lasiurus blossevillii*	–	ASC	–	–	2
Western yellow bat *Lasiurus xanthinus*	–	ASC	–	–	2
Desert pocket mouse *Chaetodipus penicillatus sobrinus*	–	–	–	–	2
Colorado River cotton rat *Sigmodon arizonae plenus*	–	–	CSC	–	2
Yuma hispid cotton rat *Sigmodon hispidus eremicus*	–	–	CSC	–	2
Western least bittern *Ixobrychus exilis hesperis*	–	ASC	CSC	–	2
California black rail *Laterallus jamaicensis coturniculus*	–	ASC	CT/FP	–	1
Yellow-billed cuckoo *Coccyzus americanus occidentalis*	FC	ASC	CE	–	1
Elf owl *Micrathene whitneyi*	–	–	CE	NP	1
Gilded flicker *Colaptes chrysoides*	–	–	CE	–	1
Gila woodpecker *Melanerpes uropygialis*	–	–	CE	–	1
Vermilion flycatcher *Pyrocephalus rubinus*	–	–	CSC	–	2
Arizona Bell's vireo *Vireo bellii arizonae*	–	–	CE	–	1
Sonoran yellow warbler *Dendroica petechia sonorana*	–	–	CSC	–	2
Summer tanager *Piranga rubra*	–	–	CSC	–	2

Table 1-2. Continued

Common and Scientific Name	Federal Status[1]	Arizona Status[2]	California Status[3]	Nevada Status[4]	Selection Criteria[5]
Flat-tailed horned lizard *Phrynosoma mcalli*	–	ASC	CSC	–	2
Relict leopard frog *Rana onca*	FC	ASC	–	NP	1
Flannelmouth sucker *Catostomus latipinnis*	–	ASC	–	–	2
MacNeill's sootywing skipper *Pholisora gracielae*	–	–	–	–	2
Sticky buckwheat *Eriogonum viscidulum*	–	–	–	NEP	1
Threecorner milkvetch *Astragalus geyeri* var. *triquetrus*	–	–	–	NEP	1
Evaluation Species					
California leaf-nosed bat *Macrotus californicus*	–	ASC	CSC	–	N/A
Pale Townsend's big-eared bat *Corynorhinus townsendii pallescens*	–	–	CSC	–	N/A
Colorado River toad *Bufo alvarius*	–	–	CSC	–	N/A
Lowland leopard frog *Rana yavapaiensis*	–	ASC	CSC	–	N/A

[1] Federal Status
- FE = Listed as endangered under the Federal Endangered Species Act ESA.
- FT = Listed as threatened under ESA.
- FC = Candidate for listing under ESA.

[2] Arizona Status
- ASC = Arizona wildlife of special concern.

[3] California Status
- CE = Listed as endangered under the California Endangered Species Act (CESA).
- CT = Listed as threatened under CESA.
- FP = Fully protected under the California Fish and Game Code.
- CSC = California species of special concern.

[4] Nevada Status
- NE = Nevada endangered
- NT = Nevada threatened.
- NEP = Nevada critically endangered plant.
- NP = Nevada protected.

[5] Selection Criteria
1. Species that are listed or that are proposed or candidates for listing under the ESA or species that are protected under Arizona, California, or Nevada law that could be affected by covered activities and would require take authorization;
2. Species that could become listed during the term of the LCR MSCP under the ESA or species that could become protected under Arizona, California, or Nevada law that could be affected by covered activities and could require future take authorization. Factors considered to determine potential for future listing during the term of the LCR MSCP are:
   - ongoing or likely future destruction, modification, or curtailment of a species' habitat or range of sufficient magnitude that could warrant future listing;
   - the inadequacy of existing regulatory mechanisms to protect a species from ongoing decline of sufficient magnitude that could warrant future listing; or
   - other natural or artificial factors that may affect a species' continued existence.

N/A = Not applicable.

conservation measures for all covered species. Of the 27 covered species, six are listed as threatened or endangered under the ESA.

Two of the covered species are nonlisted plants, sticky buckwheat and threecorner milkvetch. As described in Section 1.3.1, the prohibition against take of listed plants is limited under the ESA. The section 7(a)(2) prohibition against jeopardy, however, applies to plants and the USFWS may not issue a section 10(a)(1)(B) incidental take permit if the issuance of that permit would result in jeopardy to a listed plant species. Consequently, conservation measures for sticky buckwheat and threecorner milkvetch are included in the LCR MSCP Conservation Plan to address any impacts that may result from Federal and non-Federal covered activities and to ensure that these activities are not likely to jeopardize the continued existence of these plants.

In addition to the covered species, the LCR MSCP HCP includes four "evaluation species." Evaluation species are species that could become listed in future years and that could be added to the covered species list during LCR MSCP implementation but for which sufficient information is not available at this time to determine their status in the LCR MSCP planning area, to assess the potential effects of covered activities, or to develop specific conservation measures. The LCR MSCP Conservation Plan (see Chapter 5) includes research studies and pilot management studies for the evaluation species to determine their status in the LCR MSCP planning area and to determine appropriate conservation measures. None of the four evaluation species are presently protected under the ESA.

1.4.3 Covered Activities

The LCR MSCP HCP covers a range of activities by the Applicants that could result in incidental take of covered species. A list of the Applicants is provided in Table 1-1. Activities covered by the LCR MSCP HCP include all non-Federal actions involved in the items listed below:

- water diversions and returns of up to 7.5 mafy from existing facilities,
- diversions and returns for any surplus waters,
- future changes in points of diversion of up to 1.574 mafy,
- implementation of the LCR MSCP,
- present and future flow- and non-flow-related non-Federal actions or projects that are described and analyzed in the LCR MSCP HCP, and
- demand for and receipt of hydropower.

A detailed description of the covered activities is provided in Chapter 2. In addition to coverage of non-Federal actions, this HCP includes the analysis of impacts and conservation measures for Federal actions described in Chapter 2 of the companion LCR MSCP BA.

The LCR MSCP Conservation Plan (see Chapter 5) includes conservation measures to minimize and mitigate the effects of implementing the non-Federal covered activities

described in Chapter 2 and the Federal activities described in Chapter 2 of the LCR MSCP BA, with the exception of the following BIA agricultural development projects:

- the Chemehuevi Irrigation Project to convert 2,020 acres of existing lands to agricultural uses; and
- 3,832 acres of the total 4,442 acres of development that would remove honey mesquite type IV land cover that provides habitat for the Arizona Bell's vireo (i.e., the only 610 acres of honey mesquite type IV that could be removed are covered under the LCR MSCP).

The agricultural projects will be evaluated independent of the LCR MSCP. At the option of the BIA and/or affected Tribes, any ESA coverage determined to be applicable to these future Tribal farmland development projects may be subsequently considered for coverage through the LCR MSCP.

1.4.4 Duration of Permit

The USFWS's Five-Point Policy for HCPs (65 Federal Register [FR] 106, June 1, 2000) identifies factors to consider when determining the duration of incidental take permits, including:

- the duration of the covered activities and effects on covered species,
- the time required to implement and acquire benefits from conservation measures, and
- the period that may be required to develop sufficient information through monitoring and research to address biological uncertainties.

Based on these factors, the goal of the LCR MSCP is to provide ESA compliance for the next 50 years for covered activities conducted by Federal and non-Federal LCR MSCP participants. The Applicants are requesting a 50-year section 10(a)(1)(B) incidental take permit for all covered species in this HCP. Shortening the permit duration (e.g., to 25 or 35 years) was rejected because many of the covered activities are ongoing and continuing annually and it will take time for replacement habitat created under the LCR MSCP Conservation Plan (see Chapter 5) to develop. A lesser period of time might not allow for implementation of covered activities or the successful implementation of the conservation plan. Increasing the permit duration (e.g., to 75 or 100 years) was rejected because of the uncertainties involved with implementing a conservation plan so far in the future.

1.5 Overview of HCP Process

1.5.1 LCR MSCP Organization

The LCR MSCP has involved and will continue to involve many participating entities. The LCR MSCP Steering Committee has been responsible for the preparation of the

documents that establish and define the LCR MSCP and provide compliance with environmental laws and regulations[5]. LCR MSCP participants are agencies and other entities (including Steering Committee members) that have participated in the process of LCR MSCP development, providing input to the Steering Committee. The Applicants (see Table 1-1) are those non-Federal entities requesting section 10(a)(1)(B) incidental take permits from the USFWS for the species and activities covered in this HCP. Following issuance of the section 10(a)(1)(B) permit, the Steering Committee will continue to operate, as defined under the final FMA that will be prepared among Federal, state, local, and tribal parties, and will coordinate with the Program Manager (see Exhibit A). The Program Manager is the position to be established by Reclamation, as described in the FMA, that will be responsible for implementing the LCR MSCP.

1.5.2 Coordination with Agencies, Tribes, and Stakeholders and Public Involvement

Under its Five-Point Policy, the USFWS "strongly encourage[s] potential [permit] applicants to allow for public participation during the development of the HCP, particularly if non-Federal public agencies (e.g., State Fish and Wildlife agencies) are involved" and encourages "applicants for most large-scale, regional HCP efforts to provide extensive opportunities for public involvement during the planning and implementation process" (65 FR 106:35256, June 1, 2000). In addition, the USFWS recommends "that applicants include participation by affected Native American tribes during the development of the HCP" (65 FR 106:35256, June 1, 2000). This section provides a summary of the opportunities provided by the LCR MSCP for coordination with Federal and state agencies and other stakeholders and to solicit public involvement.

Since its formal inception in 1995, the LCR MSCP has encouraged and provided extensive opportunities for public participation in the development of the LCR MSCP Conservation Plan and the LCR MSCP HCP. At least 28 Federal, state, and local public agencies have participated in the LCR MSCP development process. Six tribes with tribal lands within the LCR MSCP planning area (Hualapai, Fort Mojave, Chemehuevi, Colorado River Indian Tribes [CRIT], Fort Yuma Quechan, and Cocopah) have participated in the process, including government-to-government meetings with Reclamation and the USFWS. Meetings between Reclamation, the USFWS, and State representatives and tribal leaders have been conducted with all six tribes. In addition to public agencies and tribes, private interest groups and individuals have been involved at their discretion in development of the LCR MSCP HCP, including groups representing recreational and environmental interests.

The LCR MSCP Steering Committee and its various subcommittees have met frequently in public places, mostly in Las Vegas (Nevada), Phoenix (Arizona), and Ontario (California). Since 1998, an average of 32 meetings of the Steering Committee and subcommittees have been held per year (nearly three meetings per month). The purpose of these meetings was to develop and provide guidance for development of the LCR MSCP and its supporting documents, including:

[5] See discussion of LCR MSCP in *Southwest Center for Biodiversity v. U.S. Bureau of Reclamation*, 143 F.3d 515, 519 n.1 (9th Cir. 1998).

- identifying the LCR MSCP program and biological goals;
- the scope of the LCR MSCP (i.e., LCR MSCP covered activities, covered species, geographic scope, and conservation commitments); and
- a framework for implementing the LCR MSCP, including commitments of the LCR MSCP participants to funding and implementing the LCR MSCP Conservation Plan.

Since 1998, the LCR MSCP has operated a public web site at www.lcrmscp.org. The web site has been regularly maintained and includes:

- a summary of the program,
- contact information of LCR MSCP participants,
- schedule of upcoming meetings,
- meeting notes from past meetings, and
- links to related news items and web pages.

Through the LCR MSCP web site, relevant steps, decisions, and documents in the development of the LCR MSCP HCP have been made available to the public. In addition to the LCR MSCP web site, Reclamation's Lower Colorado Regional Office maintains a web site at www.usbr.gov/lc/region/g2000/mscp. Reclamation's web site includes documents relevant to the joint NEPA/CEQA process and particularly the public scoping process.

In 1999, Reclamation, the USFWS, and the Metropolitan Water District of Southern California (Metropolitan) prepared a public involvement plan (PIP) for the LCR MSCP that was reviewed by the LCR MSCP participants and made available on Reclamation's Lower Colorado Region web page. The PIP identified key issues and public outreach initiatives and addressed the process for scoping for NEPA and CEQA compliance and responding to comments on public draft and final LCR MSCP EIS/EIR documents.

The LCR MSCP maintains an extensive mailing list for both email and postal delivery. Most LCR MSCP products have been emailed for review and comment to more than 80 individuals representing a wide range of Federal, state, and local agencies and private interest groups. In addition, preliminary draft and draft documents have been put on compact discs (CDs) and mailed on request.

As part of the joint NEPA/CEQA process, a notice of intent/notice of preparation to prepare the LCR MSCP EIS/EIR was published in the Federal Register in May 1999 (64 FR 95:27000–27002, May 18, 1999) and a supplemental notice of intent/notice of preparation was published in July 2000 (65 FR 194:43031–43034, July 12, 2000). Public scoping meetings were held in 1999, 2000, and 2003. Seven public meetings were held in June–July 1999 at Lake Havasu City, Arizona; Laughlin, Nevada; Henderson, Nevada; Yuma, Arizona; Phoenix, Arizona; Blythe, California; and Ontario, California. Four public meetings were held in July–August 2000 at Yuma, Arizona; Blythe, California; Henderson, Nevada; and Laughlin, Nevada. Three scoping meetings were held in November 2003 in Yuma, Arizona; Blythe, California; and Laughlin, Nevada. Newsletters and news releases were distributed prior to the 1999 and 2000 scoping meetings, and news releases were distributed prior to the 2003 meetings.

On June 18, 2004, the U.S. Department of the Interior provided notice in the Federal Register of the availability of draft documents regarding the LCR MSCP for public review and comment. (See 69 FR 34185–34187.) Approximately 360 copies of the Draft LCR MSCP EIS/EIR, HCP, and BA were distributed to agencies, public libraries, Indian tribes, organizations, and individuals for review during a 60-day period ending on August 18, 2004. Additionally, three public hearings were held in Henderson, Nevada; Blythe, California; and Phoenix, Arizona on July 20–22, 2004 in order to receive public comments on the Draft EIS/EIR.

Coordination with public agencies and tribes and public outreach have been key elements in the development of the LCR MSCP HCP and will continue to be key elements in implementation of the LCR MSCP.

1.5.3 Coordination with Science Review Panels

Under its Five-Point Policy, the USFWS "encourage[s] the use of scientific advisory committees during development and implementation of an HCP" (65 FR 106:35256, June 1, 2000). In addition to frequent meetings of the LCR MSCP Biological Subcommittee, the LCR MSCP engaged in independent peer review during development of the LCR MSCP Conservation Plan on two separate occasions. An early scientific peer review was conducted by a panel assembled by the Scientific Peer Advisory and Review Services Division of the American Institute of Biological Sciences in 1999. The second scientific peer review was conducted by a panel assembled by M3 Research in 2002 and completed in 2003. The results of the 1999 and 2002–2003 scientific peer review processes are described in Chapter 10, "Experts Contacted and Peer Review Process."

1.6 Document Organization

The Final LCR MSCP documents comprise five volumes:

- Volume I: *Environmental Impact Statement/Environmental Impact Report*;
- Volume II: *Habitat Conservation Plan*;
- Volume III: *Biological Assessment*;
- Volume IV: *Appendices to Volumes I–III and V*, Table 1-3 lists the appendices and indicates which ones are referenced in Volumes I–III; and
- Volume V: *Responses to Comments on LCR MSCP Volumes I–IV*.

The LCR MSCP HCP provides all information required by the ESA section 10(a)(1)(B) and the USFWS section 10(a)(1)(B) regulations (50 C.F.R. Part 17). Below is a summary of the contents of each chapter of the LCR MSCP HCP.

- Chapter 2, "Description of Covered Activities," describes the covered activities for which ESA take authorization is being sought.

- Chapter 3, "Resources of the LCR," describes the historical and existing river ecosystem and vegetation of the LCR relevant to the species covered in the LCR MSCP HCP and the approach to assessing habitat for each of the covered species.
- Chapter 4, "Analysis of Impacts and Level of Take," contains the analysis of impacts on covered species expected to result from covered activities and implementation of the LCR MSCP Conservation Plan.
- Chapter 5, "Conservation Plan," provides the conservation plan that will be implemented under the LCR MSCP. The LCR MSCP Conservation Plan includes a description of biological goals; conservation measures that minimize and mitigate impacts on covered species; and the monitoring, research, and adaptive management program. Included in the adaptive management program are means for addressing changed circumstances, procedures for addressing unforeseen circumstances, and procedures to gauge the effectiveness of existing conservation measures and modify or replace those measures as the need arises.
- Chapter 6, "Governance and Implementation Structure," describes the governance and implementation structure that will be described in the final FMA and roles and responsibilities of the LCR MSCP Steering Committee and Program Manager for implementation of the LCR MSCP.
- Chapter 7, "Implementation Costs and Funding Sources," provides an estimate of the LCR MSCP implementation costs, the methods used to estimate those costs, and the sources of funding to implement the LCR MSCP.
- Chapter 8, "Assurances," describes commitments from the USFWS requested by the Applicants.
- Chapter 9, "Alternatives to Take Considered and Rejected," describes the alternatives to take that were considered and the reasons why these alternatives were not proposed to be used.
- Chapter 10, "Experts Contacted and Peer Review Process," provides a list of names of species experts contacted and a summary of the scientific review process conducted during the development of the LCR MSCP and LCR MSCP HCP.
- Chapter 11, "List of Preparers," provides the names and organizations of individuals involved in the development of the LCR MSCP and LCR MSCP HCP.
- Chapter 12, "References," lists the references and personal communications cited in the LCR MSCP HCP.

Table 1-3. List of Appendices to LCR MSCP Volumes I–III and V (Volume IV)

Appendix	Referenced in Volume I, LCR MSCP EIS/EIR	Referenced in Volume II, LCR MSCP HCP	Referenced in Volume III, LCR MSCP BA
A The Law of the River	X	X	X
B Notices of LCR MSCP EIS/EIR Preparation	X		
C LCR MSCP Scoping Summary Reports	X		
D Non-Covered Sensitive Species Potentially Present in the Planning Area and Off-Site Conservation Areas	X		

Appendix	Referenced in Volume I, LCR MSCP EIS/EIR	Referenced in Volume II, LCR MSCP HCP	Referenced in Volume III, LCR MSCP BA
E Additional Background Information on the Bureau of Reclamation's Cultural Resource Identification Effort	X		
F EIS Disclosure Statement Concerning the Preparation of an EIS/EIR for the Lower Colorado River Multi-Species Habitat Conservation Plan	X		
G Covered Colorado River Water Contracts		X	X
H Summary of Land Cover Types by River Reach and Landowner		X	X
I Status of LCR MSCP Covered Species	X	X	X
J Technical Documentation of Ongoing and Future Operations		X	X
K Hydrologic Depletion Analysis of the Effects of Changes in Points of Diversion on Water Elevations and Land Cover Types		X	X
L Reach 7 Effects		X	X
M Effects of LCR MSCP Flow-Related Activities on Lake Mead		X	X
N Detailed Implementation Cost Estimate Assumptions		X	
O Major Facilities on the Lower Colorado River			X
P Field Working Agreement between Department of the Interior, Bureau of Reclamation, and Department of the Army, Corps of Engineers for Flood Control Operation of Hoover Dam and Lake Mead			X
Q Compilation of Records in Accordance with Article V of the Decree of the Supreme Court of the United States in *Arizona v. California* dated March 9, 1964			X
R History of River Work and Maintenance			X
S Relevant Sections of Western Area Power Administration's and Bureau of Reclamation's Joint Operating Agreement and Master Agreement			X
T List of Common Names and Scientific Names for Plants and Wildlife Mentioned in the LCR MSCP HCP and BA		X	X
U Acronyms and Abbreviations Used in the LCR MSCP HCP and BA		X	X
V Glossary of Terms Used in the LCR MSCP HCP and BA		X	X

Chapter 2

Description of Covered Activities

2.1 Introduction

This chapter describes the ongoing and proposed future non-Federal projects, actions, and activities (i.e., covered activities) for which authorization for the incidental taking of LCR MSCP HCP covered species is being requested under section 10(a)(1)(B) of the ESA. All of the covered activities would be implemented within the LCR MSCP planning area. Four categories of covered activities are described for each of the states:

- ongoing flow-related activities,
- future flow-related activities,
- ongoing non-flow-related activities, and
- future non-flow-related activities.

Ongoing flow-related activities for which incidental take authorization is requested by Colorado River water and power contractors are listed for each state, below. Appendix G provides a list of the water contractors in Arizona, California, and Nevada. Colorado River water contractors with projects listed in Appendix G would be expected to be party to the section 10(a)(1)(B) incidental take permit issued by the USFWS, either directly as the permit holder or indirectly through the authority of a state agency permit holder. Water diversions and returns of up to 7.5 mafy from existing facilities and diversions and returns for any surplus waters are covered under the LCR MSCP HCP for water contractors in Arizona, California, and Nevada.

Future flow-related activities that are covered under the LCR MSCP HCP and LCR MSCP BA include power production and changes in points of diversion of Colorado River water and associated reduction in water releases from the Hoover, Davis, and Parker Dams. Future changes in points of diversion for up to 1.574 mafy are covered under the LCR MSCP HCP for water contractors in Arizona, California, and Nevada. Diversion changes are expected to occur in response to shifts in water demand during the 50-year term of the LCR MSCP.

Certain assumptions about future diversions have been made to guide the analysis of impacts. Except as noted in Section 2.3.2, neither the source nor the recipient of water that will be diverted as a result of future projects can be determined until these projects are developed. However, the participants do expect that there will be shifts in demand

among water users within each of the Lower Division States. For the purposes of the LCR MSCP, a "worst case scenario" has been assumed with regard to the location and quantities of water that may be transferred as a result of future projects.

The future condition that is assumed is a 1.574 mafy shift in water diversion from the southern reaches of the Colorado River, upstream to Lake Mead or to Lake Havasu. Although no additional water would be diverted in a normal water year as a result of these future projects, the points of diversion in this scenario would change based on demand. The description of ongoing and future flow-related covered activities in this LCR MSCP HCP includes the operation, maintenance, and replacement (OM&R) of the diversion facilities through which the flow-related activities are implemented.

Ongoing non-flow-related covered activities include the OM&R of existing water diversion and conveyance facilities and electrical generation and transmission facilities within the LCR MSCP planning area and programs and activities conducted by the Arizona Game and Fish Department (AGFD) and the Nevada Department of Wildlife (NDOW).

Future non-flow-related covered activities include the OM&R of existing water diversion and conveyance facilities and electrical generation and transmission facilities within the LCR MSCP planning area and programs and activities conducted by AGFD and NDOW.

2.1.1 Relationship of Non-Federal Covered Activities to Federal Nondiscretionary Actions

Under the LCR MSCP's combined section 7–section 10(a)(1)(B) approach to ESA compliance, the covered activities are categorized as either Federal discretionary actions requiring consultation pursuant to section 7 of the ESA or as non-Federal actions for which a section 10(a)(1)(B) HCP is appropriate. Some of the covered activities have been characterized as Federal nondiscretionary actions but contain an element of non-Federal action. Because Reclamation's role in water delivery is nondiscretionary and not subject to section 7 consultation, it is Reclamation's position that these activities do not create section 9 responsibility for Reclamation. Similarly, the non-Federal LCR MSCP participants do not believe that they are required by the ESA to obtain take authorization for such Federal actions. To eliminate any uncertainty regarding which method of take authorization, section 7 or section 10(a)(1)(B), is more appropriate in this situation, the LCR MSCP participants will request that the USFWS authorize take under both sections 7 and 10(a)(1)(B). The effects of all covered Federal and non-Federal activities, whether discretionary or not, have therefore been described and covered in this LCR MSCP HCP, as well as in the LCR MSCP BA prepared by Reclamation.

Given the combined Federal and non-Federal effort in the conservation actions and covered activities of the LCR MSCP, the USFWS has determined to analyze the effects of the covered Federal activities and issuance of the section 10(a)(1)(B) permit for non-Federal covered activities in one BO.

2.1.2 No Waiver of Defenses

Although the LCR MSCP and the incidental take permits requested by the LCR MSCP participants are intended to cover existing facilities and water and power operations in addition to future programs that have not yet been developed, the LCR MSCP non-Federal participants do not waive any defenses they may have relating to the applicability of the ESA to existing facilities and water and power operations on the LCR. Any reference in the LCR MSCP HCP and related documents that states or implies that the LCR MSCP non-Federal participants are compelled to comply with the ESA to operate existing water and power facilities should be read with the understanding that such LCR MSCP participants are not waiving any legal defenses in regard to the applicability of the ESA to existing facilities and operations.

2.2 Arizona Covered Activities

Arizona covered projects and activities for all reaches described below include the diversion of up to 2.8 million acre-feet (maf) of Arizona's full annual entitlement, plus surplus, plus Arizona's share of any unused apportionment, plus the volume of return-flow as applicable. The major agencies that divert the water and create return flows are described below for each reach. Arizona covered projects also include non-flow-related activities associated with the OM&R of existing water diversion and conveyance facilities and electrical generation and transmission facilities within the LCR MSCP planning area. Maintenance means those routine activities that maintain the capacity and operational features of existing facilities through which the covered activities are implemented. Replacement applies to existing facilities that are both within the LCR MSCP planning area and within the existing facility footprint. OM&R applies to:

- the facilities and equipment through which water is diverted and conveyed,
- the facilities through which return flows are returned to the river,
- the facilities and equipment through which electric power is generated and transmitted, and
- the appurtenant works that support these facilities in the historical floodplain (see Figures 3-3–3-8), including access and service roads, electric power and communication transmission lines and substations, docks, boat ramps, and bankline protection (riprap).

OM&R activities include the daily operation of the water diversion, conveyance, and delivery systems; canal maintenance; placement of riprap for bankline protection and erosion control; vegetation management and weed control; O&M of electrical power generation and transmission facilities; and routine maintenance as needed to ensure continued operations and replacement of facility or system components when necessary to maintain system capacity and operational capabilities. Arizona's covered projects and activities are located within LCR MSCP Reaches 1–7.

2.2.1 Ongoing Flow-Related Covered Activities

Flow-related activities include ongoing diversions, return flows, and the generation and transmission of hydroelectric power as described below by river reach.

2.2.1.1 Reach 1

- present perfected rights[1] (PPRs) , as identified in the Decree and in the 1979, 1984, and 2000 U.S. Supreme Court Supplemental Decree in *Arizona v. California* (Supplemental Decree);
- other Colorado River contractors in Arizona and legal Colorado River water diverters, as identified in Appendix G, including diversions via instream pumps and wells; and
- generation and transmission of hydroelectric power at Hoover Dam.

2.2.1.2 Reach 2

- PPRs, as identified in the Decree and in the Supplemental Decree;
- other Colorado River contractors in Arizona and legal Colorado River water diverters, as identified in Appendix G; and
- generation and transmission of hydroelectric power at Davis Dam.

2.2.1.3 Reach 3

- Central Arizona Project (CAP) diversion at Havasu pumping plant into the Hayden-Rhodes Aqueduct;
- Lake Havasu City diversion by wells;
- PPRs, as identified in the Decree and in the Supplemental Decree;
- other Colorado River contractors in Arizona and legal Colorado River water diverters, as identified in Appendix G; and
- generation and transmission of hydroelectric power at Parker Dam.

2.2.1.4 Reach 4

- Cibola Valley Irrigation and Drainage District diversion via river pumps, unmeasured return flows;

[1] With respect to the Colorado River, a water right exercised by the actual diversion of a specific quantity of water, prior to June 25, 1929, the effective date of the Boulder Canyon Project.

- PPRs, as identified in the Decree and in the Supplemental Decree;
- other Colorado River contractors in Arizona and legal Colorado River water diverters, as identified in Appendix G; and
- generation and transmission of hydroelectric power at Headgate Rock Dam.

2.2.1.5 Reach 5

- City of Yuma, as delivered by Yuma County Water Users' Association and Yuma Mesa Irrigation and Drainage District;
- Diversions from Imperial Dam via the Gila Gravity Main Canal and return flows for:
  - Mittry Lake;
  - Wellton-Mohawk Irrigation and Drainage District;
  - Yuma-Mesa Division, including:
    - North Gila Valley Irrigation and Drainage District,
    - Yuma Irrigation District, and
    - Yuma-Mesa Irrigation and Drainage District,
  - Yuma Auxiliary Project, Unit B;
- Yuma County Water Users' Association, as measured at the Colorado River siphon after diversion from the All American Canal (AAC);
- PPRs, as identified in the Decree and in the Supplemental Decree;
- other Colorado River contractors in Arizona and legal Colorado River water diverters, as identified in Appendix G; and
- generation and transmission of hydroelectric power at Siphon Drop.

2.2.1.6 Reach 6

- return flows of Colorado River water into this reach that was diverted in Reach 5, as identified in Section 2.2.1.5 and Appendix G;
- PPRs, as identified in the Decree and in the Supplemental Decree;
- other Colorado River contractors in Arizona and legal Colorado River water diverters, as identified in Appendix G; and
- measured return flows from operation of drainage wells in the Yuma area.

2.2.1.7 Reach 7

- return flows of Colorado River water into this reach that was diverted in this Reach and also diverted in Reaches 5 and 6, as identified in Section 2.2.1.5, Section 2.2.1.6, and Appendix G;
- PPRs, as identified in the Decree and in the Supplemental Decree; and
- other Colorado River contractors in Arizona and legal Colorado River water diverters, as identified in Appendix G.

2.2.1.8 Arizona Hydroelectric Power Contract Holders

Ongoing programs and activities by Arizona hydroelectric power contract holders proposed for coverage under the LCR MSCP HCP include the contracting for, ordering of, and scheduling of Federal hydroelectric power by purchasers in Arizona to maximize the economic value of such power generation within the constraints of the water release schedule(s).

2.2.2 Future Flow-Related Covered Activities

2.2.2.1 Arizona Water Contract Holders

Future flow-related activities by Arizona covered under the LCR MSCP HCP would include future Colorado River water contracts for the approximately 20,000 af of unallocated Arizona Colorado River water.

Future activities by Arizona covered under the LCR MSCP HCP would include diversions, discharges, and return flows through existing facilities on the LCR. Future volumes of diversions, discharges, and volume of return flows may be changed by administrative actions, which may include changes to points of diversion, new points of diversion, interstate water banking, water marketing, water transfers, inadvertent overruns, or any other actions as made possible from any future agreements and/or measures taken by the Arizona Department of Water Resources (ADWR) or contract holder(s). Future volumes of diversions, discharges, and return flows, may include permanent transfers of entitlement and change in points of diversion of up to 200,000 af annually. Future projects would also include the full use of Colorado River entitlements (change in point of diversion) by existing contractors and decreed water right holders including, but not limited to:

- City of Kingman, and
- City of Quartzsite.

Future activities by Arizona covered under the LCR MSCP HCP would also include temporary and intermittent water exchanges, forbearances, and associated changes in

points of diversion for Arizona water-banking activities or short-term (i.e., less than 5 years) leasing. Temporary and intermittent water exchanges include, but are not limited to, water exchanges between the Arizona Water Banking Authority (AWBA) and Mohave County and La Paz County agencies, Metropolitan, and the Southern Nevada Water Authority (SNWA). Water exchanges between the AWBA and both Mohave County and La Paz County are expected to be temporary exchanges and intermittent in nature. These exchanges are anticipated to be approximately 15,000 afy and approximately 1,000 afy, respectively. Water exchanges between the AWBA and agencies within California and Nevada are expected to be temporary and would not cumulatively exceed a total of 100,000 afy for both California and Nevada.

2.2.2.2 Arizona Hydroelectric Power Contract Holders

The execution, administration, and operation of extended, renewed, new, or additional contracts for hydroelectric power from hydroelectric facilities at Hoover Dam, Davis Dam, Parker Dam, Headgate Rock Dam, Siphon Drop, and Pilot Knob Power Plant by power users in Arizona are proposed for coverage under the LCR MSCP HCP.

2.2.3 Ongoing Non-Flow-Related Covered Activities

Arizona seeks coverage for non-flow-related activities associated with the OM&R of existing water diversion and conveyance facilities and electrical generation and transmission facilities within the LCR MSCP planning area. Maintenance means those routine activities that maintain the capacity and operational features of existing facilities through which the covered activities are implemented. Replacement applies to existing facilities, both within the LCR MSCP planning area and within the existing facility footprint. OM&R applies to:

- the facilities and equipment through which water is diverted and conveyed, including 234 miles of canals in the Yuma Valley—canal maintenance includes regular compaction with a sheep's foot roller,
- the facilities through which return flows are returned to the river, including 72 miles of drains (e.g., maintaining drains by chaining to remove vegetation in drains to maintain flow capacity),
- drainage wells in the Yuma area,
- the facilities and equipment through which electric power is generated and transmitted, and
- the appurtenant works that support these facilities in the historical floodplain (see Figures 3-3–3-8), including access and service roads, electric power and communication transmission lines and substations, docks, boat ramps, and bankline protection (riprap).

The locations and entities involved in non-flow-related maintenance and replacement activities are listed in Section 2.2.1, "Ongoing Flow-Related Covered Activities." Additional ongoing non-flow-related activities for AGFD are described below.

2.2.3.1 Arizona Game and Fish Department Programs and Activities

Ongoing programs and activities by the AGFD proposed for coverage under the HCP include vegetation and habitat management programs, maintenance of aids to navigation and boating access, and law enforcement patrol activities. Ongoing programs and activities related to surveying, capturing, and handling of Federally listed species will be covered under section 10(a)(1)(A) permits and other authorities, as defined in the section 6 Cooperative Agreement between the AGFD and the USFWS. These programs and activities are, therefore, not covered activities under the LCR MSCP HCP.

Vegetation and Habitat Management Programs

Vegetation and habitat management programs include aquatic, wetland, and riparian habitat maintenance and restoration activities designed, located, or implemented in a manner to avoid impacts to sensitive species and habitats. Sites for habitat maintenance and restoration will be selected and designed to increase or improve habitat for native wetland and riparian wildlife species and will be selected to avoid impact to or removal of existing functional cottonwood-willow, marsh, honey mesquite, and backwater land cover types that provide habitat for covered and evaluation species. Habitat maintenance and restoration will be implemented to avoid the breeding season of all covered bird species. Aquatic habitat maintenance and restoration includes installation of fish attractor structures to increase take of nonnative fish by anglers and to provide cover for young-of-year fish of up to 10 acres in any 5 year period over the term of the LCR MSCP. Wetland and riparian habitat maintenance and restoration activities would be limited to 10 acres in any 5-year period over the term of the LCR MSCP.

Fish Surveys

The fish surveys described herein are general population surveys of nonnative species found along the LCR. Surveys for Federally listed species are conducted under the auspices of separate permits issued by the USFWS. The intention is that surveys for species not described in the Federal permits that may result in take of a listed species are a covered activity. Fish surveys include using electrofishing, netting, angling, and noninvasive but potentially disturbing visual surveys (as with using scuba gear). The goal during electrofishing surveys is to use the minimum practicable current settings to minimize impacts to fish. Specific settings are required for some species such as flathead catfish since that species is not effectively caught during surveys for centrarchids and other warm water species. Likewise, other species are not typically caught during flathead surveys. Trammel or gill net surveys are also conducted. A "best management practices" (BMPs) type of approach has been used for netting surveys to reduce impacts to fish, including variations in gear selection and the frequency in which nets are pulled.

Vertical gill net sets in deep water have been the only effective means of surveying striped bass in large lakes such as Lake Havasu. During surveys, any fish that accidentally die are available for detailed examination. Such examinations may address the aging of otoliths to improve our understanding of length/age relationships and determination of stomach contents, improving our understanding of food habits. The total effort is approximately 30 nights for netting and 30 nights for electrofishing annually.

Fish Stocking

AGFD evaluates the stocking of trout on a case-by-case basis, and stocks trout to simultaneously address recreational opportunity and aquatic insect nuisance problems identified by local governments. The mainstem of the LCR is stocked in the Bullhead City (Reach 3) and Parker Strip (Reach 4) areas up to 3 times in a 10 year period. Stocking is conducted using rainbow trout with limited life expectancies and very limited potential for persistence.

Maintenance of Aids to Navigation and Boating Access

AGFD places and maintains aids to navigation along the LCR. This typically involves hand lowering of concrete-filled automobile wheels as anchors, attached by rope and chain to floating buoys. These buoys are placed to advise boaters of regulated areas, mark hazards to navigation, or provide other information. At present, AGFD maintains 132 buoys, including regulatory, informational, and hazard markers, along the LCR. It is anticipated that additional effort will be required associated with additional conservation actions. AGFD also maintains boating access improvements. Currently, in Reach 6, there is a boat ramp in the Yuma Division and a boat dock at Mittry Lake in the Laguna Division.

Law Enforcement Patrol Activities

Pursuant to state law, AGFD is responsible for administering the law enforcement and boating safety program on the state level. These programs include law enforcement patrols using watercraft to pursue and stop other watercraft. When pursuing a watercraft exceeding wakeless speed in a no-wake zone, the patrol boat also creates a wake. Some incidental impact to resources that the no-wake zone was intended to protect may occur as a result. Estimated total effort for watercraft-based law enforcement patrol activities is 1,500–2,000 person-days for all entities enforcing Arizona law in both the mainstem of the Colorado River and mainstem reservoirs. Of that total, which includes all activity while on the water, it is estimated that less than five percent is located in more sensitive off-channel areas. Time spent in pursuit is usually limited to a few minutes; other time spent patrolling in sensitive areas is at low speed. Additional effort may be required in association with new conservation actions.

2.2.4 Future Non-Flow-Related Covered Activities

In addition to the OM&R of facilities described in Section 2.2.1, future non-flow-related activities include the AGFD programs and activities described below.

2.2.4.1 Arizona Game and Fish Department Programs and Activities

Future projects by AGFD covered by the HCP include ongoing projects identified in Section 2.2.3.1 and AGFD projects related to implementation of the LCR MSCP.

2.3 California Covered Activities

California covered projects and activities for all applicable reaches include the diversion of up to 4.4 maf of California's full annual entitlement (consistent with the Quantification Settlement Agreement [QSA]), plus California's share of any unused apportionment and designated surpluses, plus volume of return flows as applicable. The agencies that divert the water and create applicable return flows are described below for each reach. California's covered projects and activities also include all flow-related and non-flow-related OM&R activities associated with existing water diversions, conveyance facilities, and electrical generation and transmission facilities within the LCR MSCP planning area. Maintenance means those routine activities that maintain the capacity and operational features of existing facilities through which the covered activities are implemented. Replacement applies to existing facilities that are both within the LCR MSCP planning area and within the existing facility footprint. OM&R applies to:

- the facilities and equipment through which water is diverted and conveyed,
- the facilities through which return flows are returned to the river,
- the facilities and equipment through which electric power is generated and transmitted, and
- the appurtenant works that support these facilities in the historical floodplain (see Figures 3-4–3-7), including access and service roads, electric power and communication transmission lines and substations, docks, boat ramps, and bankline protection (riprap).

OM&R activities include the daily operation of the water diversion, conveyance, and delivery systems; canal maintenance; placement of riprap for bankline protection and erosion control; vegetation management and weed control; O&M of electrical power generation and transmission facilities; and routine maintenance as needed to ensure continued operations and replacement of facility or system components when necessary to maintain system capacity and operational capabilities. California's covered projects and activities are located within LCR MSCP Reaches 1–6. There are no California covered projects or activities within Reach 7 (i.e., Limitrophe Division).

2.3.1 Ongoing Flow-Related Covered Activities

Flow-related activities include ongoing diversion, return flows, and the generation and transmission of hydroelectric power as described below by river reach.

2.3.1.1 Reach 1

California covered activities in Reach 1 would include retaining a portion of the Metropolitan's allocation in Lake Mead, periodically, at the request of the United States. This occurs in order to facilitate transportation of a portion of the 1944 Water Treaty obligation (1.5 maf) through Metropolitan's Colorado River Aqueduct and distribution system to the San Diego County Water Authority (SDCWA), and ultimately, to Mexican municipal and industrial (M&I) uses in Tijuana, B.C., Mexico. The delivery of 1944 Water Treaty waters to Tijuana is described in greater detail in Chapter 2 of the LCR MSCP BA.

Additionally, California covered projects and activities in Reach 1 include the generation and transmission of electrical energy generated at Reclamation's Hoover Dam facility.

2.3.1.2 Reach 2

California covered projects and activities in Reach 2 include the generation and transmission of electrical energy generated at Reclamation's Davis Dam facility.

2.3.1.3 Reach 3

- City of Needles diversion from wells and return flows;
- Lower Colorado Water Supply Project—diversion in this reach, although all or some of the water may come from another reach (e.g., Reach 6) and includes non-Federal approval of subcontracts and development of the projects;
- Metropolitan—all diversions through operation of the Whitsett Pumping Plant and Colorado River Aqueduct facilities in Lake Havasu and return flows;
- PPRs—identified in the Decree and in the Supplemental Decree; and
- other Colorado River contractors in California (as identified in Appendix G) and legal mainstream Colorado River water diverters and their return flows—includes diversions via instream pumps and wells.

California's covered projects and activities in Reach 3 also include the generation and transmission of electrical energy generated at Reclamation's Parker Dam facility.

2.3.1.4 Reach 4

- Palo Verde Irrigation District (PVID) diversions at Palo Verde Diversion Dam, conveyance and water delivery system infrastructure (consisting of 400 miles of canals, drains, and spill channels) and appurtenant works and features within the PVID, with return flows through the Palo Verde Outfall Drain sluiceways and spill channels, as well as other drain structures and features;
- PPRs, as identified in the Decree and in the Supplemental Decree;
- Lower Colorado Water Supply Project—diversion in this reach, although all or some of the water may come from another reach (e.g., Reach 6) and includes non-Federal approval of subcontracts and development of the projects; and
- other Colorado River contractors in California, as identified in Appendix G, and legal mainstream Colorado River water diverters and their return flows, including diversions via instream pumps and wells.

2.3.1.5 Reach 5

- Imperial Diversion Dam, desilting basins, appurtenant works and features, and diversions into the AAC for delivery, and return flows (where appropriate) associated with:
  - Imperial Irrigation District (IID),
  - Coachella Valley Water District (CVWD),
- Bard Water District (BWD) component of the Yuma Project (consisting of 85 miles of drains, canals, and laterals):
  - Reservation Division,
  - Yuma County Water Users' Association via the Siphon Drop facility through the Yuma Main Canal (which crosses under the Colorado River from the California side to the Arizona side), and
  - diversion and transportation of a portion of the 1944 Water Treaty obligation at Imperial Dam and through the AAC for delivery back to the mainstream via the Siphon Drop Power Plant and through Yuma Main Canal and the Pilot Knob Power Plant above the NIB in Reach 6;
- PPRs, as identified in the Decree and in the Supplemental Decree;
- Lower Colorado Water Supply Project—diversion in this reach, although all or some of the water may come from another reach (e.g., Reach 6) and includes non-Federal approval of subcontracts and development of the projects; and
- other Colorado River contractors in California, as identified in Appendix G, and legal mainstream Colorado River water diverters and their return flows, including diversions via instream pumps and wells.

California's covered projects and activities in Reach 5 also includes the generation and transmission of electrical energy generated at Siphon Drop Power Plant.

2.3.1.6 Reach 6

- PPRs, as identified in the Decree and in the Supplemental Decree;
- IID generation and transmission of electrical energy at the Pilot Knob Power Plant;
- IID O&M of the federally owned Laguna Dam and Senator Wash and generation and transmission of electrical energy from the Senator Wash Pumping Plant;
- transportation of a portion of the 1944 Water Treaty obligation through the AAC for delivery back to the mainstream via the Pilot Knob Power Plant and through Yuma Main Canal and the Siphon Drop Power Plant above the NIB; and
- other Colorado River Contractors in California, as identified in Appendix G, and legal mainstream Colorado River water diverters and their return flows, including diversions via instream pumps and wells.

2.3.1.7 California Hydroelectric Power Contract Holders

Ongoing programs and activities by California hydroelectric power contract holders proposed for coverage under the LCR MSCP HCP include the contracting for, ordering of, and scheduling of Federal hydroelectric power by purchasers in California to maximize the economic value of such power generation within the constraints of the water release schedule(s).

2.3.2 Future Flow-Related Covered Activities

Future projects and activities by California covered under the HCP would include diversions, discharges, and return flows through existing facilities on the LCR. Up to 800,000 af annually of diversions, discharges, and return flows may be changed by administrative actions, which may include changes to points of diversion (e.g., associated with the LCR Water Supply Project), new points of diversion, interstate water banking, forbearance, inadvertent overruns, water marketing, and water transfers, or any other actions as made possible from any future agreements and/or measures taken by the Colorado River Board of California or contract holder(s). Included within these projects and activities are: (1) the change in point of diversion of up to 200,000 afy from Imperial Dam to Lake Havasu pursuant to the Agreement for Transfer of Conserved Water by and between the IID and the SDCWA, dated April 29, 1998, as amended (20,000 af are scheduled for transfer in 2004 based on a prescribed ramp-up schedule); and (2) the change in point of diversion of up to 77,700 afy from Imperial Dam to Lake Havasu transferred to the SDCWA, as described in the Allocation Agreement among the United States of America, Metropolitan, CVWD, IID, SDCWA, the La Jolla, Pauma, Pala, Rincon, and San Pasqual Bands of Mission Indians, the San Luis Rey River Indian Water Authority, the City of Escondido, and Vista Irrigation District, dated October 10, 2003. Those transfers are part of the change in point of diversion of up to 400,000 afy addressed in the section 7 consultation resulting in the 2001 Interim Surplus Criteria (ISC)/Secretarial Implementation Agreement (SIA) BO (U.S. Fish and Wildlife Service

2001). The transfers described above were also the subject of project level environmental review and compliance in accordance with NEPA and CEQA. As noted in Sections 1.3.4 and 4.2, the California contract holders are including the 400,000 af in annual changes in point of diversion as a covered activity for purposes of the section 10(a)(1)(B) permit issued for the LCR MSCP. Other future changes in point of diversion within the 800,000 afy are projects implemented in accordance with the QSA or contemplated in the Draft California Colorado River Water Use Plan.

2.3.2.1 California Hydroelectric Power Contract Holders

The execution, administration, and operation of extended, renewed, new, or additional contracts for hydroelectric power from hydroelectric facilities at Hoover Dam, Davis Dam, Parker Dam, Headgate Rock Dam, Siphon Drop Power Plant, and Pilot Knob Power Plant by power users in California are proposed for coverage under the LCR MSCP HCP.

2.3.3 Ongoing Non-Flow-Related Covered Activities

California's covered projects and activities include all ongoing non-flow-related OM&R activities associated with existing water diversions, conveyance facilities, and electrical generation and transmission facilities within the LCR MSCP planning area. Maintenance means those routine activities that maintain the capacity and operational features of existing facilities through which the covered activities are implemented. Replacement applies to existing facilities, both within the LCR MSCP planning area and within the existing facility footprint. OM&R applies to:

- the facilities and equipment through which water is diverted and conveyed, including 313 miles of canals by PVID and BWD (e.g., maintaining canals by chaining or dredging to remove vegetation in canals to maintain flow capacity),
- the facilities through which return flows are returned to the river, including 172 miles of drains by PVID and BWD (e.g., maintaining drains by chaining or dredging to remove vegetation in drains to maintain flow capacity),
- the facilities and equipment through which electric power is generated and transmitted, and
- the appurtenant works that support these facilities in the historical floodplain (see Figures 3-4–3-7), including access and service roads, electric power and communication transmission lines and substations, docks, boat ramps, and bankline protection (riprap).

The locations and entities involved in ongoing non-flow-related maintenance and replacement activities are listed in Section 2.3.1, "Ongoing Flow-Related Covered Activities."

2.3.4 Future Non-Flow-Related Covered Activities

The locations and entities involved in future non-flow-related maintenance and replacement activities are listed in Section 2.3.1, "Ongoing Flow-Related Covered Activities."

2.4 Nevada Covered Activities

Nevada covered projects and activities for all reaches described below include the diversion of up to 0.3 maf of Nevada's full annual entitlement, plus surplus flows, plus Nevada's share of any unused apportionment, plus volume of return flows as applicable. The agencies that divert the water and create applicable return flows are described below. Nevada entities seek coverage for OM&R of existing water diversion and conveyance facilities and electrical generation and transmission facilities within the LCR MSCP planning area. Maintenance means those routine activities that maintain the capacity and operational features of existing facilities through which the covered activities are implemented. Replacement applies to existing facilities that are both within the LCR MSCP planning area and within the existing facility footprint. OM&R applies to:

- the facilities and equipment through which water is diverted and conveyed,
- the facilities through which return flows are returned to the river,
- the facilities and equipment through which electric power is generated and transmitted, and
- the appurtenant works that support these facilities in the historical floodplain (see Figures 3-2–3-4), including access and service roads, electric power and communication transmission lines and substations, docks, boat ramps, and bankline protection (riprap).

OM&R activities include the daily operation of the water diversion, conveyance, and delivery systems; canal maintenance; placement of riprap for bankline protection and erosion control; vegetation management and weed control; O&M of electrical power generation and transmission facilities; and routine maintenance as needed to ensure continued operations and replacement of facility or system components when necessary to maintain system capacity and operational capabilities. Nevada's covered projects and activities are located within LCR MSCP Reaches 1–3. There are no ongoing Nevada actions in Reaches 4–7.

2.4.1 Ongoing Flow-Related Covered Activities

Flow-related activities include ongoing diversions, return flows, and the generation and transmission of hydroelectric power by the following.

2.4.1.1 Reach 1

Nevada covered projects in Reach 1 include:

- Boulder Canyon Project diversions at Hoover Dam;
- City of Boulder City diversions at Hoover Dam and Temple Park;
- City of Henderson and Basic Water Company (BWC) diversions at Saddle Island, Lake Mead (one intake);
- Las Vegas Valley return flows (dry weather flows, treated wastewater returns, and unmeasured returns);
- Nevada Department of Fish and Game (now NDOW) diversion at Saddle Island, Lake Mead;
- Pacific Coast Building Products diversion at Gypsum Wash, Lake Mead (diversion through well[s]);
- SNWA diversions at Saddle Island, Lake Mead, known as Robert B. Griffith Water Project and River Mountains Facility (two intakes);
- PPRs, as identified in the Decree and in the Supplemental Decree;
- other Colorado River contractors in Nevada and legal Colorado River water diverters, as identified in Appendix G;
- Boulder Canyon Project Diversion at Hoover Dam—Federal project, used for dam facilities and Reclamation's visitors' center, accounted for within Nevada's allocation; and
- Lake Mead NRA diversions—PPR and water user contract for the NPS, facilities owned and operated by the City of Boulder City.

Nevada's covered activities in Reach 1 include the generation and transmission of hydroelectric power at Hoover Dam.

2.4.1.2 Reach 2

Nevada covered projects in Reach 2 include:

- Lake Mead NRA diversions at Cottonwood Cove, Lake Mohave;
- other Colorado River contractors in Nevada and legal Colorado River water diverters, as identified in Appendix G;
- PPRs, as identified in the Decree and in the Supplemental Decree; and

Nevada's covered activities in Reach 2 include the generation and transmission of hydroelectric power at Davis Dam.

2.4.1.3 Reach 3

Nevada covered projects in Reach 3 include:

- Big Bend Water District (Laughlin) diversion and return flows;
- Boy Scouts of America (diversion through well[s]);
- existing wells determined to be pumping Colorado River water;
- Laughlin area return flows (treated wastewater returns and unmeasured returns);
- SNWA diversions at the Mohave Generation Station;
- Sportsman Park (diversion through well[s]);
- other Colorado River contractors in Nevada and legal Colorado River water diverters, as identified in Appendix G; and
- PPRs, as identified in the Decree and in the Supplemental Decree.

Nevada's covered activities in Reach 3 include the generation and transmission of hydroelectric power at Parker Dam.

2.4.1.4 Nevada Hydroelectric Power Contract Holders

Ongoing programs and activities by Nevada hydroelectric power contract holders proposed for coverage under the LCR MSCP HCP include the contracting for, ordering of, and scheduling of Federal hydroelectric power by purchasers in Nevada to maximize the economic value of such power generation within the constraints of the water release schedule(s).

2.4.2 Future Flow-Related Covered Activities

Future projects by Nevada covered under the HCP would include diversions, discharges, and return flows through existing facilities on the LCR. Future volumes of diversions, discharges, and return flows may be changed by administrative actions, which may include changes to points of diversion, new points of diversion, interstate water banking, water marketing, and water transfers, or any other actions as made possible from any future agreements and/or measures taken by the Colorado River Commission of Nevada or contract holder(s). The potential changes in flows from future projects by Nevada are not expected to exceed 233,000 af of consumptive use (CU). CU includes return flows from activities on the LCR.

Future projects by Nevada also include coverage for potential changes to existing flows into Lake Mead from the Muddy and Virgin Rivers (i.e., inflows discharging within the full pool elevation of Lake Mead), which may affect lake levels. Flow from the Muddy and Virgin Rivers pass into Lake Mead, and could be increased by augmentation from

potential future projects implemented outside of the LCR MSCP planning area along the Muddy and Virgin Rivers (e.g., actions such as purchasing irrigation water shares), or decreased by construction of upstream water diversion and conveyance facilities. Those activities that would be implemented outside the LCR MSCP planning area that could affect lake levels, however, are not covered under the LCR MSCP, including effects of these actions on the Muddy and Virgin Rivers. Such potential future projects would need to provide environmental documentation and obtain all applicable permits independent of the LCR MSCP. Flow into Lake Mead from the Virgin River could increase by approximately 30,000 af annually or decrease by approximately 60,000 af annually. Flow into Lake Mead from the Muddy River could increase by approximately 30,000 af annually or decrease by approximately 8,000 af annually. The potential changes in flow into Lake Mead from the Muddy and Virgin Rivers are within the 233,000 af CU.

Future projects and activities by Nevada covered under the HCP would also include temporary water exchanges, forbearances, and associated changes in points of diversion for water banking activities or short-term leasing. Temporary water exchanges include, although are not limited to, water exchanges between the AWBA and the SNWA, and/or other legal Colorado River water user within Nevada. Water exchanges between the AWBA and agencies within Nevada are expected to be temporary, and would not cumulatively exceed 100,000 afy for California and Nevada combined.

2.4.2.1 Nevada Hydroelectric Power Contract Holders

The execution, administration, and operation of extended, renewed, new, or additional contracts for hydroelectric power from hydroelectric facilities at Hoover, Davis, Parker, and Headgate Rock Dams by power users in Nevada are proposed for coverage under the HCP.

2.4.3 Ongoing Non-Flow-Related Covered Activities

In addition to the OM&R of facilities described in Section 2.4.1, ongoing non-flow-related activities include the NDOW programs and activities described below.

2.4.3.1 Nevada Department of Wildlife Programs and Activities

NDOW has statutory responsibilities and authorities and the ability to perform activities/programs within the discretion of NDOW. The majority of activities which are occurring or which are anticipated to occur in the future are not reasonably anticipated to result in take of species listed under ESA or are performed under authority of Title 50 C.F.R. §17.21(c)(5) and existing cooperative agreements with the USFWS. For those state level activities performed by NDOW that are funded under the Cooperative

Endangered Species Conservation Fund, Federal Aid in Sport Fish Restoration Act, and Wildlife Restoration Act, consultation to address potential take is performed as part of the review of existing statewide Federal Aid grant processes through Region 1 of the USFWS. It is the intent of NDOW to continue this existing review and consultation process outside of the auspices of the LCR MSCP program and permitting process. Those activities/programs may include:

- fish stocking, procurement, and reintroduction efforts, including those for endangered species and rainbow trout;
- fish surveys using electrofishing, netting, and angling;
- Sport Fish Restoration Act—funded sportfish enhancement projects; and
- wildlife surveys.

Additional activities/programs may be performed by NDOW that may be funded entirely from non-Federal revenue sources, or partially/entirely using Sport Fish/Wildlife Restoration Act funding including state matching funds and resources. Where these activities/programs include a Federal funding component, it is the intent of NDOW to use existing ESA consultation processes as described above for those actions. Ongoing programs and activities related to surveying, capturing, and handling of Federally listed species will be covered under section 10(a)(1)(A) permits and other authorities, as defined in the section 6 Cooperative Agreement between the NDOW and the USFWS. These programs and activities are, therefore, not covered activities under the LCR MSCP HCP.

Ongoing and potential activities for which coverage is requested under the HCP, depending on inclusion of a Federal funding component, include the following.

1. Aquatic, wetland, and riparian habitat maintenance and restoration activities, including installation of artificial fishery habitat enhancement. Most of these activities have occurred or are occurring at Lake Mead and Lake Mohave and are funded under the Sport Fish/Wildlife Restoration Act. Additional activities are not planned at this time but may occur, depending on reservoir surface elevations and as benefits to fisheries are realized and justified through existing activities. Future projects are anticipated to focus on small-scale, localized habitat enhancement projects targeted at existing high angler use areas on mainstem reservoirs. It is currently estimated that up to 20 acres of aquatic habitat improvements and 10 acres of terrestrial habitat improvements could occur within any 5-year period over the term of the LCR MSCP. Sites for habitat maintenance and restoration will be selected and designed to increase or improve habitat for native wetland and riparian wildlife species and will be selected to avoid impact to or removal of existing functional cottonwood-willow, marsh, honey mesquite, and backwater land cover types that provide habitat for covered and evaluation species. Habitat maintenance and restoration will be implemented to avoid the breeding season of all covered bird species.
2. Revegetation activities for aquatic, wetland, and riparian enhancement. No projects are currently ongoing or anticipated but would occur principally on state lands and would use only native vegetation.

3. Maintenance of aids to navigation and boating access. NDOW places and maintains aids to navigation along the LCR and in Lake Mead and Lake Mohave. This activity typically involves hand-lowering of anchors, attached by rope and chain to floating buoys. These buoys are placed to advise boaters of regulated areas, mark hazards to navigation, or provide other information. It is anticipated that additional effort will be required associated with additional conservation actions and in response to increasing levels of recreational boating activity. The NDOW also maintains boating access improvements. Currently, there is a boat ramp at Fisherman's Park in Laughlin, and NDOW provides cooperative assistance to maintain and enhance boating access facilities at Big Bend State Park near Laughlin, although boating access improvements may take place anywhere along the River including mainstem reservoirs. Maintenance and improvements to existing facilities at Fisherman's Park and Big Bend State Park is funded in part under the Sport Fish/Wildlife Restoration Act and also through use of state motorboat fuel tax revenues. Cooperative assistance to the NPS for maintenance and enhancement of boating access facilities within the Lake Mead NRA is primarily funded under the Sport Fish/Wildlife Restoration Act.

4. Law enforcement patrol activities including boating safety programs. Pursuant to state law, NDOW is responsible for administering the law enforcement and boating safety program on the state level. These programs include law enforcement patrols using watercraft to pursue and stop other watercraft. When pursuing a watercraft exceeding wakeless speed in a no-wake zone, the patrol boat also creates a wake. Some incidental impact to resources that the no-wake zone was intended to protect may occur as a result. The annual level of law enforcement patrol activities is anticipated to be similar to the estimated total effort for watercraft-based law enforcement patrol activities in 2002. NDOW estimates that a total of 22,000 person-hours will be expended to conduct these activities in 2002 for both the mainstem of the river and mainstem reservoirs and lakes. Of that total, which includes all activity while on the water, it is estimated that less than one percent is located in more sensitive off-channel areas. Time spent in pursuit is usually limited to a few minutes; other time spent patrolling in sensitive areas is at low speed. Additional effort may be required in association with new conservation actions.

2.4.4 Future Non-Flow-Related Covered Activities

In addition to the OM&R of facilities described in Section 2.4.1, future non-flow-related activities include the NDOW programs and activities described below.

2.4.4.1 Nevada Department of Wildlife Programs and Activities

Future projects by NDOW covered under the HCP would include those ongoing projects identified in Section 2.4.3.1, which may be funded entirely from non-Federal revenue sources, including NDOW projects identified as ongoing projects that NDOW does not currently participate in, but may participate in sometime in the future, and NDOW projects related to the LCR MSCP.

Chapter 3

Resources of the LCR

3.1 Introduction

This chapter describes the past and present environmental conditions of the LCR MSCP planning area. Past and present ecological conditions in the LCR MSCP planning area are described in Section 3.2, "Historical Conditions." Section 3.3, "Baseline Conditions," describes the existing ecological conditions from which potential impacts of implementing the covered activities and LCR MSCP on covered species are assessed. Section 3.4, "Land Cover Types Used for Species Habitat Models," describes the land cover types that are present in the LCR MSCP planning area and are used to determine the existing extent of covered species habitats. The status of covered species and designated critical habitat is described in Section 3.5, "Status of Covered and Evaluation Species Habitats in the LCR MSCP Planning Area" and Appendix I, "Status of LCR MSCP Covered Species."

3.2 Historical Conditions

This section summarizes historical conditions of the LCR ecosystem. Major sources used to prepare this summary include:

- *Biological Assessment, Description and Assessment of Operations, Maintenance, and Sensitive Species of the Lower Colorado River* (Bureau of Reclamation 1996);
- *Biological and Conference Opinion on the Lower Colorado River Operations and Maintenance-Lake Mead to the Southerly International Boundary* (U.S. Fish and Wildlife Service 1997);
- *Resource Use by Native and Non-Native Fishes of the Lower Colorado River: Literature Review, Summary and Assessment of Relative Roles of Biotic and Abiotic Factors in Management of an Imperiled Indigenous Ichthyofauna* (Pacey and Marsh 1998); and
- *Biological Assessment, Interim Surplus Criteria, Secretarial Implementation Agreements, Water Administration, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary* (Bureau of Reclamation 2000a).

The LCR has undergone dramatic changes since the late 1800s (Table 3-1). Prior to water development, the Colorado River flowed unimpeded and was a highly dynamic system. Seasonal water fluctuations and associated high sediment loads were major elements contributing to the physical and biological characteristics of the river. Water flows and sediment loads ranged widely, from flows exceeding 100,000 cubic feet per second (cfs) in May–July (when water runoff was greatest) to flows of 5,000 cfs or less during late fall and winter (Grinnell 1914; Carothers and Minckley 1981). Sediment loads were highest during August and September; loads in May and June were also high (Turner and Karpiscak 1980). Sediment loads at Yuma averaged more than 10^8 metric tons per year (U.S. Geological Survey 1973).

This wide flow fluctuation allowed geologic processes such as aggradation (i.e., deposition of sediment that raises the elevation of the floodplain) and degradation or scouring (i.e., erosion that lowers the elevation of the floodplain) to occur and forced biological communities to adapt to the constantly changing environment. Swift, sediment-filled flows scoured the canyons in the LCR, which hindered the establishment of most riparian plant communities. Conversely, aggradation occurred when the water and sediment were released from the narrow canyons into the broad valleys where soil deposition took place allowing backwaters, marshes, and riparian areas to establish.

The river bottom changed constantly as bedload was transported (Minckley 1979). Native plant communities became established within the broad valley river reaches extending away from the river for up to several miles where the water table was relatively shallow. In addition, meandering of the river caused by occasional large flows created or reconnected oxbows and backwaters. Among the larger historical backwaters and/or oxbows were Beaver Lake, Lake Su-ta-nah, Duck Lake, Spears Lake, Powell Slough (now part of Topock Marsh), and Lake Tapio. All were located between what are now Bullhead City and Topock (Ohmart et al. 1975).

Because of the seasonality of the flooding, several communities of plants and animals developed in response to high flows taking place from May to July and low flows occurring during the winter months. Riparian communities along the river were constantly undergoing change in response to variable rates of aggradation and degradation in the river channel and near stream areas. Floodplain communities developed in areas that were seasonally, or only intermittently, inundated. Marsh communities developed in areas of extended inundation.

Conditions in the LCR ecosystem have changed because of anthropogenic influences (Fradkin 1981 cited in Pacey and Marsh 1998). Table 3-1 provides a timeline for major events that have affected conditions in the LCR MSCP planning area, including water development activities, changes in vegetation, and introductions of non-native species.

3.2.1 Facilities Construction

Construction of facilities, including water diversion structures, dams, and flood control facilities, resulted in the most radical physical change that the river system has undergone. These facilities altered the natural hydrologic regime, which in turn altered biological communities within the system.

Table 3-1. Chronology of Lower Colorado River Events

Year	Event
1700–1800	Lower Colorado River (LCR) explored by Spanish priests and military, culminating with the establishment of a mission at Yuma in 1774 and its subsequent destruction by Yuma Indians in 1781 (Ohmart et al. 1988).
1848	LCR area north of the Gila River acquired by United States.
1840–1870	LCR explored by U.S. military. Most of early expeditions explored possible transportation routes. Notes on the geology, flora, and fauna of LCR were made.
1850	Fort Yuma established by U.S. Army.
1852	First steamboat, the *Uncle Sam*, captained by James Turnbull, traveled up Colorado River to resupply Fort Yuma. This activity marked beginning of the steamboat trade, which would eventually have profound effects on mature riparian areas along the river (Lingenfelter 1978).
1854	Gadsden Purchase consummated, extending U.S. territory south of the Gila River to the present border with Mexico.
1857	LCR, from Yuma, Arizona, north to present site of Hoover Dam, explored by J.C. Ives; region reported to be valueless.
1862	Colorado River gold rush began. The 1861 silver strike at El Dorado Canyon and the 1861 gold strike at Laguna de la Paz created Colorado River Gold Rush of 1862 (Lingenfelter 1978). Gold rush fueled steamboat trade along LCR. Initially, downed, dried cottonwood, willow, and mesquite were used as fuel for the steamboats (Ives 1861). Increased river traffic soon used all available wood debris, and crews began cutting down large quantities of cottonwoods, willows, and mesquites. By 1890, most large cottonwood-willow stands and mesquite bosques had been cut over (Ohmart et al. 1988, Grinnell 1914). Natural regeneration continued to establish new stands with each annual flood event.
1869	Colorado River from Green River in Utah to Virgin River confluence explored by John Wesley Powell.
1877	Rail line over the Colorado River completed by Yuma Southern Pacific Railroad. First diversion of water from LCR constructed by European settlers for irrigating the Palo Verde Valley near Blythe, California.
1883	Second rail line crossed the river. Together with crossing at Yuma, crossing at Needles by Atlantic and Pacific Railroad in 1883 sounded the death knell of steamboat trade along the LCR (LaRue 1916). Steamboat commerce further reduced by declines in mining, and by 1887, steamboats no longer traveled above Eldorado Canyon (Lingenfelter 1978).
1885	First documented improvements on LCR were made. Lieutenant S.W. Roessler hired a barge and crew to make improvements at Six Mile Rapids and Mojave Crossing for navigation, which was first recorded instance of alteration of river (Smith 1972).
	Carp known to be established in LCR ecosystem, altering the native fish fauna for the first time (Minckley 1973).
1892	Channel catfish stocked into the Colorado River by Arizona Game and Fish (LaRivers 1962).
1895	Construction began on Alamo Canal at Yuma to irrigate the Imperial Valley.
Late 1800s to early 1900s	Saltcedar, which was introduced into United States as an ornamental tree, escaped cultivation by the late 1800s. Expansion of saltcedar range was rapid by the early 1900s, especially between 1935 and 1955 along the Colorado River (DeLoach 1989).
1901	Alamo (Imperial) Canal completed; water diverted near Yuma and conveyed through Mexico to irrigate the Imperial Valley in California; canal supplied 700 miles of lateral canals, enabling irrigation of 75,000 acres.
1902	Reclamation Act passed establishing U.S. Reclamation Service. U.S. government began planning large-scale irrigation projects (LaRue 1916).

Table 3-1. Continued

Year	Event
1905	Temporary diversion structure at Alamo Canal heading breached by flood on Gila River, and Colorado River flowed into Salton Sink.
1907	Dike repaired and river redirected back to the correct channel by Southern Pacific Railroad. Salton Sea was accidentally created from Colorado River floodwaters; 330,000 acres were inundated; flooding increased political pressure to dam the Colorado River.
1909	Laguna Diversion Dam completed; water diverted through the Yuma Main Canal to irrigate 53,000 acres in the Yuma Valley, Arizona, and 14,700 acres in the Reservation Division in California, and through the North Gila Canal to irrigate 3,500 acres in the Gila Valley, Arizona.
1910	Three-month expedition from Needles to Yuma led by Joseph Grinnell to collect data on mammals, birds, and associated habitats. Expedition provided one of first detailed accounts of flora and fauna of LCR. Grinnell observed carp and catfish, documented effects of Laguna Dam on the ecosystem, and documented loss of riparian vegetation to agriculture (Grinnell 1914).
1913	Estimated acreage of irrigated land between Virgin River and Southerly International Boundary was 367,000 acres, most of this land was in Imperial Valley (LaRue 1916). Along the mainstem Colorado River between Cottonwood Basin and the U.S./Mexico border, the conversion of 53,000 acres to irrigated agriculture land resulted in substantial loss of riparian vegetation.
1920	Saltcedar appeared along mainstem of the Colorado River (Ohmart et al. 1988). This species is well suited to changed riverine ecosystem and displaced native riparian species throughout LCR. Important wildlife habitats, including the cottonwood-willow gallery forests, all but disappeared from Colorado River and were replaced by less desirable saltcedar (Anderson and Ohmart 1984a).
1922	Colorado River Compact signed, whereby water was allocated between the upper (Colorado, Wyoming, New Mexico, Utah) and lower (California, Nevada, Arizona) basins.
1927	Irrigated acreage along the mainstem of LCR increased from 53,000 acres in 1913 to 95,000 acres in 1927 (Wilbur and Ely 1948). Increase resulted in further decreases in extent of riparian vegetation.
1935	Boulder Dam (now Hoover Dam) completed; Lake Mead covered 300 square miles and stored 31 million acre-feet (maf) of water, enough to irrigate 650,000 acres in California and Arizona and 400,000 acres in Mexico. Hydrography of river changed; devastating floods were eliminated. Hydropower of 4 billion kilowatt-hours produced annually.
	U.S. Fish and Wildlife Service (USFWS) stocked largemouth bass, bluegill sunfish, green sunfish, and black crappie in Lake Mead and rainbow trout into river below Lake Mead (Jonez and Sumner 1954).
1938	Parker Dam completed; Lake Havasu behind the dam covers 39 square miles and stores 600,000 acre-feet of water. Metropolitan Water District of Southern California diversions into the Colorado River Aqueduct initiated.
	Imperial Dam completed; additional water diverted via the Gila Gravity Main Canal and the All American Canal for irrigating southeast California and southwest Arizona.
	Pilot Knob Wasteway off All American Canal completed, allowing water to be diverted from behind Imperial Dam on the California side to be returned to the river.
1938–1939	Although largemouth bass and bluegill already present in system, State of California planted additional stocks to increase spread of species (Dill 1944).
1939	Gila Gravity Main Canal completed, replacing the North Gila Canal (from behind Laguna Dam) and delivering irrigation water from behind Imperial Dam to irrigate 105,000 acres in Arizona's Gila Valley.
1940	All-American Canal completed, replacing Alamo Canal and delivering irrigation water from behind Imperial Dam to Imperial Valley in California; 461,642 acres currently irrigated.
1941	Havasu National Wildlife Refuge (NWR) established near Needles, California. Imperial NWR established near Martinez Lake, Arizona.
	Siphon Drop completed, delivering irrigation water from All-American Canal to Yuma Valley in Arizona; it replaced Yuma Main Canal (sealed in 1948), originating behind Laguna Dam.

Table 3-1. Continued

Year	Event
1944	Headgate Rock Dam completed; irrigation water diverted to Colorado River Indian Tribes Reservation near Parker, Arizona; water diverted to enable irrigation of 107,588 acres.
1948	Coachella Canal completed; water from All-American Canal conveyed to Coachella Valley in California; 58,579 acres currently irrigated.
	Red shiners introduced to Colorado River as baitfish.
1950	Morelos Diversion Dam completed; irrigation water delivered by Mexico to Mexicali Valley.
	Davis Dam closed and first water storage for Lake Mohave begun in January 1950. Powerplant still under construction.
1952	Yuma Division stabilized from Laguna Dam to Southerly International Boundary; 17.6 miles of levees constructed; 17.4 miles of channel dredged; 264,000 cubic yards of riprap placed; 41 miles of access roads constructed.
1953	Davis Dam and power plant completed, providing regulation of water to be delivered to Mexico and regulating flows from Hoover Dam; Lake Mohave behind dam capable of storing 1.8 maf of water.
	Mohave Division from Davis Dam to Topock, Arizona, channelized and stabilized; 31 miles of channel dredged, 288,082 cubic yards of riprap placed, and 47 miles of levees built.
1954	Laguna Dam no longer used for diversion (Imperial Dam used instead).
	Threadfin shad introduced into Lake Mead (274 fish). Second release in 1955 of 11,000 fish resulted in successful establishment in Lake Mead (Allan and Roden 1978).
1955	Threadfin shad introduced into Lake Mohave (6,000 fish) (Allan and Roden 1978).
1956	Topock Desilting Basin completed, providing control of river sediment near Needles, California; 4,400,000 cubic yards of material excavated.
1957	Palo Verde Diversion Dam completed; irrigation water continues to be diverted to the Palo Verde Valley near Blythe, California; 121,000 acres under irrigation.
1959	Striped bass introduced by State of California into Colorado River near Blythe (introduced into Lake Havasu in 1960). This species became top fish predator in the Colorado River system.
1962	Flathead catfish introduced into river by State of Arizona.
1963–1967	*Tilapia* introduced into Colorado River by California and Arizona.
1964	Cibola NWR was established near Blythe, California.
1965	Laguna Desilting Basin completed, providing control of river sediment north of Yuma, Arizona; 3,120,000 cubic yards of material excavated.
	Irrigated acreage estimated at 293,000 acres along mainstem of LCR (Lower Colorado Region State-Federal Interagency Group for the Pacific Southwest Interagency Committee 1971).
1966	Senator Wash Dam and Reservoir completed north of Yuma; reservoir covered 470 acres and held 13,836 acre-feet of water.
	Topock Marsh inlet and outlet structures completed, providing 4,000 acres of marsh at Havasu NWR.
1967	Palo Verde Oxbow inlet and outlet structures completed near Blythe, California, to provide wildlife habitat.
1968	River channel stabilized from Palo Verde Diversion Dam to Taylor Ferry, 19.5 miles. Banklines armored in Parker Division, Section I; 11 miles stabilized.
1969	Training structures south of Laughlin, Nevada, completed, reducing bankline erosion.
	Striped bass introduced into Lake Mead in 1969–1972, creating the first documented establishment of a persistent reproducing population of striped bass in the LCR in the pelagic zone of a reservoir not connected to a suitable riverine reach.
1970	Mittry Lake inlet structure completed, south of Imperial Dam, to provide wildlife habitat.
	Cibola Division stabilized from Taylor Ferry to Adobe Ruin; 16 miles dredged.

Table 3-1. Continued

Year	Event
1974	Cibola Lake inlet and outlet structures completed at Cibola NWR to improve wildlife habitat.
1980	Bonytail listed as endangered under the Federal Endangered Species Act (ESA).
1983	Reservoirs on entire lower river spilled for first time as a result of extremely high precipitation from El Niño weather event.
1985	Inlet structure to the Central Arizona Project aqueduct behind Parker Dam completed; water diverted to supply Phoenix and Tucson, Arizona; 1.5 maf currently diverted.
1986	Hoover Dam power plant upgrade from 1,448-megawatt to 1,951-megawatt output started. (Upgrade was completed in 1992.)
1989	Establishment of Lake Mohave Native Fish Work Group to implement cooperative actions for conservation of adult razorback sucker population in Lake Mohave.
1991	Razorback sucker listed as endangered under the ESA.
1992	Powerplant added to Headgate Rock Dam; maximum generating capacity is 19.5 megawatts.
1993	Hoover Dam power plant upgrade from 1,448-megawatt to 1,951-megawatt output completed. (Upgrade started in 1986.)
	Flood event occurred on Colorado River due to Gila River flooding.
1994	Areas of lower Colorado River designated as critical habitat for two endangered fish, bonytail and razorback sucker, under the ESA. Although not within the LCR MSCP planning area, critical habitat was designated on the LCR for humpback chub.
1995	Parker Division, Section II stabilized.
	Southwestern willow flycatcher listed as endangered under the ESA.
	Flood event occurred on Colorado River due to Gila River flooding.
1995	Partnership to develop and implement a long-term endangered species compliance and management program for the historic floodplain of the LCR formed by U.S. Department of Interior agencies; water, power, and wildlife resources agencies from Arizona, California, and Nevada; Native American tribes; water and power providers; environmental interests; and recreational interests.
1996	Reclamation issued final biological assessment for operations, maintenance, and sensitive species of LCR in August.
1997	USFWS issued a final biological opinion on LCR operations and maintenance in April.
2000	Reclamation issued biological assessment covering the Interim Surplus Criteria, Secretarial Implementation Agreements, Water Administration, and Conservation Measures on LCR Lake Mead to Southerly International Boundary.
2001	USFWS issued biological opinion on Interim Surplus Criteria, Secretarial Implementation Agreements, Water Administration, and Conservation Measures on LCR Lake Mead to the Southerly International Boundary.
	USFWS published draft recovery goals for humpback chub, razorback sucker, bonytail, and Colorado pikeminnow, setting forth numeric and management levels needed to downlist and delist these species under the ESA.
2002	USFWS published final recovery goals for humpback chub, razorback sucker, bonytail, and Colorado pikeminnow and published the *Southwestern Willow Flycatcher Recovery Plan*.
	Reclamation requested reinitiation of the 1997 consultation. USFWS issued an interim BO, which identified minor modifications to the provisions of its 1997 BO and extended coverage for Reclamation's discretionary actions on the LCR for 3 years to April 30, 2005.
2004	The USFWS proposed critical habitat for the southwestern willow flycatcher including areas in the LCR MSCP planning area in October.

Sources: Bureau of Reclamation 1996, 2000a; U.S. Fish and Wildlife Service 2001, 2002a–e.

Water diversion for agricultural irrigation on the LCR began as early as 1877 in the Palo Verde Valley. The first water diversion project for large-scale agricultural use on the LCR was the Alamo Canal, which was completed in 1901. The canal delivered water to the Imperial Valley. Laguna Dam was constructed in 1909 near Yuma, Arizona, and was the first structure to block the entire river channel on the LCR. This structure diverted water to the Yuma Valley and the Reservation Division via the Yuma Main Canal and to the Gila Valley via the North Gila Canal.

The construction of the Hoover Dam and the AAC System altered the LCR significantly. Hoover Dam, which created Lake Mead, was constructed to control high flows and protect agricultural lands and facilities. Changes associated with Hoover Dam include sediment trapping, decreased productivity downstream of the dam, decreased water temperatures, increased water clarity downstream of the dam, elimination of large flood events, introduction of new species, and isolation of native fish populations (by impeding their migration). The AAC System includes the AAC, Coachella Canal, and Imperial Dam and Desilting Works. These canals transport waters away from the system, altering water flows.

Two additional large dams were constructed in the river: Parker Dam in 1938 and Davis Dam in 1953. The changes in environmental conditions associated with these dams are similar to those associated with Hoover Dam. Parker Dam created Lake Havasu and Davis Dam created Lake Mohave. These two dams further reduced riparian vegetation, reduced sediment transport, increased water clarity, and impeded fish movement. At the upstream end of Lake Havasu, a delta formed as sediment was deposited, creating Topock Marsh.

Smaller dams and other diversion structures built in the river include Imperial Dam, Headgate Rock Dam, Morelos Diversion Dam, and Palo Verde Diversion Dam. Imperial Dam created a large backwater and series of marsh complexes, inundating existing riparian vegetation.

Starting in the 1950s, levee, training structure, and jetty construction; bankline stabilization; and channel realignment were undertaken by Reclamation to control floods, regulate flows, and prevent bank erosion, among other purposes. Dredging was undertaken to realign the channel, control sediment, provide material for levee construction, and conduct environmental enhancement and mitigation. Levees that were constructed close to the main river channel restricted the floodplain and removed connections between the river and riparian vegetation, marshes, and backwaters. Narrower, straighter portions of the river channel were created by levee and training structure construction, bankline stabilization, and dredging. In addition, banks were protected from erosion by bankline stabilization and training structures. Increased water velocity in the narrow portions of the river channel eroded a formed channel as the fast-moving water eroded the bottom of the river. (U.S. Fish and Wildlife Service 1997; Bureau of Reclamation 2000a.)

In areas where channel deepening occurred, the water table lowered. Marshes and backwaters dried up. If the roots of riparian vegetation could reach to the lowered water table, the vegetation could survive; however, regeneration of riparian vegetation decreased. (U.S. Fish and Wildlife Service 1997.)

Though new backwaters and marshes are no longer likely to form naturally because of modifications to the river channel and flow regime, construction of training structures resulted in the formation of more expansive and permanent marshes than had existed historically. (Bureau of Reclamation 2000a.)

3.2.2 Loss of Riparian Vegetation and Floodplain

Agriculture contributed to changes on the floodplain along the LCR. Levee construction and water diversion associated with agricultural practices hindered floodwaters from reaching riparian, marsh, and backwater areas. Channelization and bankline stabilization altered erosion and flooding patterns, while water diversions decreased water levels, both contributing to the loss of native fishes. Though most agricultural development occurred in fertile valleys away from the river itself, some agricultural land was located along river terraces, replacing riparian vegetation, marshes, and backwaters.

Boat traffic added to the loss of riparian vegetation as steamboats used the riparian vegetation along the river for fuel.

Dams also contributed to the loss of riparian vegetation and floodplain. Large dams, such as Hoover, Parker, and Davis Dams, inundated miles of river, riparian areas, and adjacent desert areas.

Historically, approximately 400,000–450,000 acres of riparian vegetation were estimated to occur on the LCR between Fort Mohave and Fort Yuma (Mearns 1907). An analysis by Reclamation (1999) of 1938 aerial photography, historical journals, historical photographs, surveyor plats, and historical maps indicated the presence of approximately 89,200 acres of potentially suitable willow flycatcher breeding habitat between the Grand Canyon and the SIB (in the analysis, historical willow flycatcher habitat is defined as "dense willows often with an over story of cottonwood"). Currently, approximately 126,000 acres of woody riparian vegetation occurs in the LCR MSCP planning area, of which approximately 23,000 acres are native vegetation (the remainder is dominated by saltcedar). Regeneration of woody riparian vegetation has also decreased considerably because of loss of riparian vegetation to agricultural, residential, and commercial development and bankline stabilization; water table lowering because of channelization; and loss of seasonal flooding because of dam construction.

3.2.3 Changes in Marsh and Backwaters

Marsh and backwaters were lost from areas where they historically occurred because of agricultural conversion, construction of reservoirs, river channelization, and bankline stabilization. The natural formation of new marshes and backwaters because of river action is also now unlikely. However, flow regulation and shifts in the timing of flows because of water diversion resulted in large marsh and backwater complexes developing where riparian vegetation historically occurred. Marsh complexes developed behind Imperial Dam and Parker Dam at the Bill Williams Delta and Topock Marsh. The construction of training structures also created areas of more expansive and permanent backwater and marsh than had occurred historically on the LCR. In addition, some

marshes have been created as mitigation for channel improvement projects. These improvement projects contributed to the elimination of overbank flows and river meandering that created the historical marsh and backwater communities. Reclamation maintains these marshes as well as marshes formed by the construction of training structures and other river control features. (U.S. Fish and Wildlife Service 1997; Bureau of Reclamation 2000a.)

3.2.4 Introduction of Nonnative Species

Nonnative species have been present in the river since the late 1800s. Carp and catfish were among the first fish species to be introduced in the river (Grinnell 1914). However, the extent of their presence was not completely documented. Other fish species introductions followed, including mosquitofish for mosquito control in the 1920s and 1930s, largemouth bass and other centrarchids (i.e., freshwater basses and sunfishes) in Lake Mead for sport fishing, and rainbow trout below Hoover Dam (where water clarity had increased) in the 1930s for sport fishing. Red shiners and threadfin shad were introduced for a sport fishing forage base in the 1950s; threadfin shad quickly spread throughout the LCR. Striped bass were introduced in the 1960s by the state game and fish agencies to take advantage of the thriving forage base; this species became a top fish predator in the Colorado River system. Flathead catfish were also introduced into the Colorado River in the 1960s. Fish from the genus *Tilapia* were introduced for weed control in the irrigation systems beginning in the 1960s. (Bureau of Reclamation 1996.)

In all, 29 nonnative fish species have become established in the river and are believed to be the primary reason for the lack of recruitment of native species because of predation and competition (Pacey and Marsh 1998). Native fish were adapted to the historical extremes of the LCR; nonnative fish were not. However, under postdam conditions, native fish had no competitive advantage over nonnative fish. Many of the nonnative fish species produced far more eggs per female than the native species, allowing them to quickly increase their numbers relative to native species. Introduced fish species invaded the off-channel habitats frequented by native fish, where they could compete for resources with and prey on the native fish, especially juveniles. In addition, the increase in water clarity downstream of dams may have given nonnative fish a predatory advantage. (Bureau of Reclamation 1996.)

Introduction of nonnative plants modified the riparian community and its wildlife habitat quality. Saltcedar, which was introduced into the United States as an ornamental tree, escaped cultivation by the late 1800s. Saltcedar appeared along the mainstem of the Colorado River in 1920 (Ohmart et al. 1988), though rapid expansion of its range along the river did not occur until 1935 to 1955 (DeLoach 1989). The substantial changes to the hydrology of the Colorado River favored saltcedar establishment, while limiting recruitment and persistence of cottonwood-willow communities. Important wildlife habitats, including cottonwood-willow gallery forests, all but disappeared from the Colorado River and were replaced by less desirable saltcedar (Anderson and Ohmart 1984a). Additional introduced plant species, such as giant reed and giant salvinia, are also contributing to the decline of native plant communities.

3.2.5 Water Quality Changes

Water quality changes within the LCR system have occurred because of irrigation return flows, M&I effluents, dam construction, and a number of point sources. The quality of irrigation return water has potential effects on wildlife and fish. Agricultural return flows have generally resulted in an increase in salinity in receiving water bodies because of salts leached from the irrigated soils. Irrigation return flows may also contain various residuals from fertilizers and pesticides. Typical inorganic contaminants include selenium, zinc, and copper (Buhl and Hamilton 1996). Dams trap sediment and nutrients, increasing downstream water clarity, and potentially decreasing downstream productivity. In addition, evaporation from reservoirs increases salinity concentration.

3.3 Baseline Conditions

This section describes the regulatory context for the baseline conditions and summarizes the present conditions of the LCR ecosystem. Major sources used to prepare this summary include:

- *Biological Assessment, Description and Assessment of Operations, Maintenance, and Sensitive Species of the Lower Colorado River* (Bureau of Reclamation 1996);
- *Biological and Conference Opinion on the Lower Colorado River Operations and Maintenance-Lake Mead to the Southerly International Boundary* (U.S. Fish and Wildlife Service 1997);
- *Resource Use by Native and Non-Native Fishes of the Lower Colorado River: Literature Review, Summary and Assessment of Relative Roles of Biotic and Abiotic Factors in Management of an Imperiled Indigenous Ichthyofauna* (Pacey and Marsh 1998);
- *Biological Assessment, Interim Surplus Criteria, Secretarial Implementation Agreements, Water Administration, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary* (Bureau of Reclamation 2000a); and
- *Biological Opinion for Interim Surplus Criteria, Secretarial Implementation Agreements, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary; Arizona, California and Nevada* (U.S. Fish and Wildlife Service 2001).

3.3.1 Regulatory Context

Existing conditions represent a “snapshot” in time of the status of populations and habitat of the covered species in the LCR MSCP planning area. This snapshot is used to assess the effects of the covered activities described in Chapter 2, “Description of Covered Activities,” on the covered species. Existing conditions include all effects of actions taken in the past, even if effects of some of the actions have not yet been fully manifested. This definition of the existing conditions is used because the current

environmental conditions are derived in large measure from permanent artificial facilities (e.g., dams, jetties, training structures, protected banklines, levees) and annual river operations along the LCR. The effects of these permanent facilities on covered species are considered irreversible and are not appropriately considered an effect of the activities covered under the LCR MSCP HCP. Existing conditions along the LCR reflect the effects of past and ongoing human and natural factors leading to the current status of the covered and evaluation species, their habitat, and the ecosystem in the LCR MSCP planning area. Existing conditions are the existing extent of land cover types and abundance and distribution of species described in this chapter. Human factors considered part of existing conditions include the past and present effects of existing facilities (e.g., dams along the LCR), flood control infrastructure (e.g., levees, protected backlines), and ongoing operations and maintenance activities. The effects of natural factors, such as climate (e.g., flooding, drought, variation throughout the year in precipitation and temperature), topography, and riverbed composition, are also considered part of existing conditions along the LCR.

3.3.2 Present Conditions

Present conditions[1] in the LCR are significantly different from historical conditions. The river is no longer free flowing and does not constitute a continuous ecosystem because of the many impoundments along its length. In addition, the hydrologic regime does not support extreme fluctuations mainly because of the presence of large, mainstem dams farther upstream, resulting in reduced natural backwaters and reduced periods of inundation in adjacent floodplain lowlands.

The present condition consists of approximately 126,000 acres of woody riparian vegetation occurs in the LCR MSCP planning area. The majority is dominated by saltcedar (i.e., saltcedar, saltcedar–honey mesquite, and saltcedar–screwbean mesquite land cover types); only 23,000 acres are native cottonwood-willow, honey mesquite, arrowweed, and atriplex land cover types. See Appendix H for a summary of the current extent of native and nonnative vegetative cover in the LCR MSCP planning area by landownership status.

Reach 1 is defined by Hoover Dam to the full pool elevation of Lake Mead at 1,229 feet mean sea level (msl). Hoover Dam and Lake Mead were created to provide flood control, water storage for irrigation, and hydroelectric power. In addition to the Colorado River, Hoover Dam retains flows from the Muddy and Virgin Rivers. Lake Mead is characterized as a mesotrophic lake (i.e., intermediate in nutrient levels and productivity) (La Bounty and Horn 1997). Because of the construction of Glen Canyon Dam, most of the Colorado River sediment load is trapped in Lake Powell. Lake Mead, formed by Hoover Dam, traps Colorado River sediment from the Grand Canyon in its upper reaches, and the river downstream of the dam is relatively clear. Water temperatures downstream of the dam are cool because of releases from the hypolimnetic zone (deeper, cold-water layer) of the reservoir. Lake Mead supports a small recruiting population of razorback sucker, as well as a large number of nonnative fishes, many of which prey on native

[1] The extent of existing vegetation described in this Chapter is derived from aerial photographs taken of the LCR MSCP planning area from 1997 through 2001 and, consequently, represent the extent of vegetation types that were present at the time of the aerial photographs were taken and represent the best available information.

species of fish. Native fishes are unable to move upstream or downstream of the barrier created by the dam. Riparian vegetation along Lake Mead is limited because of lack of substrate and frequent water fluctuations in the reservoir. At the time vegetation was delineated in 1997, approximately 4,000 acres of woody riparian vegetation was present within the full pool elevation of Lake Mead 1,700 acres of which are native cottonwood-willow; the remainder are saltcedar or mixed saltcedar–mesquite). Approximately 140 acres of marsh occur in Reach 1.

Reach 2 extends from Hoover Dam to Davis Dam and is defined by the boundary of Lake Mohave to the full-pool elevation of 647 feet. Davis Dam and Lake Mohave were created to provide part of the capacity for water delivery to Mexico and to re-regulate fluctuating discharge from Hoover Dam. Additional sediments are trapped behind Davis Dam. The inflow to Lake Mohave is mostly discharge from Hoover Dam with some infrequent desert-wash flooding (Pacey and Marsh 1998). The river reach (Reach 2) from below Hoover Dam to Lake Mohave contains cold tailwater. Lake Mohave is clear but highly productive (Pacey and Marsh 1998). Like Lake Mead, Lake Mohave supports warm water and coldwater sport fisheries, as well as repatriated and remnant native fish populations of razorback sucker and bonytail. Approximately 1,200 acres of woody riparian vegetation, 5 acres of which are native cottonwood-willow and honey mesquite (the remainder are saltcedar or mixed saltcedar–mesquite), and 20 acres of marsh occur in Reach 2.

Reach 3 extends from Davis Dam to Parker Dam and is defined by the boundary of Lake Havasu to the full-pool elevation of 450 feet. Immediately below Davis Dam, the system is characterized by a riverine reach controlled by the cold water discharge from Davis Dam. Parker Dam and Lake Havasu were created mainly to provide a forebay and desilting basin for Metropolitan's Whitsett Pumping Plant for the Colorado River Aqueduct (Pacey and Marsh 1998). The Topock Desilting Basin, located near Needles, California, was constructed to reduce the flow of sediment into Topock Gorge and is periodically dredged. Lake Havasu is a relatively shallow mesoeutrophic (i.e., tending toward high nutrient levels and high primary productivity) and warm-water impoundment with a complex shoreline. Topock Marsh, which came into existence because of the construction of Parker Dam and the filling of Lake Havasu, is located at the upstream end of Lake Havasu. The Bill Williams River empties into Lake Havasu (Pacey and Marsh 1998). Water is withdrawn from Lake Havasu by the CAP and Metropolitan. Lake Havasu supports sport fisheries of nonnative species and also the repatriated and potentially remnant native fish populations of razorback sucker and bonytail. More than 50 percent of the riverbank downstream of Davis Dam has been replaced with riprap (Minckley 1979). Reach 3 contains approximately 31,500 acres of woody riparian vegetation, approximately 2,700 acres of which are native cottonwood-willow, honey mesquite, arrowweed, and atriplex (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 4,400 acres of marsh.

Reach 4 extends from Parker Dam to Adobe Ruin and Reclamation's Cibola Gage. This reach is channelized. Backwaters along this reach include Palo Verde Oxbow, Cibola Lake and Three Fingers Lake. The riverine portion of this reach includes the epilimnetic water (warm, surface water layer) released from Parker Dam. Diversions provide water to the agricultural lands along the floodplain and adjacent uplands; the main diversions are at Headgate Rock Dam and the Palo Verde Diversion Dam. River flows receive irrigation return flows and infrequent runoff (Pacey and Marsh 1998). The water

temperature is warm and the river supports abundant nonnative fish populations. Approximately 65,700 acres of woody riparian vegetation, approximately 14,500 acres of which are native cottonwood-willow, honey mesquite, arrowweed, and atriplex (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 2,100 acres of marsh occur in Reach 4.

Reach 5 extends from southern extent of Cibola National Wildlife Refuge (NWR) and Reclamation's Cibola Gage to Imperial Dam. Imperial Dam created Imperial Reservoir and provides water to the Gila Gravity Main Canal in Arizona and the AAC in California. Generally, Imperial Reservoir is warm and shallow and acts as a desilting basin for the canal intakes (Pacey and Marsh 1998). The desilting works for the Gila Gravity Main Canal and AAC move sediment from above Imperial Dam to the Laguna Desilting Basin. In addition, dredging periodically occurs in the reservoir basin upstream of Imperial Dam to maintain diversions for the Gila Gravity Main Canal and AAC. Razorback suckers are also present in Reach 5. Reach 5 contains approximately 7,800 acres of woody riparian vegetation, approximately 800 acres of which are native cottonwood-willow, honey mesquite, and arrowweed (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 3,800 acres of marsh.

Reach 6 extends from Imperial Dam to the NIB and includes Laguna Dam, Mittry Lake, and the confluence with the Gila River. The Laguna Desilting Basin, which receives sediment from upstream sources, is periodically dredged. Flows in Reach 6 are minimal, consisting of water resulting from sluicing operations at Imperial Dam and irrigation return flows. The fish fauna is dominated by nonnative species. Reach 6 contains approximately 12,200 acres of woody riparian vegetation, approximately 2,600 acres of which are native cottonwood-willow, honey mesquite, *Atriplex*, and arrowweed (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 1,400 acres of marsh.

Reach 7 includes only the LCR floodplain within the United States extending from the NIB to the SIB and includes Morelos Diversion Dam. Morelos Diversion Dam provides water for the Mexican canals, leaving little water to be carried to the river delta at the Gulf of California. River conditions below Morelos Diversion Dam to the SIB are frequently dry, or nearly so. Flow, when present, in this reach is maintained by seepage and releases from Morelos Diversion Dam, irrigation return flows, canal wasteway discharges, and groundwater discharge. Considerable sediment was deposited in this reach during the 1993 Gila River flooding. To maintain flow capacity for flood events in the river channel, periodic dredging is expected to occur between the NIB and Cocopah Bend. Reach 7 contains approximately 3,700 acres of woody riparian vegetation, approximately 800 acres of which are native cottonwood-willow, arrowweed, and atriplex (the remainder are saltcedar or mixed saltcedar–mesquite), and approximately 130 acres of marsh.

3.4 Land Cover Types Used for Species Habitat Models

With the exception of the southwestern willow flycatcher, covered species habitats have not been directly field delineated in the LCR MSCP planning area. Therefore, for some covered and evaluation species, species habitats are defined by application of species habitat models based on the likelihood for each land cover type to support a species habitat (Section 3.5.1.1, "Species Habitat Models). For these species, the analysis of the extent of their habitat begins with a definition of the land cover types used for the species models.

The land cover type classification system used in the LCR MSCP was derived from previous classifications developed by Anderson and Ohmart (1984b), Younker and Anderson (1986), Salas et al. (1996), and Ogden Environmental and Energy Services (1998). Fourteen land cover types are described in the LCR MSCP planning area (Table 3-2). Five woody riparian land cover types are divided into multiple structural types, and the marsh land cover type is divided into seven compositional types based on plant composition and vegetation structure.

Table 3-2. Land Cover Type Classification used in Mapping Resources of the LCR MSCP Planning Area

Woody riparian land cover types
Cottonwood-willow (six structural types)
Saltcedar (six structural types)
Honey mesquite (four structural types)
Saltcedar–honey mesquite (four structural types)
Saltcedar–screwbean mesquite (five structural types)
Arrowweed
Atriplex
Marsh land cover type (seven compositional types)
Aquatic land cover types
River
Reservoir
Backwater
Adjacent land cover types
Desert scrub
Agriculture
Developed

3.4.1 Woody Riparian Land Cover Types

Woody riparian land cover types are classified by plant community and structural type (Anderson and Ohmart 1984b). Criteria used to define woody riparian land cover types are presented in Table 3-3. Six structural types have been described (I–VI) and reference is made to the proportion of foliage present in each of three vertical layers. For example, a plant community with structural type VI has most of its foliage in the lowermost layer, less foliage in the mid-height layer, and little or no foliage in the upper canopy. A structural type I community has well-developed foliage in all three layers, with the upper canopy dominating. Figure 3-1 and Table 3-4 describe the relationship between the six structural types and the foliage density at various heights. Numerical dominance can be shared by more than one species, as long as each species constitutes at least 5 percent of the total trees present (Anderson and Ohmart 1984b).

Table 3-3. Woody Riparian Land Cover Types and Characteristics Used in Classification

Habitat Type	Characteristics
Cottonwood-willow	*Salix gooddingii* and *Populus fremontii* (the latter usually in low densities) constituting at least 10 percent of total trees (remaining trees are usually saltcedar).
Saltcedar	*Tamarix* spp. constituting 80–100 percent of total trees.
Honey mesquite	*Prosopis glandulosa* constituting 90–100 percent of total trees.
Saltcedar–honey mesquite	*Prosopis glandulosa* constituting at least 10 percent of total trees; rarely found to constitute more than 40 percent of total trees.
Saltcedar–screwbean mesquite	*Prosopis pubescens* constituting at least 20 percent of total trees.
Arrowweed	*Pluchea sericea* constituting 90–100 percent of total vegetation in area.
Atriplex	*Atriplex lentiformis*, *A. canescens* and/or *A. polycarpa* constituting 90–100 percent of total vegetation in area.

Source: Anderson and Ohmart 1984b.

Table 3-4. Description of Woody Riparian Land Cover Structural Types

Type I	Mature stand with distinctive overstory more than 15 feet tall; intermediate class is 2–15 feet tall and understory is 0–2 feet tall.
Type II	Overstory is more than 15 feet tall and constitutes more than 50 percent of the trees; little or no intermediate class present.
Type III	Largest proportion of trees is 10–20 feet tall; few trees above 20 feet or below 5 feet tall.
Type IV	Few trees above 15 feet tall; 50 percent of the vegetation is 5–15 feet tall and 50 percent is 1–2 feet tall.
Type V	60–70 percent of the vegetation is 0–2 feet tall, the remainder is 5–15 feet tall.
Type VI	75–100 percent of the vegetation is 0–2 feet tall.

Source: Anderson and Ohmart 1984b.

3.4.1.1 Cottonwood-Willow

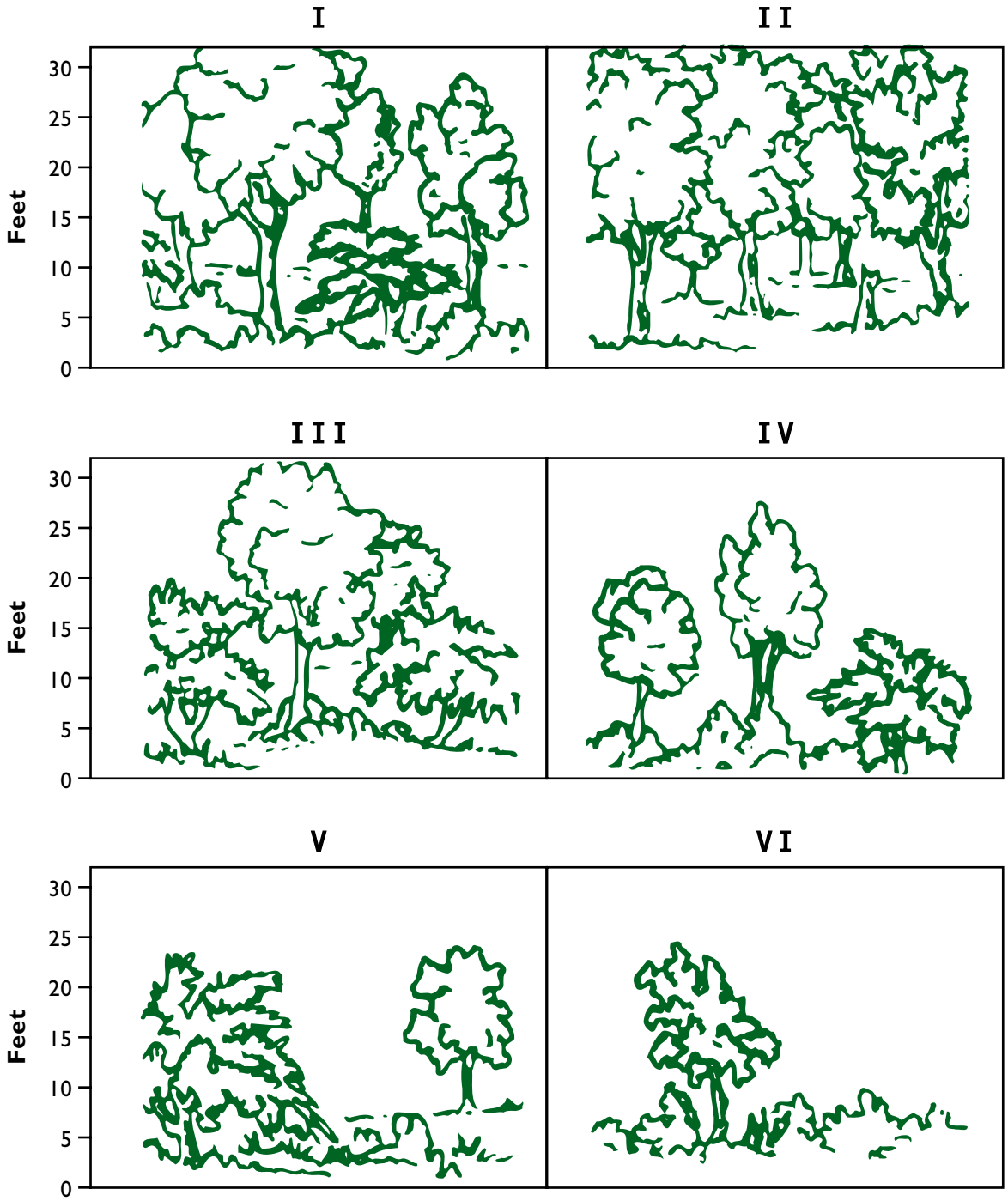
This community comprises winter-deciduous, broadleaf trees that grow to about 60 feet tall (Holland 1986; Rowlands et al. 1995). The dominant tree species are Fremont cottonwood and Goodding's willow, although other willow species may be present. The community occurs in deep, well-watered, loamy alluvial soils along the floodplain of the Colorado River and major tributaries (Holland 1986). To be maintained, it requires periodic winter or spring flooding that creates new silt beds for seed germination of the dominant species. Both Fremont cottonwood and Goodding's willow reproduce primarily by seed and have narrowly defined germination requirements. In addition, neither species can tolerate prolonged inundation (Ohmart et al. 1988; Brown 1994). Postdam stabilized flows along the Colorado River are not conducive to seed germination for these species. As a result, stands of cottonwood-willow that remain along the mainstem are largely decadent and show little evidence of seedling recruitment (Brown 1994).

The cottonwood-willow land cover type includes areas where Fremont cottonwood and Goodding's willow comprise at least 10 percent of the total trees (Younker and Andersen 1986). The canopy ranges from continuous to open, and the ground layer is variable. Cottonwoods typically are present in far smaller amounts than are willows. The majority of remaining trees is usually saltcedar.

3.4.1.2 Saltcedar

Saltcedar is the common name applied to several nonnative species of shrubs to medium-size trees of the genus *Tamarix* that have increased in abundance over the last 50 years, while the extent of native riparian vegetation has declined along the Colorado River. The most commonly invasive species are *Tamarix chinensi*s, *T. parviflora*, and *T. ramosissima*. The related "athel," a larger tree that has been widely planted in the LCR MSCP planning area, may also be included in areas mapped as saltcedar. This association generally occurs as a monoculture of saltcedar shrubs or trees. Saltcedar occurs over the entire range of soil conditions found along the LCR, including areas where lack of flooding and high evaporation allow salts to build up in soils. Saltcedar is also a prolific seeder and, although the seed remains viable for only a few weeks, it is produced over a long period (March through October) relative to native riparian species. The seeds are minute and readily dispersed long distances by wind and water (DeLoach et al. 2000; Lovich 2000). Germination and establishment occur on open sites where soil moisture is high for a prolonged period. The operation of dams along the Colorado River results in stabilized low flows and regular summer flooding of river bars, providing ideal conditions for the establishment of saltcedar (Turner and Karpiscak 1980). Subsequent growth is extremely rapid and tends to preclude the establishment of native riparian species on such sites (Ohmart et al. 1988; Lovich 2000).

Saltcedar has replaced the native woody riparian associations along much of the river, particularly in areas where the native vegetation has been cleared or removed by fire (Brown 1994; Turner and Karpiscak 1980; Ohmart et al. 1988). Saltcedar is able to persist in highly saline soils that are not conducive to the establishment and growth of cottonwood and willow. Saltcedar's consumptive water use in the planning area ranges



Adapted from Anderson and Ohmart (1984).

00450.00-303

Figure 3-1
Examples of Woody Riparian Land Cover Structural Types

from 57.3 to 58.4 inches per year, as compared to a range of 56.2–57.4 inches per year for cottonwood-willow, 56.5–58.0 inches per year for mesquite, and 53.1–54.2 inches per year for arrowweed/atriplex (Bureau of Reclamation 2000b). Saltcedar takes up and excretes salts, increasing soil salinity, and it increases fire frequency by producing large amounts of litter (DeLoach et al. 2000).

The saltcedar land cover type is dominated by nearly monotypic stands of saltcedar that are less than 16-feet tall. Saltcedars comprise approximately 80–100 percent of the total trees in this category (Younker and Andersen 1986), and the cover may be continuous or open. Because of its pervasive nature, saltcedar is found interspersed within every other riparian land cover type. Patches of arrowweed as large as 5 acres may be included in saltcedar land cover areas (Younker and Andersen 1986) and the ground layer is typically sparse.

3.4.1.3 Honey Mesquite

Historically, honey mesquite land cover type occurred on the broad alluvial floodplains of the Colorado River, on secondary and higher terraces above the main channel. Honey mesquite, the dominant species in this association, is a facultative upland plant with the potential to occur in both upland and wetland areas (Reed 1988). It is also a facultative phreatophyte that has adapted to avoid water stress through several mechanisms, including a long taproot that is able to reach deep water tables (Nilsen et al. 1983; Ohmart et al. 1988). Riparian honey mesquite has high productivity, which results from several physiological and morphological adaptations that allow them to “decouple” from the normal limitations on water and nutrient resources in desert systems (Nilsen et al. 1983). Foremost, a deep root system allows mesquite to tap water sources unavailable to shallower rooted plants, while association with nitrogen-fixing symbionts releases mesquite from nitrogen limitation (Stromberg 1993a).

This species cannot tolerate even relatively short inundations during the growing season and, prior to river regulation by dams, became established on infrequently flooded terraces at some distance from the river. The acreage of honey mesquite has been decimated as these floodplain terraces have been converted to agriculture. Although regulation of the river has enabled honey mesquite to colonize areas that are closer to the river, it is vulnerable to replacement by saltcedar. Flooding, vegetation clearing between the levees, and increased fire frequency (promoted by saltcedar), can eliminate honey mesquite, which does not colonize or reestablish in open areas as readily as saltcedar (Minckley and Brown 1982; Ohmart et al. 1988).

Honey mesquite often forms monotypic stands of trees that are less than 30 feet in height. It can also grow interspersed with or as a mosaic with shrubby species, such as arrowweed, quail bush, fourwing saltbush, allscale, wolfberry, or inkweed, among others. Shrub associates are typically in openings in the canopy rather than forming a true understory. The coverage of honey mesquite is generally 90–100 percent of the total vegetation in the mapped area (Younker and Andersen 1986). The canopy can be continuous or open, and the ground layer is typically sparse or grassy.

3.4.1.4 Saltcedar–Honey Mesquite

As described above, honey mesquite often occurs in monotypic stands along the Colorado River or is present in a mosaic association with shrubby species. Representative examples of mixtures of saltcedar and honey mesquite occur at Cibola NWR and Fort Mohave Indian Reservation. In these areas, saltcedar is present as a dense understory layer and honey mesquite forms a well-developed, relatively open canopy layer (Ohmart et al. 1988).

Saltcedar dominates this land cover type; however, honey mesquite constitutes at least 10percent, but rarely more than 40 percent, of the total trees (Younker and Andersen 1986). The formation of saltcedar–honey mesquite stands reflects the ability of saltcedar to rapidly establish and become dominant in relatively open or senescent stands of mesquite. The greater vulnerability of mesquite to fires, floods, and increased salinity, coupled with the greater recruitment of saltcedar, indicates the gradual loss of honey mesquite and the replacement of the mixed association with a monoculture of saltcedar (Ohmart et al. 1988). Shrubby species, such as arrowweed or quail bush, or widely scattered individuals or clumps of screwbean mesquite may also be present, but unlike saltcedar, these native species do not establish in abundance as an understory of honey mesquite.

3.4.1.5 Saltcedar–Screwbean Mesquite

Although screwbean mesquite occurred historically along the LCR, it was relatively scarce (Ohmart et al. 1988) and restricted to older portions of the riverbed or backwater areas before stabilization or channelization of the river. As documented by Ohmart et al. (1988), after the closure of Parker Dam, from 1938–1960, screwbean mesquite experienced significant increases in cover downstream. Recruitment and growth of screwbean mesquite were evidently favored by the curtailment of spring flooding and the stabilization of summer low flows, while these changes in the hydrograph had the opposite effect on cottonwood-willow vegetation. Between 1960 and 1976, with the expansion of agriculture on Tribal lands and the loss of riparian vegetation within the floodplain, the total cover of screwbean mesquite decreased. In the years following 1976, screwbean mesquite has continued to decline, primarily because of replacement by saltcedar. The circumstances that favored the expansion of screwbean mesquite along the river are no longer operating, apparently because the open sites that would otherwise provide recruitment opportunities are now rapidly colonized and effectively preempted by saltcedar (Ohmart et al. 1988).

Within the LCR MSCP planning area, screwbean mesquite is always found in association with saltcedar. This association reflects the ongoing expansion of saltcedar and its displacement of screwbean mesquite along the LCR (Ohmart et al. 1988; DeLoach et al. 2000).

While the primary criterion for saltcedar–screwbean mesquite cover type is that screwbean mesquite constitutes at least 20 percent of the total trees in the category, much of the acreage is typically dominated by saltcedar (Younker and Andersen 1986). Widely

scattered clumps of individual cottonwood, willow, or honey mesquite trees may also be present.

3.4.1.6 Arrowweed

The arrowweed land cover type historically formed dense, monotypic, linear belts or small stands of vegetation along drier portions of the Colorado River floodplain, adjacent to stands of cottonwood-willow (Ohmart et al. 1988). It is still characterized by nearly monotypic stands of arrowweed within the riverine corridor. In addition to this location, it is found along canyon bottoms and irrigation ditches, around springs, and in washes with sandy or gravelly channels (Holland 1986; Brown 1994; Sawyer and Keeler-Wolf 1995).

Arrowweed reproduces both by seed and vegetatively. The seeds (achenes) are tiny (less than 0.04 inches) and have small bristles that facilitate their dispersal (McMinn 1939). Establishment from seed occurs on newly exposed, damp alluvial soils. Once established, arrowweed spreads laterally by underground rhizomes, forming continuous stands that tend to inhibit the establishment of other riparian species and remain dominant in the absence of disturbance. Arrowweed shoots withstand moderate flooding, and although they are unable to withstand strong scouring from floods, they recolonize open alluvial deposits readily by resprouting from roots and buried stems (Stromberg et al. 1991). Arrowweed survives at greater water table depths and tolerates greater soil salinities than Fremont cottonwood or Goodding's willow (Ohmart et al. 1988; Busch and Smith 1995). As a result, it has replaced cottonwood-willow vegetation in some areas that are subject to groundwater pumping (Holland 1986). However, it has been displaced by saltcedar in other areas (Turner and Karpiscak 1980).

3.4.1.7 Atriplex

This land cover type occurs locally in relatively undisturbed, saline portions of the LCR corridor. Spatially, it is often found between stands of cottonwood-willow or saltcedar and stands of mesquite (Ohmart et al. 1988; Brown 1994). This land cover type can include one or several atriplex species, including quail bush, fourwing saltbush, and allscale. Atriplex species compose 90–100 percent of the total vegetation in this category (Younker and Andersen 1986). This land cover type is typified by quail bush, which is a phreatophyte that is tied to the riparian corridor along the LCR. The other saltbush species are nonphreatophytic and, in the absence of quail bush, are better classified under desert scrub.

3.4.2 Marsh Land Cover Type

The marsh land cover type is classified into seven different types based primarily on the percent cover of cattail, bulrush, common reed, and open water (Younker and Anderson 1986) (Table 3-5). Marsh vegetation occurs in areas of prolonged inundation where long-term flooding persists. Historically, it was found along oxbow lakes and in backwater

areas. Today, it also occurs around relatively stable reservoirs that have minimal daily and annual fluctuations in water level (Ohmart et al. 1988, Brown 1994). The most common components of this association are cattail, bulrush or tule, and common reed (Ohmart et al. 1988). Cattails occur in shallow water up to 3 feet deep and are found on sloping, generally stable substrates. Bulrushes (particularly, *Scirpus californicus*) can grow adjacent to cattails but in deeper water. They are found in water as deep as 5 feet, and can extend as high as 10 feet above the water surface. Thick stands of bulrushes occur on unmodified banks. Common reed can also form dense stands along the banks (Ohmart et al. 1988; Brown 1994).

Table 3-5. Marsh Land Cover Types and Characteristics Used in Classification

Type	Characteristics
1	Nearly 100 percent cattail/bulrush; small amounts of *Phragmites australis* (common reed) and open water.
2	Nearly 75 percent cattail/bulrush; many trees and grasses interspersed throughout cover.
3	About 25–50 percent cattail/bulrush; some *Phragmites australis*, open water, trees, and grass.
4	About 35–50 percent cattail/bulrush; many trees and grasses interspersed throughout cover.
5	About 50–75 percent cattail/bulrush; few trees and grasses interspersed throughout cover.
6	Nearly 100 percent *Phragmites australis*; little open water.
7	Open marsh (75percent water) adjacent to sparse marsh vegetation; sandbars and mudflats visible when Colorado River is low.

Source: Anderson and Ohmart 1984b.

This land cover type consists primarily of cattail/bulrush associations, although stands of common reed are also included (Anderson and Ohmart 1984b). These marsh elements typically intermingle with riparian scrub species (e.g., saltcedar, arrowweed, quail bush, mesquite) at their upper-elevation limits (Brown 1994). Marsh includes open water, sandbars, and mudflats formed when the Colorado River is low (Salas et al. 1996).

3.4.3 Aquatic Land Cover Types

Aquatic land cover types encompass areas that typically contain open water part or most of the year. Three aquatic land cover types are recognized: river, reservoir, and backwater.

3.4.3.1 River

The river land cover type includes the mainstem of the LCR and tributaries, including natural and artificial (i.e., canals and drains) channels within the LCR MSCP planning area. The criterion for inclusion in this category is the presence of flowing water throughout the year or most of the year. The river land cover type includes channel type

(e.g., riffle, run, pool), cover (e.g., instream woody material, emergent and submerged vegetation), and substrate (e.g., sand, gravel, concrete lined).

During periods of overbank flooding, the river inundates parts of its floodplain and provides habitat values associated with inundated vegetation. Historically, substantial floodplain area was inundated by the high river flows following winter and summer storms and during the spring and early summer runoff (Minckley 1979). Under existing conditions, the river is constrained by reservoir operations, levees, and channelization, but higher flows during some seasons and years may inundate limited floodplain area. Flooded riparian areas provided temporary rearing habitat for fish and other aquatic species.

3.4.3.2 Reservoir

Storage reservoirs have substantial water storage as an operational element and include Lake Mead, Lake Mohave, Lake Havasu, and Senator Wash Reservoir. Diversion Reservoirs primarily provide stage control for gravity diversions and include the backwater pools at Headgate Rock Dam, Palo Verde Diversion Dam, Imperial Dam, Laguna Dam, and Morelos Diversion Dam.

3.4.3.3 Backwater

Backwaters more or less represent the open water elements of the pre-dam Colorado River channel and associated floodplain. Under existing conditions, backwaters include oxbow lakes, abandoned river channel pools, floodplain ponds and lakes, secondary river channel pools, and hydrologically isolated coves on reservoirs. Backwaters may be remnant features historically created by river processes or may be man-made. Backwaters may be permanent or temporary, drying completely during some seasons or years. Connections with the river may be open or in various degrees of closure, connected to the river by culverts, weirs, porous dikes, and groundwater. They can vary in size from less than 1 acre to more than 100 acres.

3.4.4 Adjacent Land Cover Types

Land cover types adjacent to riparian and aquatic land cover types in the LCR MSCP planning area include desert scrub, agricultural, and developed.

3.4.4.1 Desert Scrub

The desert scrub land cover type encompasses a variety of plant communities that can be distinguished on the basis of dominant species or combinations of species (e.g., creosote-bursage), as well as different microhabitats (e.g., desert wash woodland). Except for agricultural and developed areas (see below), the river channel and floodplain in the planning area are surrounded by desert scrub.

3.4.4.2 Agriculture

The agriculture land cover type includes both fallow and actively cultivated areas. Agricultural lands are concentrated in several wide, low-lying valleys along the LCR.

3.4.4.3 Developed

This land cover type includes urbanized areas and areas that have been graded or otherwise altered with the effect that they are not expected to support any natural vegetation other than ornamental and ruderal species. In addition to cities and towns, this category includes rural residences and buildings, campgrounds, golf courses, and parks and other landscaped areas. The most extensive areas of developed land in or near the LCR MSCP planning area include Laughlin, Bullhead City, Needles, Lake Havasu City, Parker and the Parker Strip, Blythe, and Yuma.

3.4.5 GIS Land Cover Database

The land cover geographic information systems (GIS) database was developed to provide a complete coverage of the entire LCR MSCP planning area. This database was used to identify the existing extent and distribution of land cover types in the LCR MSCP planning area. Habitat models for covered species were developed and applied to the land cover GIS database to estimate the extent and distribution of habitat for each covered species for which these data were suitable (Section 3.5.1.1, “Species Habitat Models”). With the exception of backwaters, all of the land cover types listed above are delineated in the GIS database. The backwaters land cover type is not delineated separately in the GIS database; rather, it is encompassed within the river and marsh land cover types.

The land cover GIS database was assembled using several previously developed GIS databases:

- Reclamation’s GIS database of land cover types within the riparian corridor of the LCR (Bureau of Reclamation 1997, supplemented in 2002),
- BIA’s database of land cover types on potentially irrigated reservation lands (Bureau of Indian Affairs 2001),
- Lower Colorado River Accounting System (LCRAS) GIS database of irrigated agricultural lands (Bureau of Reclamation 2001a), and
- LCRAS phreatophyte inventory (Bureau of Reclamation 2001b).

The dates and precision of the mapping efforts described above are presented in Table 3-6. The extent of mapping is the LCR MSCP planning area. Because there is overlap among the databases used to develop the LCR MSCP planning area land cover map and because the databases are of differing resolution and accuracy, the LCR land cover GIS database was created by applying priority levels to these databases. The databases were applied in the following priority order:

- 1st Priority—BIA database (it has the highest level of accuracy for potentially irrigated reservation lands but makes up only 4 percent of the GIS database),
- 2nd Priority—LCRAS irrigated lands database (it has the highest level of accuracy for irrigated agricultural lands in the LCR MSCP planning area and makes up 37 percent of the GIS database; however, it has a lower level of accuracy than the BIA database for potentially irrigated reservation lands),
- 3rd Priority—Reclamation database (it has a lower level of accuracy than the BIA database for potentially irrigated reservation lands and the LCRAS irrigated lands database for irrigated agricultural lands but has the greatest extent of coverage, making up 55 percent of the GIS database), and
- 4th Priority—LCRAS phreatophyte database (it has the lowest level of resolution but covers some areas that the other databases do not; it makes up 4 percent of the GIS database).

Table 3-6. Date and Precision of GIS Databases Used to Prepare and Assemble the LCR MSCP Land Cover Type GIS Database and Map

GIS Database	Date of Imagery Mapped	Scale of Imagery	Minimum Mapped Unit (acres)
Bureau of Reclamation	1997	1:24,000	1
Bureau of Indian Affairs	1997–2001	1:24,000	1
Lower Colorado River Accounting System (irrigated lands)	2001	1:24,000	1
Lower Colorado River Accounting System (phreatophyte inventory)	2001	1:24,000	2.5

GIS = geographic information systems.

The distribution of land cover types in the LCR MSCP planning area by river reach is presented on Figures 3-2–3-8. The land cover GIS database contains a greater level of classification detail than is presented on these map figures. These maps combine several land cover types (Table 3-7) and do not include woody riparian land cover structural type categories or marsh land cover subtypes. Table 3-8 presents the extent of each land cover type by river reach, including the extent of cottonwood-willow, marsh, saltcedar, and mesquite land cover types by structure class. The extent of land cover type by reach and landowner is presented in Appendix H.

Table 3-7. Land Cover Type Legend for Figures 3-2 through 3-8

Figure Land Cover Category	LCR MSCP Land Cover Types
Cottonwood-willow	Cottonwood-willow
Saltcedar	Saltcedar, saltcedar–screwbean mesquite, saltcedar–honey mesquite
Marsh	Marsh
Other riparian	Arrowweed, atriplex, honey mesquite, undetermined riparian (from LCRAS phreatophyte database)
Open water[a]	River Reservoir
Desert scrub	Desert scrub
Agriculture	Agricultural
Developed	Developed

[a] The backwater land cover type is not included in figures.

LCRAS = Lower Colorado River Accounting System.

3.5 Status of Covered and Evaluation Species Habitats in the LCR MSCP Planning Area

As described in Chapter 1, "Introduction," the MSCP HCP addresses 27 covered species for which incidental take authorization for implementing the covered activities described in Chapter 2, "Description of Covered Activities," is sought under section 10(a)(1)(B) of the ESA. In addition, the MSCP HCP addresses four evaluation species for which coverage under the section 10(a)(1)(B) permit could be proposed in future years (Table 1-2). Detailed descriptions of the ecological requirements and status of covered species are provided in Appendix I.

The LCR MSCP HCP uses a habitat-based approach for compliance with section 10(a)(1)(B) of the ESA. To implement this approach, habitat models were developed for applicable covered species, and the results of the application of these models were used in the assessment of impacts and development of the LCR MSCP Conservation Plan. This section defines habitat for each of the covered and evaluation species and describes the extent of existing habitat in the LCR MSCP planning area for species for which such information is available.

3.5.1 Covered and Evaluation Species Habitats

Based on the best available information about the known or potential distribution of covered and evaluation species habitat in the LCR MSCP planning area, species habitats are defined either by:

Table 3-8. Extent of Land Cover Type by River Reach

	Extent of Land Cover Type by River Reach (acres)[b]							
Land Cover Type[a]	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Total
Cottonwood-willow I	617	1	677	47	66	219	67	1,693
Cottonwood-willow II	32	0	13	25	2	7	1	81
Cottonwood-willow III	518	0	722	414	465	570	284	2,974
Cottonwood-willow IV	507	0	61	297	63	428	147	1,503
Cottonwood-willow V	46	0	42	31	3	61	127	309
Cottonwood-willow VI	2	0	26	75	16	40	49	209
Total cottonwood-willow	**1,721**	**1**	**1,541**	**889**	**616**	**1,325**	**675**	**6,768**
Saltcedar I	0	0	286	7	23	35	3	355
Saltcedar II	0	0	3	3	0	10	0	15
Saltcedar III	1,179	57	106	402	174	101	7	2,026
Saltcedar IV	680	626	8,122	14,821	4,530	4,455	898	34,132
Saltcedar V	304	144	4,172	8,358	500	915	999	15,392
Saltcedar VI	91	11	959	3,332	354	741	892	6,380
Total saltcedar	**2,254**	**838**	**13,647**	**26,923**	**5,581**	**6,257**	**2,800**	**58,300**
Honey mesquite III	0	0	0	689	0	1	0	690
Honey mesquite IV	0	4	545	4,815	148	4	0	5,517
Honey mesquite V	0	0	81	873	26	0	0	980
Honey mesquite VI	0	0	0	66	0	0	0	66
Total honey mesquite	**0**	**4**	**627**	**6,443**	**175**	**5**	**0**	**7,253**

Table 3-8. Continued

Land Cover Type[a]	Extent of Land Cover Type by River Reach (acres)[b]							
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Total
Saltcedar–honey mesquite III	3	3	400	81	41	22	2	553
Saltcedar–honey mesquite IV	10	356	1,278	8,169	725	128	0	10,667
Saltcedar–honey mesquite V	5	0	1,431	4,580	11	83	0	6,110
Saltcedar–honey mesquite V	40	0	354	568	0	1	0	963
Total saltcedar–honey mesquite	**58**	**359**	**3,463**	**13,398**	**778**	**234**	**2**	**18,293**
Saltcedar–screwbean mesquite I	0	0	0	10	0	0	0	10
Saltcedar–screwbean mesquite III	0	0	271	333	24	49	0	677
Saltcedar–screwbean mesquite IV	0	28	3,769	3,210	488	691	49	8,235
Saltcedar–screwbean mesquite V	0	4	625	896	67	25	0	1,617
Saltcedar–screwbean mesquite VI	0	0	393	204	0	21	0	619
Total saltcedar–screwbean mesquite	**0**	**32**	**5,058**	**4,654**	**579**	**786**	**49**	**11,159**
Arrowweed	0	0	496	6,541	48	1,069	48	8,201
Atriplex	0	0	19	582	0	177	121	899
Marsh 1	14	0	2,188	541	1,010	490	3	4,246
Marsh 2	0	0	235	116	289	11	0	651
Marsh 3	24	0	205	710	1,419	538	6	2,902
Marsh 4	15	0	1,013	464	496	90	6	2,084
Marsh 5	74	0	484	66	206	9	0	839
Marsh 6	0	0	101	29	315	146	15	606
Marsh 7	10	22	116	102	26	75	99	450
Unspecified marsh	0	0	18	62	0	56	0	136
Total marsh	**137**	**22**	**4,358**	**2,091**	**3,762**	**1,414**	**129**	**11,914**

Land Cover Type[a]	Extent of Land Cover Type by River Reach (acres)[b]							
	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Total
River[c]	660	1	5,764	6,918	2,797	887	140	17,167
Reservoir[c]	155,916	27,357	17,981	1,226	1,837	615	9	204,942
Desert scrub	353	31	7,676	11,710	397	3,151	129	23,447
Agriculture	0	0	19,166	169,664	260	36,799	44,705	270,594
Developed	1	0	6,391	32,722	0	10,205	14,307	63,626
Undetermined riparian[d]	0	0	6,634	6,268	0	2,337	13	15,252
Total	**161,100**	**28,645**	**92,820**	**290,029**	**16,831**	**65,262**	**63,127**	**717,814**

Note: Columns and rows may not total correctly because numbers were totaled, then rounded.

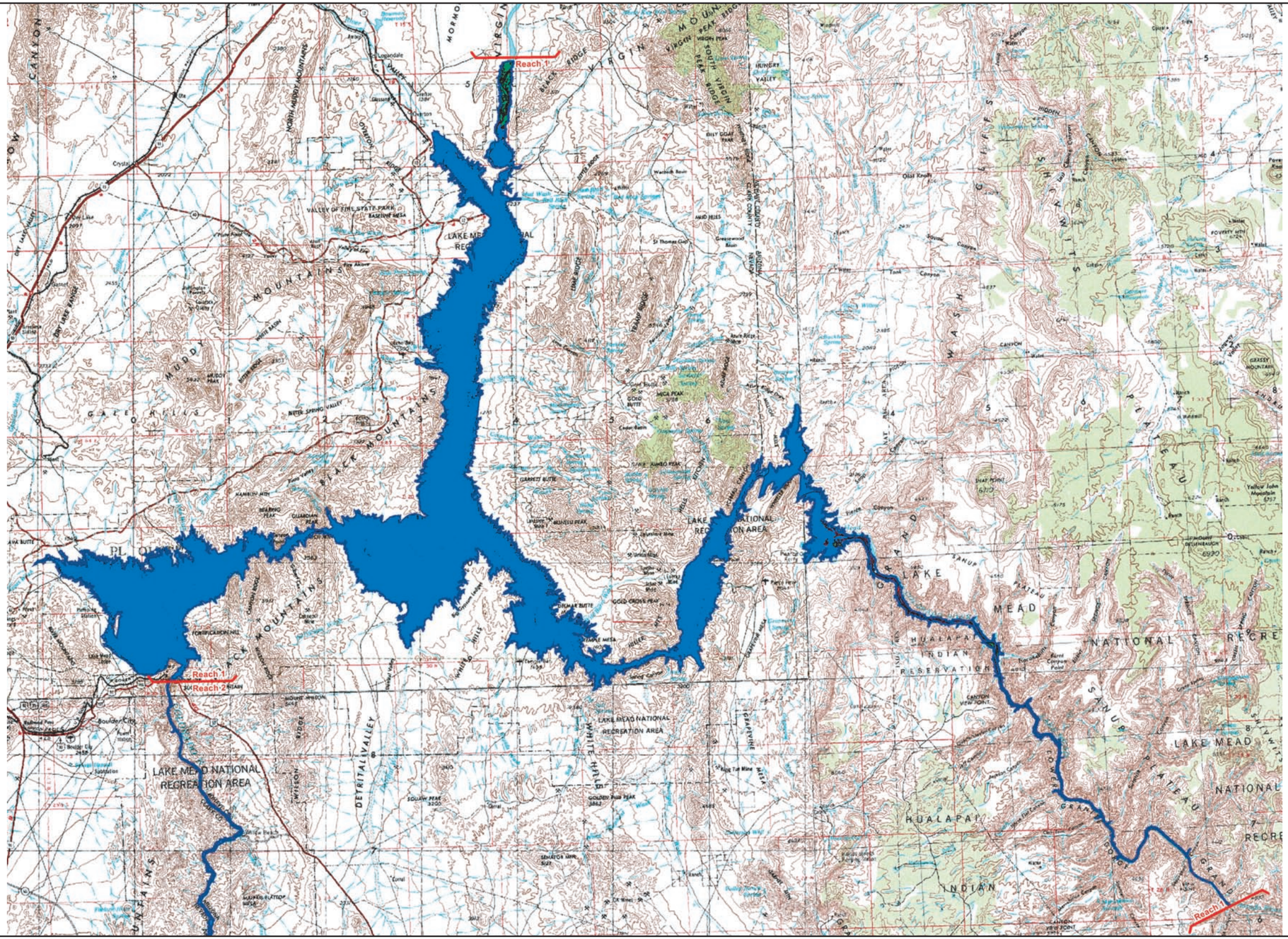
Sources:

[a] The extent of all land cover types, except undetermined riparian and unspecified marsh, are from Bureau of Reclamation 1997 (supplemented in 2002); the extent of all land cover types except river, reservoir, marsh, and undetermined riparian are from Bureau of Indian Affairs 2001; the extent of reservoir, marsh, cottonwood-willow, undetermined riparian and desert scrub are from the Lower Colorado River Accounting System (LCRAS) phreatophyte database (Bureau of Reclamation 2001a); and agriculture is from the LCRAS phreatophyte and irrigated lands databases (Bureau of Reclamation 2001b).

[b] Reach 1 data are from Bureau of Reclamation 1997 (supplemented in 2002) data only. Reach 2 data are from Bureau of Reclamation 1997 (supplemented in 2002) and the Lower Colorado River Accounting System phreatophyte database (Bureau of Reclamation 2001b) data only.

[c] The acreages shown for the river and reservoir land cover types include the backwater land cover type. The backwater land cover type is not included as a separate land cover type in the LCR MSCP GIS database.

[d] The *undetermined riparian* land cover type are riparian land cover types described in the LCRAS phreatophyte database that cannot be correlated to the LCR MSCP land cover types. The LCRAS riparian land cover types included in this table as *undetermined riparian* are saltcedar-low, saltcedar-high, mesquite-low, mesquite-high, saltcedar-mesquite, saltcedar-arrowweed, low vegetation, mesquite-arrowweed, and saltcedar-mesquite-arrowweed. Because *undetermined riparian* cannot be correlated to the LCR MSCP land cover types, they are not included in the species habitat models described in Section 3.5.1.1. The analysis of the impacts of covered activities in Chapter 4, however, indicates that mapped patches of *undetermined riparian* land cover will not be affected be affected by flow- or non-flow-related covered activities. Consequently, the inclusion of this land cover type category does not affect the analysis of the impacts of covered activities on covered species habitats presented in Chapter 4.

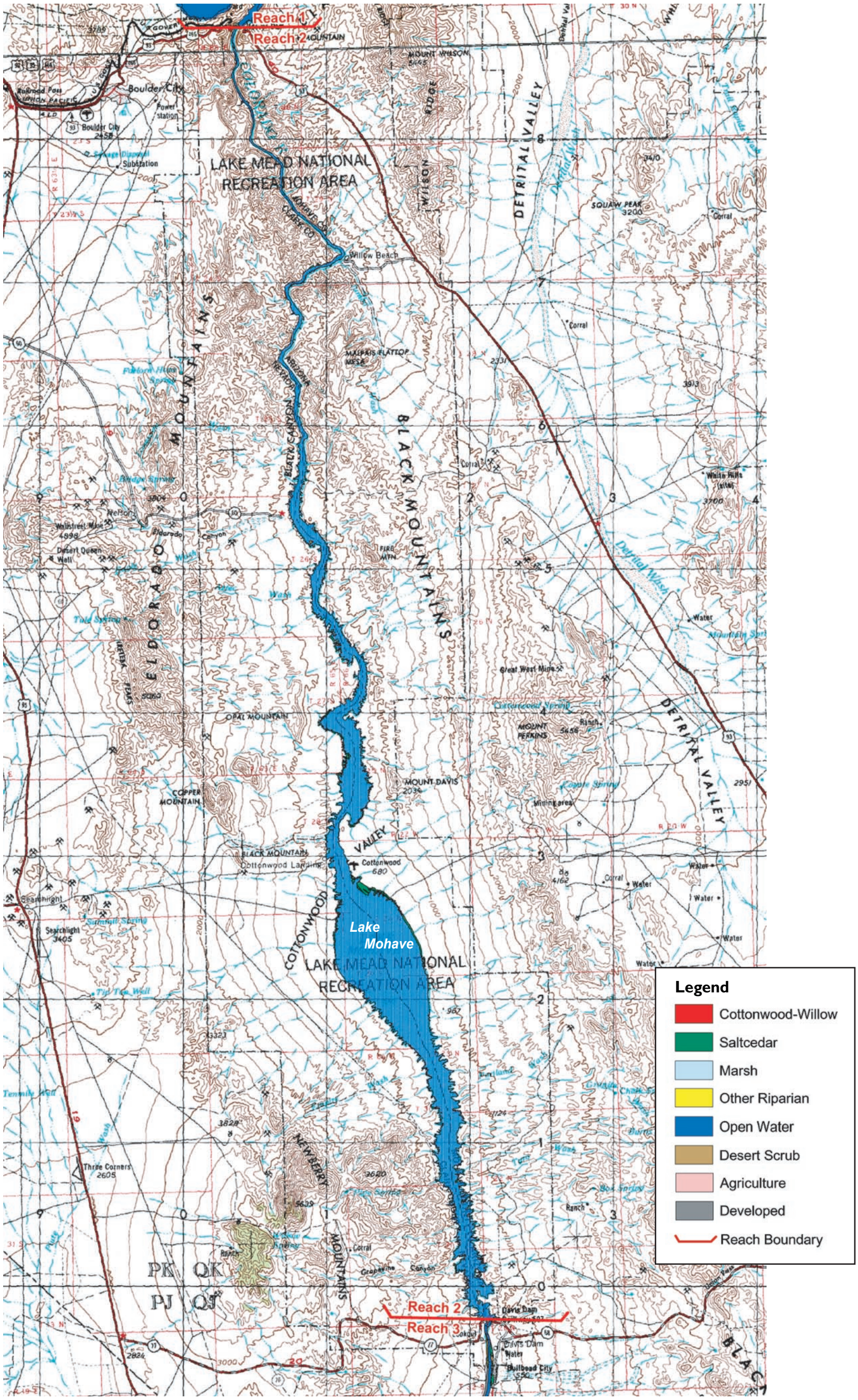


0 2 4 6 8
Miles

N

Figure 3-2
Land Cover Types in Reach 1

00450.00-303

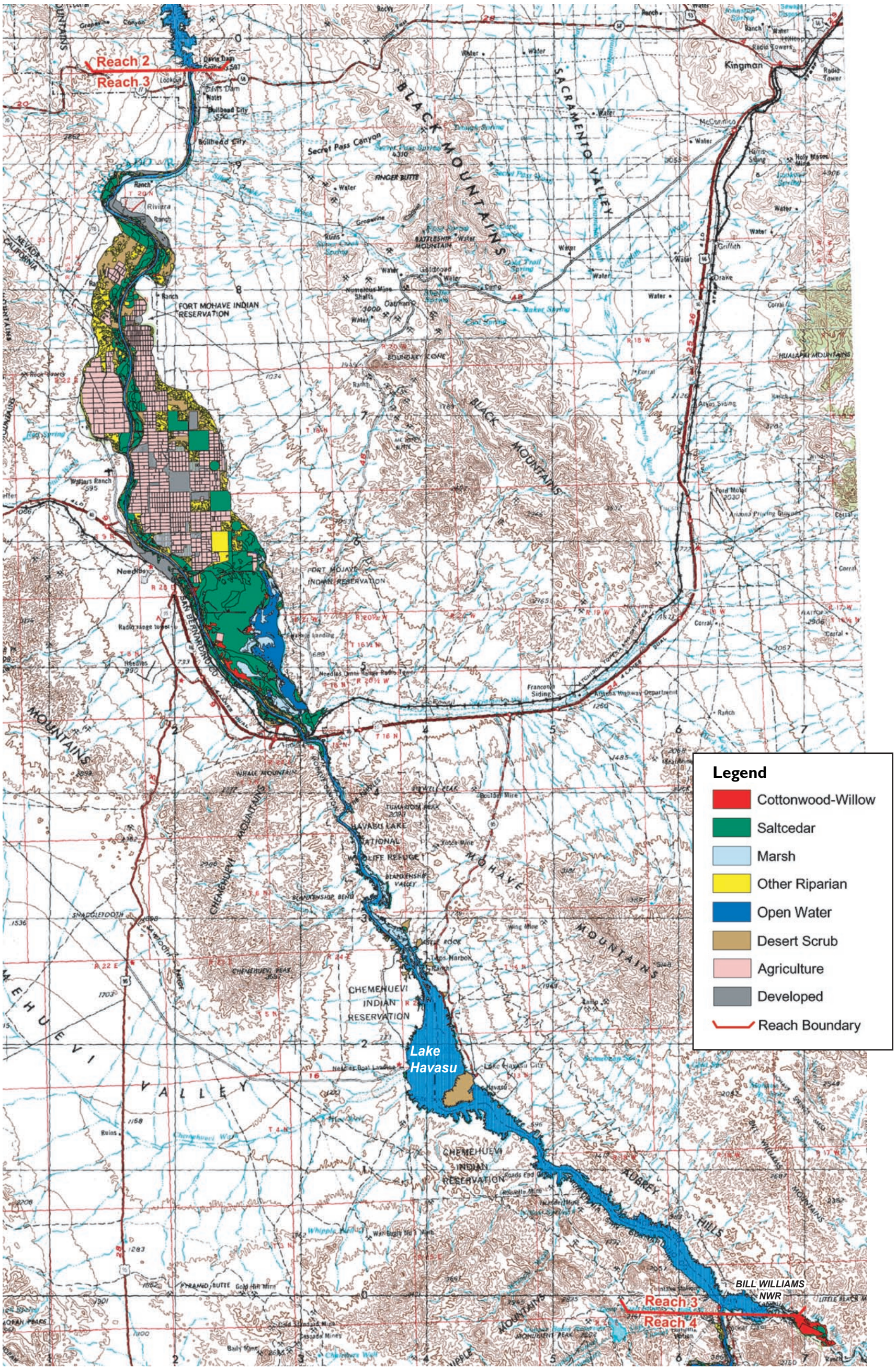


0 2 4 6 8
Miles

N

Figure 3-3
Land Cover Types in Reach 2

00450.00-303

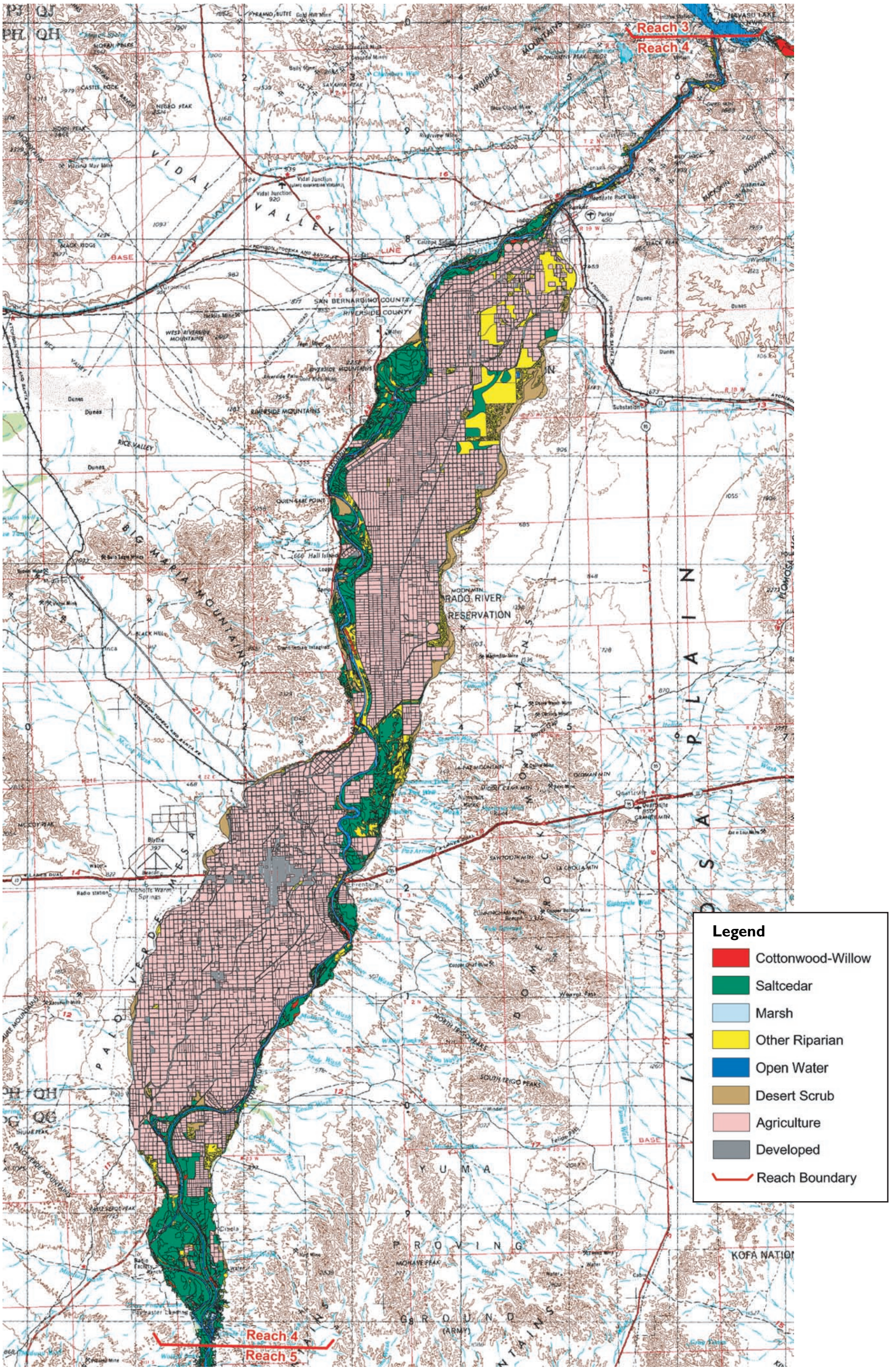


0 2.5 45 7.5 10
Miles

N

Figure 3-4
Land Cover Types in Reach 3

00450.00-303



0 3 6 9 12
Miles

N

Figure 3-5
Land Cover Types in Reach 4

00450.00-303

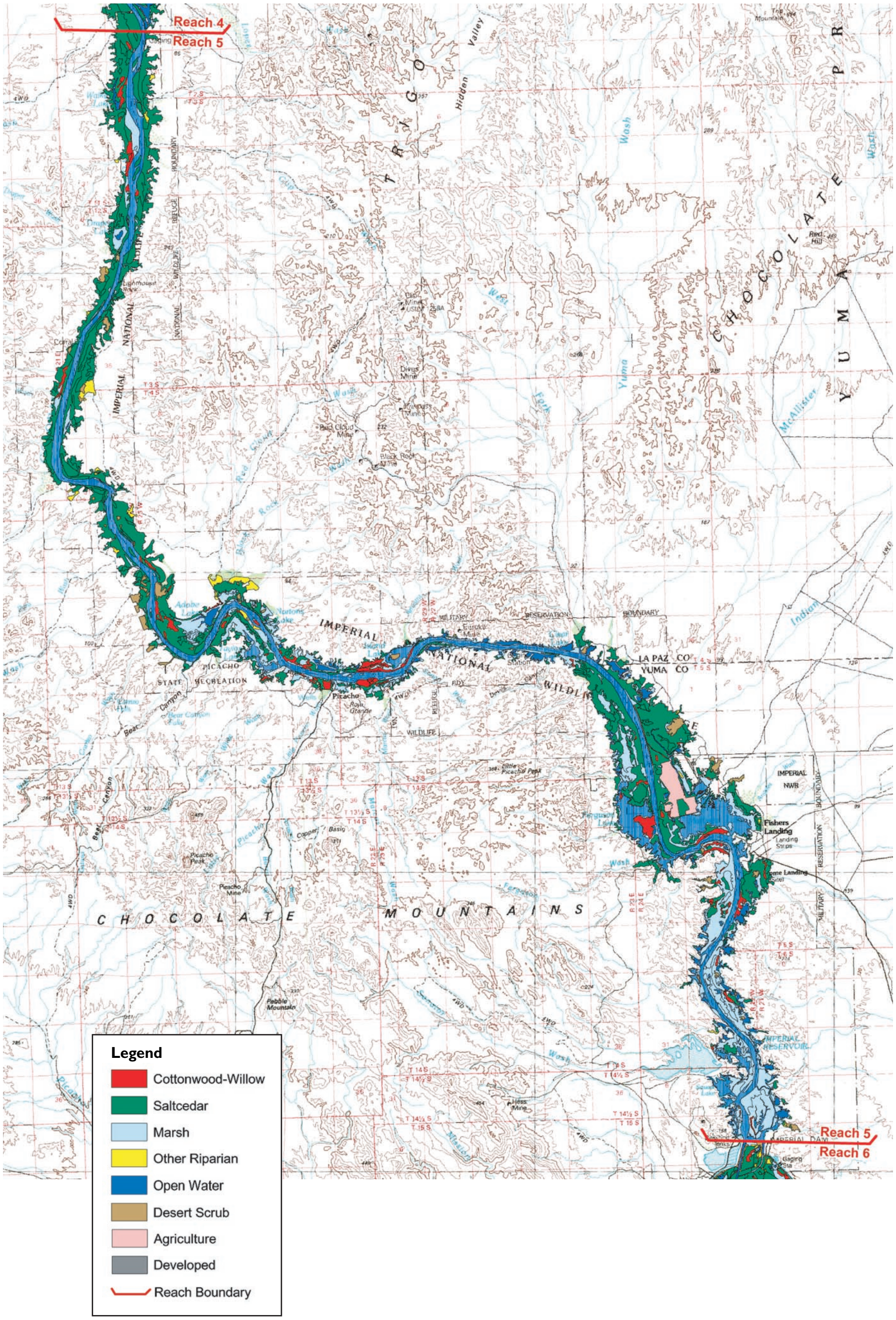
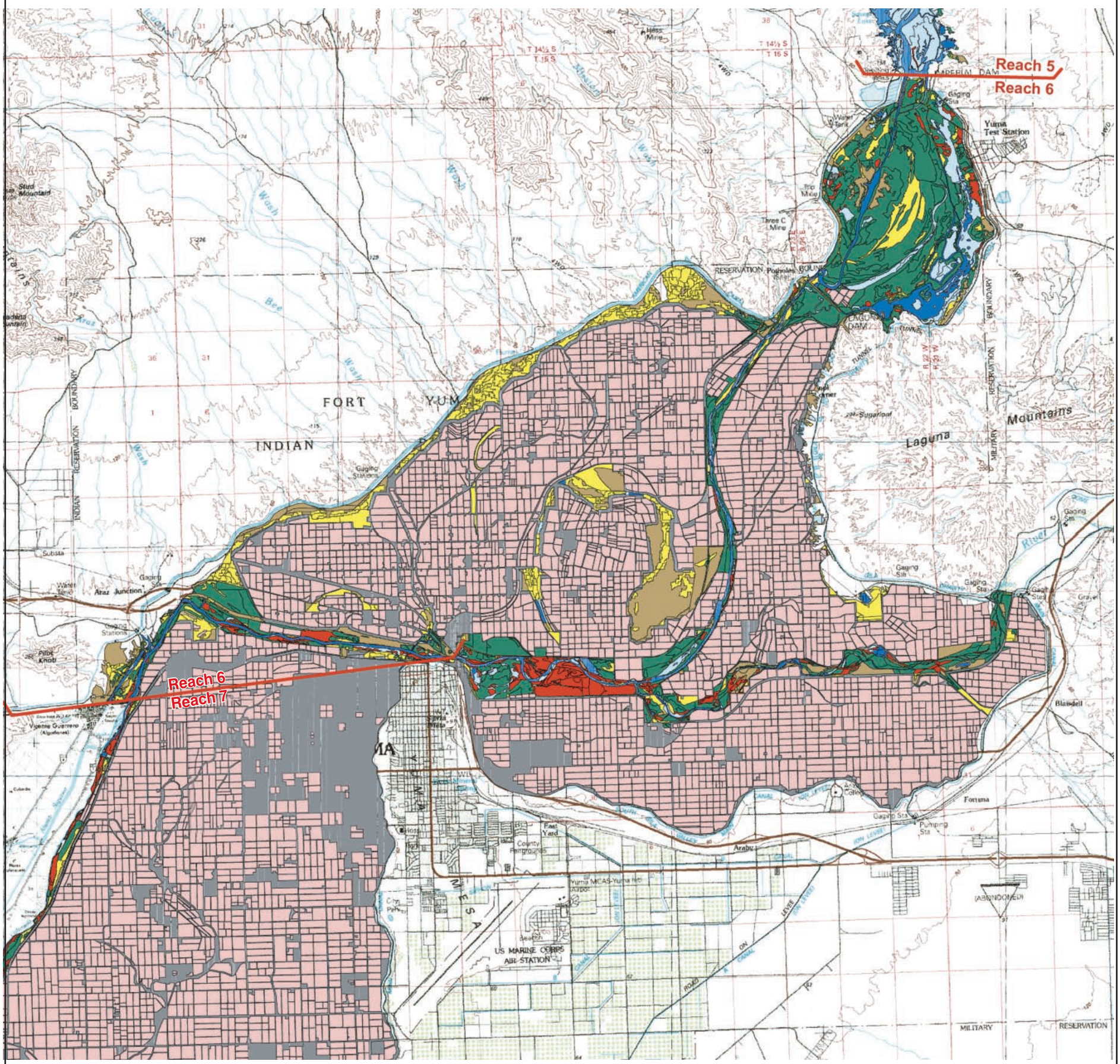


Figure 3-6
Land Cover Types in Reach 5

00450.00-303



Legend

- Cottonwood-Willow
- Saltcedar
- Marsh
- Other Riparian
- Open Water
- Desert Scrub
- Agriculture
- Developed
- Reach Boundary

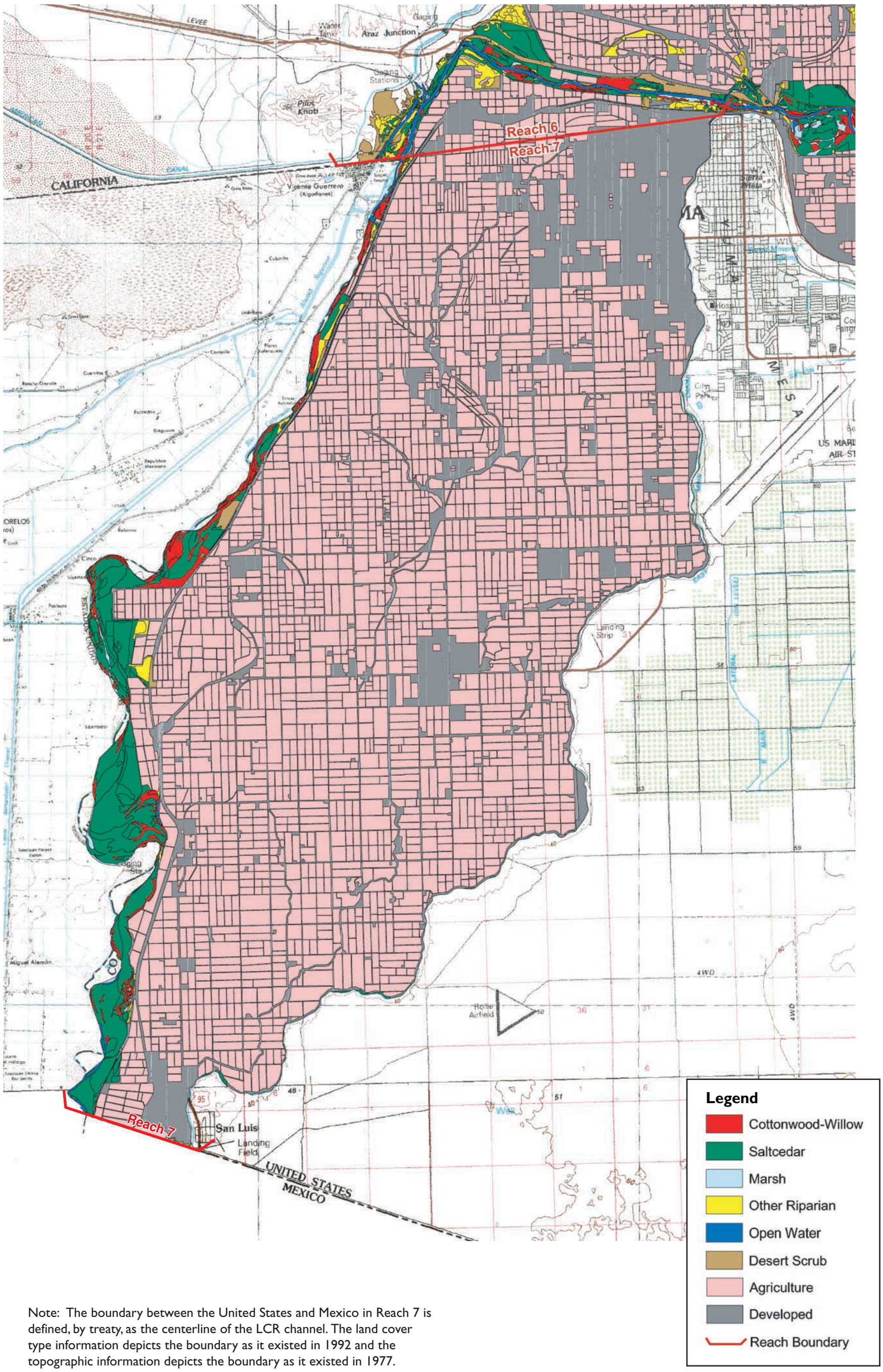
Lower Colorado River Multi-Species Conservation Program

0 1 2 3 4
Miles

N

Figure 3-7
Land Cover Types in Reach 6

00450.00-303



Note: The boundary between the United States and Mexico in Reach 7 is defined, by treaty, as the centerline of the LCR channel. The land cover type information depicts the boundary as it existed in 1992 and the topographic information depicts the boundary as it existed in 1977.

Lower Colorado River Multi-Species Conservation Program

0 1 2 3 4
Miles

N

Figure 3-8
Land Cover Types in Reach 7

00450.00-303 (9/04)

- application of species habitat models based on the likelihood for each land cover type to support a species habitat (22 species),
- delineation of actual habitat within the LCR MSCP planning area (one species), or
- known occurrences and habitat requirements for species whose habitats cannot be reasonably correlated to land cover types (eight species).

3.5.1.1 Species Habitat Models

With the exception of the southwestern willow flycatcher, covered species habitats have not been directly field delineated in the LCR MSCP planning area. To prepare the LCR MSCP HCP, habitat models have been developed for 22 covered species whose habitats can reasonably be correlated to the physical and biological attributes associated with each of the LCR MSCP land cover types. Habitat models are based on the land cover types described in Section 3.4, "Land Cover Types Used for Species Habitat Models," and that were used to construct the LCR MSCP GIS land cover database.

The models define habitat for each covered species as the LCR MSCP land cover types that would be most likely to encompass the elements of each covered species' habitat (Appendix I, "Status of LCR MSCP Covered Species") within the river reaches where each species is known or expected to occur based on known habitat requirements for the species. For each species, the existing distribution of habitat, assessment of impacts on covered species habitat, and assessment of expected outcomes of implementing the covered activities with LCR MSCP conservation measures is based on application of these models. Species habitat models are presented in Table 3-9. The calculated extent of existing habitat for each species by land cover type and by river reach in the LCR MSCP planning area is presented in Tables 3-10 and 3-11, respectively. Recent occurrences of these species in the LCR MSCP planning area are presented on Figures 3-9a–d; critical habitat and occurrence of razorback sucker and bonytail are presented on Figure 3-10a and 3-10b.

To construct the species habitat models, biologists identified the basic components of habitat for each species from a literature review. The habitat models are based only on the components of each covered species habitat that are related to vegetation communities (e.g., dominant plant species, canopy height). Only those vegetation communities clearly identified as providing frequently used relatively high quality habitat for a species are included in that species habitat model; however, it was recognized that other vegetation communities might be used by the species at a lesser frequency. The LCR MSCP land cover types that included the vegetation communities identified as providing high quality habitat for a covered species were assumed to provide habitat for that species. These models were the subject of the independent peer review process, and were determined suitable for use in the impact analysis and development of conservation measures (see Chapter 10). The extent of existing habitat in the LCR MSCP planning area for a covered species was determined by summing the extent of land cover types that provide habitat for a species in each of the reaches where the species is known or expected to occur based on known habitat requirements for the species.

Because these habitat models only consider the components of covered species habitats that are related to the general physical and biological attributes of vegetation communities, application of these habitat models overestimates the extent of habitat present in the LCR MSCP planning area. For example, mature cottonwood-willow forests provide habitat for the yellow-billed cuckoo and it is assumed that all patches of cottonwood-willow types I–III provide habitat. Consequently, even though as few as 10 percent of the trees present in patches of cottonwood-willow types I–III (see Table 3-3) may be cottonwood or willow (the remainder of the trees typically being saltcedar), all patches of cottonwood-willow types I–III are assumed to provide habitat for the yellow-billed cuckoo.

3.5.1.2 Southwestern Willow Flycatcher

The LCR MSCP HCP defines the extent of existing southwestern willow flycatcher habitat based on field survey delineation of its habitat in the LCR MSCP planning area and not on a habitat model. Prior to an observation of a juvenile southwestern willow flycatcher at the Havasu NWR in 1995, the southwestern willow flycatcher was believed to have been extirpated as a breeding species from the LCR MSCP planning area. As a result of that observation, in 1996 Reclamation initiated and continues to conduct extensive annual surveys for the southwestern willow flycatcher in the LCR MSCP planning area (Gould pers. comm.). The surveys were designed to collect information necessary to:

- determine whether populations are present along the LCR and its tributaries,
- determine breeding status,
- determine the suitability of habitats in the survey area,
- identify the relationships among habitat features and fitness components for the species, and
- determine the status and distribution of the species along the LCR (McKernan and Braden 2002).

Results of information collected on surveys has substantially increased the understanding of the:

- status and distribution of the southwestern willow flycatcher in the LCR MSCP planning area;
- the physical and biological components that compose nesting habitat;
- timing of egg laying, nestling development, fledging, and other life history information;
- factors influencing production of young, including causes and effects of nest parasitism by brown-headed cowbirds and predation;
- survival of adult and juvenile birds; and
- adult and juvenile dispersal patterns.

Table 3-9. LCR MSCP Habitat Models for Selected Species

Covered Species	Assumed Distribution by River Reach[a, b]							Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
	1	2	3	4	5	6	7		
Selected Threatened and Endangered Species									
Yuma clapper rail	X		X	X	X	X	X	Associated primarily with freshwater marshes with water no more than 12 inches deep, unless mats of floating vegetation are present; the highest densities occur in mature stands of dense to moderately dense cattails and bulrushes.	Marsh types 1–7 provide habitat.
Desert tortoise (Mojave population)	X	X	X	X	X	X		Occupies arid lands, typically in association with creosote bush scrub.	Desert scrub provides habitat.
Bonytail		X	X	X[d]	X[d]			In the LCR MSCP planning area, limited to the river reach from Davis Dam to Lake Havasu and artificial impoundments such as ponds and reservoirs.	Reservoir, river, and backwaters provide habitat.
Razorback sucker	X	X	X	X	X			In the LCR MSCP planning area, found in the LCR channel, connected backwaters, and artificial impoundments, such as ponds and reservoirs.	Reservoir, river, and backwaters provide habitat.
Selected Other Covered Species									
Western red bat	X	X	X	X	X	X	X	Occupies riparian and wooded areas, including riparian woodland vegetation consisting of sycamores and cottonwoods; typically roosts in foliage of trees, shrubs, and herbs.	Cottonwood-willow types I and II and honey mesquite type III provide roosting habitat. All land cover types, except developed, are assumed to produce insect prey species and thus provide foraging habitat.
Western yellow bat	X	X	X	X	X	X	X	Known primarily from areas with palm trees, and is known to roost in palm trees; also found in riparian deciduous forests and woodlands and in urban areas with palms in landscaping.	Cottonwood-willow types I and II and honey mesquite type III provide roosting habitat. All land cover types, except developed, are assumed to produce insect prey species and thus provide foraging habitat.
Colorado River cotton rat			X	X				Occupies narrow band of mesic vegetation along the banks of the Colorado River; most often trapped successfully in areas dominated by common reed; has been found in association with irrigated croplands in some areas.	Marsh types 1–7 provide habitat[e].

Covered Species	Assumed Distribution by River Reach[a, b]							Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
	1	2	3	4	5	6	7		
Yuma hispid cotton rat						X	X	Occupies moist, grassy habitats where the rats cut runways through the grass.	Cottonwood-willow provides habitat; all structural types of cottonwood-willow are assumed to support herbaceous understory used by this species; herbaceous understory vegetation is assumed to be either too sparse or soil conditions too dry to support species habitat in other riparian land cover types.
Western least bittern	X		X	X	X	X	X	Usually found in densely vegetated freshwater marshes; in the LCR MSCP planning area, the largest breeding populations are found in extensive cattail and bulrush marshes (e.g., Topock Marsh); smaller populations are found throughout the valley at a variety of marshy areas, including ponds and agricultural canals (Rosenberg et al. 1991).	Marsh types 1–7 provide habitat.
California black rail			X	X	X	X		In the LCR MSCP planning area, typically associated with marsh edges with water less than 1 inch deep and dominated by California bulrush and three-square bulrush.	Marsh types 1–7 provide habitat.
Yellow-billed cuckoo	X		X	X	X	X	X	Typically associated with large patches of mature cottonwood-willow forest.	Cottonwood-willow types I–III provides breeding and migration habitat.
Elf owl			X	X	X			Inhabits saguaro deserts, wooded canyons, and riparian forests; in the LCR Valley, inhabits cottonwood-willow stands and tall mesquite groves with remnant cottonwood or willow snags.	Cottonwood-willow types I and II and honey mesquite type III, provide habitat.
Gilded flicker			X	X	X	X	X	Occupies saguaro deserts, mature cottonwood-willow riparian forests, and occasionally mesquite groves with tall snags (during the breeding season).	Cottonwood-willow types I–III provides habitat.
Gila woodpecker			X	X	X	X		Closely associated with saguaros or large trees used for nesting; in California, found primarily in mature riparian forests, although mesquite stands, orchards, and tall cultivated trees may be used for nesting; riparian trees in isolated patches smaller than 49 acres do not support this species.	Cottonwood-willow types I–V in patches of at least 49 acres, provides habitat.

Covered Species	Assumed Distribution by River Reach[a, b]							Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
	1	2	3	4	5	6	7		
Vermilion flycatcher	X	X	X	X	X	X	X	Along the LCR, usually nests in groves of cottonwood-willow bordered by honey mesquite, open water, and pastures.	Cottonwood-willow types I–V and honey mesquite type III provide habitat
Arizona Bell's vireo	X	X	X	X	X	X	X	At low elevations, largely associated with early successional cottonwood-willow stands and honey mesquite bosques.	Cottonwood-willow types III and IV and honey mesquite types III and IV provide habitat.
Sonoran yellow warbler	X	X	X	X	X	X	X	The yellow warbler is a nesting habitat generalist in mesic second-growth woodland, gardens, and scrubland; along the LCR, formerly nested in cottonwood-willow land cover ranging from gallery forests to early successional scrublands; saltcedar extensively used as a nest substrate plant and as nesting habitat along the Colorado River in the Grand Canyon and at upper Lake Mead; in the LCR MSCP planning area, use of saltcedar as nesting habitat is closely correlated with the presence of open water or moist soil conditions (McKernan and Braden 2002).	Cottonwood-willow types I–IV and saltcedar, saltcedar-honey mesquite, saltcedar-screwbean mesquite, and cottonwood-willow type V and VI components of delineated southwestern willow flycatcher nesting habitat, and unoccupied southwestern willow flycatcher habitat.
Summer tanager	X		X	X	X	X	X	The summer tanager is one of the most characteristic species of cottonwood-willow forests; summer tanagers are also attracted to stands of athel saltcedar along the Colorado River.	Cottonwood-willow types I and II provides habitat.
Flannelmouth sucker			X					Flannelmouth sucker is a riverine species that uses backwaters for juvenile rearing and main channel habitats for spawning and adult rearing.	River and backwaters provide habitat.
MacNeill's sootywing skipper	X	X	X	X				Occupies areas that support dense patches of quailbush (its larval host plant) and other plants that can be used as nectar sources by the adults; adults are obligatory nectar feeders and will fly up to 850 feet away from the host plant to find suitable nectar sources; on the Bill Williams River, adults have been reported to use honey mesquite; other plants used by adults include saltcedar, alfalfa, heliotrope, and sweet bush.	All adjoining patches of atriplex and honey mesquite land cover, extending to 850 feet on each side of the interface of the patches, provide habitat.

Covered Species	Assumed Distribution by River Reach[a, b]							Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
	1	2	3	4	5	6	7		
Selected Evaluation Species									
California leaf-nosed bat	X	X	X	X	X	X	X	Occupies low-elevation habitats, such as desert scrub, alkali scrub, desert washes, riparian associations, and palm oases. Roosting habitat includes caves, tunnels, and other physical structures.	All land cover types, except developed, within 5 miles of roost sites (the known foraging flight distance from roosts [Brown pers. comm.]) are assumed to produce insect prey species and thus provide foraging habitat.
Pale Townsend's big-eared bat	X	X	X	X	X	X	X	Most commonly associated with Mohave mixed scrub (e.g., sagebrush, sagebrush-grassland, blackbrush, creosote-bursage) and lowland riparian communities. Roosting habitat includes caves, tunnels, and other physical structures.	All land cover types, except developed, within 10 miles of roost sites (the known foraging flight distance from roosts [Brown pers. comm.]) are assumed to produce insect prey species and thus provide foraging habitat.

Notes:

X = Species is known or expected to be present in the river reach based on known habitat requirements for the species.

[a] From information presented in Appendix I, "Status of LCR MSCP Covered Species."

[b] River reach locations are shown in Figure 1-1 and described in Chapter 1, "Introduction."

[c] Land cover types are described in Section 3.4. Riparian land cover structural types are described in Table 3-4 and marsh types are described in Table 3-5.

[d] The bonytail is currently not present in the mainstem of Reaches 4 and 5. River, reservoir, and backwater land cover types present in these reaches, however, are included as habitat for this species because it could be introduced into these reaches during the term of the LCR MSCP.

[e] The distribution and specific habitat requirements of this species in the LCR MSCP planning area is not well known. Based on this species apparent affiliation with common reed and mesic vegetation, this species is assumed to be most closely associated with the marsh land cover type. The LCR MSCP Conservation Plan (Chapter 5, "Conservation Plan") includes monitoring and research that, in part, will be implemented to better define this species habitat requirements and provide information that will help guide creation of its habitat.

Table 3-10. Extent of Existing Land Cover Types That Provide Habitat for Selected Species Based on LCR MSCP Habitat Models

	Cottonwood-Willow						Saltcedar				Honey Mesquite		Saltcedar–Honey Mesquite	Saltcedar–Screwbean Mesquite												
Covered Species	I	II	III	IV	V	VI	III	IV	V	VI	III	IV	IV	IV	V	VI	Atriplex	Arrowweed	Marsh	River[a]	Reservoir[a]	Desert Scrub	Agricultural Lands	Undetermined Riparian	Developed	Total Habitat
Threatened and Endangered Species																										
Yuma clapper rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,892[a]	0	0	0	0	0	0	11,892
Southwestern willow flycatcher[c]	842	7	560	80	36	2	167	3,175	193	92	0	0	83	27	11	1	0	5	461	177	198	19	24	9	28	6,196[d] (6,548)[e]
Desert tortoise (Mojave population)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,660	0	0	0	10,660[d]
Bonytail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,480	48,401	0	0	0	0	63,881
Humpback chub[g]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ND	0	0	0	0	0	ND
Razorback sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16,140	204,317	0	0	0	0	220,457
Other Covered Species																										
Western red bat (roosting habitat)	1,693	81	0	0	0	0	0	0	0	0	690	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,464
Western yellow bat (roosting habitat)	1,693	81	0	0	0	0	0	0	0	0	690	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,464
Desert pocket mouse[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Colorado River cotton rat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,449[c]	0	0	0	0	0	0	6,449
Yuma hispid cotton rat	286	8	854	575	188	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,000
Western least bittern	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,892[b]	0	0	0	0	0	0	11,892
California black rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11,626[b]	0	0	0	0	0	0	11,626
Yellow-billed cuckoo	1,692	81	2,974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,747
Elf owl	790	40	0	0	0	0	0	0	0	0	689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,519
Gilded flicker	1,075	49	2,456	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,580
Gila woodpecker	ND	ND	ND	ND	ND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	851
Vermilion flycatcher	1,693	81	2,974	1,503	309	0	0	0	0	0	690	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,250
Arizona Bell's vireo	0	0	2,974	1,503	0	0	0	0	0	0	690	5.517	0	0	0	0	0	0	0	0	0	0	0	0	0	10,684
Sonoran yellow warbler	1,693	81	2,974	1,503	36[i]	2[i]	167[i]	3,175[i]	193[i]	92[i]	0	0	83[i]	27[i]	11[i]	1[i]	0	0	0	0	0	0	0	0	0	10,038 (10,390)[j]
Summer tanager	1,692	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,773
Flat-tailed horned lizard[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Relict leopard frog[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Flannelmouth sucker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,764[j]	0	0	0	0	0	5,764
MacNeill's sootywing skipper	0	0	0	0	0	0	0	0	0	0	23	127	0	0	0	0	106	0	0	0	0	0	0	0	0	256
Sticky buckwheat[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Threecorner milkvetch[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Evaluation Species																										
California leaf-nosed bat (roosting habitat)[l]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pale Townsend's big-eared bat (roosting habitat)[l]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colorado River toad[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lowland leopard frog[h]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

ND = Not determined.

Unless otherwise noted, land cover types that provide habitat are based on the habitat models described for each species in Table 3-9, and the extent of land cover types providing habitat for each species is derived from Table 3-8.

Rows may not total correctly because numbers were totaled, then rounded.

[a] The acreages shown for the river and reservoir land cover types include the backwater land cover type. The backwater land cover type is not included as a separate land cover type in the LCR MSCP GIS database.

[b] Marsh types 1–7 are assumed to provide habitat for this species. The extent of marsh land cover within the LCR MSCP planning area, however, overestimates the extent of this species habitat because some marsh types can include large proportions of vegetation types and substrates that do not provide habitat for this species (Table 3-5).

[c] Extent of southwestern willow flycatcher habitat is based on direct delineation of occupied and unoccupied habitat. Land cover types that provide habitat are determined by overlaying the land cover type GIS data and delineated polygons of occupied and unoccupied habitat. Consequently, because each of the datasets are not rectified to each other, some land cover types that do not support habitat, such as reservoir, are designated as land cover types that provide habitat. The total extent of occupied and unoccupied habitat in the LCR MSCP planning, however, is correct.

[d] Extent of occupied habitat.

[e] Extent of total delineated existing habitat (i.e., occupied and unoccupied habitat) shown in parentheses. A total of 352 acres of unoccupied habitat is present in the LCR MSCP planning area. Land cover types that provide unoccupied habitat have not been determined and are not shown in this table.

[f] Derived from Appendix H, Table H-1. Represents the extent of desert scrub land cover type present in Reaches 1–6 in California and Nevada.

[g] In the LCR MSCP planning area, transitory habitat for this species can occur within the full pool elevation of Lake Mead. Up to an estimated 62 miles of transitory Colorado River channel that would provide species habitat could be created and occupied by humpback chub when the Lake Mead reservoir pool is maintained at low elevations and that could be subsequently lost when reservoir elevations rise.

[h] The habitat requirements for this species are very narrowly defined, cannot be reasonably correlated to LCR MSCP land cover types, and are not shown in this table. A description of this species' habitat requirements is presented in Table 3-12.

[i] This land cover type, if delineated as southwestern willow flycatcher habitat, is also assumed to provide habitat for this species (see southwestern willow flycatcher in this table).

[j] Extent of total land cover providing habitat shown in parentheses. Includes 352 acres of unoccupied southwestern willow flycatcher habitat that are present in the LCR MSCP planning area that are also considered to provide habitat for this species. Land cover types that provide unoccupied southwestern willow flycatcher habitat have not been determined and are not shown in this table.

[k] The Colorado River and Virgin River channels that are present within the full-pool elevation of Lake Mead when Lake Mead reservoir elevations are below the high pool elevation may provide habitat for this species. The extent of these transitory river reaches are variable among water years, cannot be determined, and are not shown in this table.

[l] Roosting habitat for these species include caves, tunnels, mines, and other physical features that provide suitable microclimate and structural conditions. Features that could provide roosting habitat are most likely associated with terrain located adjacent to the LCR MSCP planning area.

Table 3-11. Extent of Existing Habitat for Selected Species Habitat by River Reach Based on LCR MSCP Habitat Models

	Extent of Existing Habitat by River Reach (acres)[a, b]							
Covered Species	1	2	3	4	5	6	7	Total
Threatened and Endangered Species								
Yuma clapper rail	137	0	4,358	2,091	3,762	1,415	129	11,892
Southwestern willow flycatcher[c]	981	0	3,489	356	1,315	255	153	6,548
Desert tortoise (Mojave population)[d]	223	24	3,594	4,271	155	2,393	0	10,660
Bonytail	0	27,358	23,745	8,144	4,634	0	0	63,881
Humpback chub[e]	ND	0	0	0	0	0	0	ND
Razorback sucker	156,576	27,358	23,745	8,144	4,634	0	0	220,457
Other Covered Species								
Western red bat (roosting habitat)	649	1	690	761	68	227	68	2,464
Western yellow bat (roosting habitat)	649	1	690	761	68	227	68	2,464
Desert pocket mouse[f]	ND	ND	ND	ND	ND	ND	ND	ND
Colorado River cotton rat	0	0	4,358	2,091	0	0	0	6,449
Yuma hispid cotton rat	0	0	0	0	0	1325	675	2,000
Western least bittern	137	0	4,358	2,091	3,762	1,415	129	11,892
California black rail	0	0	4,358	2,091	3,762	1,415	0	11,626
Yellow-billed cuckoo	1,167	0	1,412	486	533	796	352	4,747
Elf owl	0	0	690	761	68	0	0	1,519
Gilded flicker	0	0	1,412	486	533	796	352	3,580
Gila woodpecker	0	0	ND[g]	ND[g]	ND[g]	ND[g]	ND[g]	851
Vermilion flycatcher	1,719	1	1,515	1,503	600	1,286	626	7,250
Arizona Bell's vireo	1,025	4	1,328	6,215	677	1,003	431	10,684
Sonoran yellow warbler	1,989[h]	1[h]	4,025[h]	1,036[h]	1,353[h]	1,379[h]	606[h]	10,390[h]
Summer tanager	649	0	690	72	68	226	68	1,773
Flat-tailed horned lizard[f]	ND	ND	ND	ND	ND	ND	ND	ND
Relict leopard frog[f]	ND	ND	ND	ND	ND	ND	ND	ND
Flannelmouth sucker	ND[i]	0	5,764	0	0	0	0	5,764[i]

Covered Species	Extent of Existing Habitat by River Reach (acres)[a, b]							Total
	1	2	3	4	5	6	7	
MacNeill's sootywing skipper				256	0	0	0	256
Sticky buckwheat[f]	ND	ND	ND	ND	ND	ND	ND	ND
Threecorner milkvetch[f]	ND	ND	ND	ND	ND	ND	ND	ND
Evaluation Species								
California leaf-nosed bat[j]	0	0	0	0	0	0	0	0
Pale Townsend's big-eared bat[j]	0	0	0	0	0	0	0	0
Colorado river toad[f]	ND	ND	ND	ND	ND	ND	ND	ND
Lowland leopard frog[f]	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

Rows may not total correctly because numbers were totaled, then rounded.

ND = Not determined.

[a] Unless otherwise noted, land cover types that provide habitat and river reaches in which species occur or are expected to occur are based on the habitat models described for each species in Table 3-9. The extent of land cover types providing habitat for each species by river reach is derived from Table 3-8.

[b] River reach locations are shown in Figure 1-1 and described in Chapter 1, "Introduction."

[c] Extent of southwestern willow flycatcher habitat is based on direct delineation of occupied and unoccupied habitat.

[d] Derived from Appendix H, Table H-1. Represents the extent of desert scrub land cover type present in Reaches 1–6 in California and Nevada.

[e] In the LCR MSCP planning area, transitory habitat for this species can occur within the full pool elevation of Lake Mead. Up to an estimated 62 miles of transitory Colorado River channel that would provide species habitat could be created and occupied by humpback chub when the Lake Mead reservoir pool is maintained at low elevations and that could be subsequently lost when reservoir elevations rise.

[f] The habitat requirements for this species are very narrowly defined, cannot be reasonably correlated to LCR MSCP land cover types, and are not shown in this table. A description of this species' habitat requirements is presented in Table 3-12.

[g] The extent of habitat has not been determined for specific river reaches but has been determined for the entire LCRMSCP planning area.

[h] Derived from the extent of cottonwood-willow types I–IV in Table 3-8 and the extent of saltcedar, saltcedar-honey mesquite, and saltcedar-screwbean mesquite delineated as occupied and unoccupied southwestern willow flycatcher habitat.

[i] The Colorado River and Virgin River channels that are present within the full pool elevation of Lake Mead when Lake Mead reservoir elevations are below the high pool elevation may provide habitat for this species. The extent of these transitory river reaches are variable among water years, cannot be determined, and are not shown in this table.

[j] Roosting habitat for these species include caves, tunnels, mines, and other physical features that provide suitable micro-climate and structural conditions. Features that could provide roosting habitat are most likely associated with terrain located adjacent to the LCR MSCP planning area.

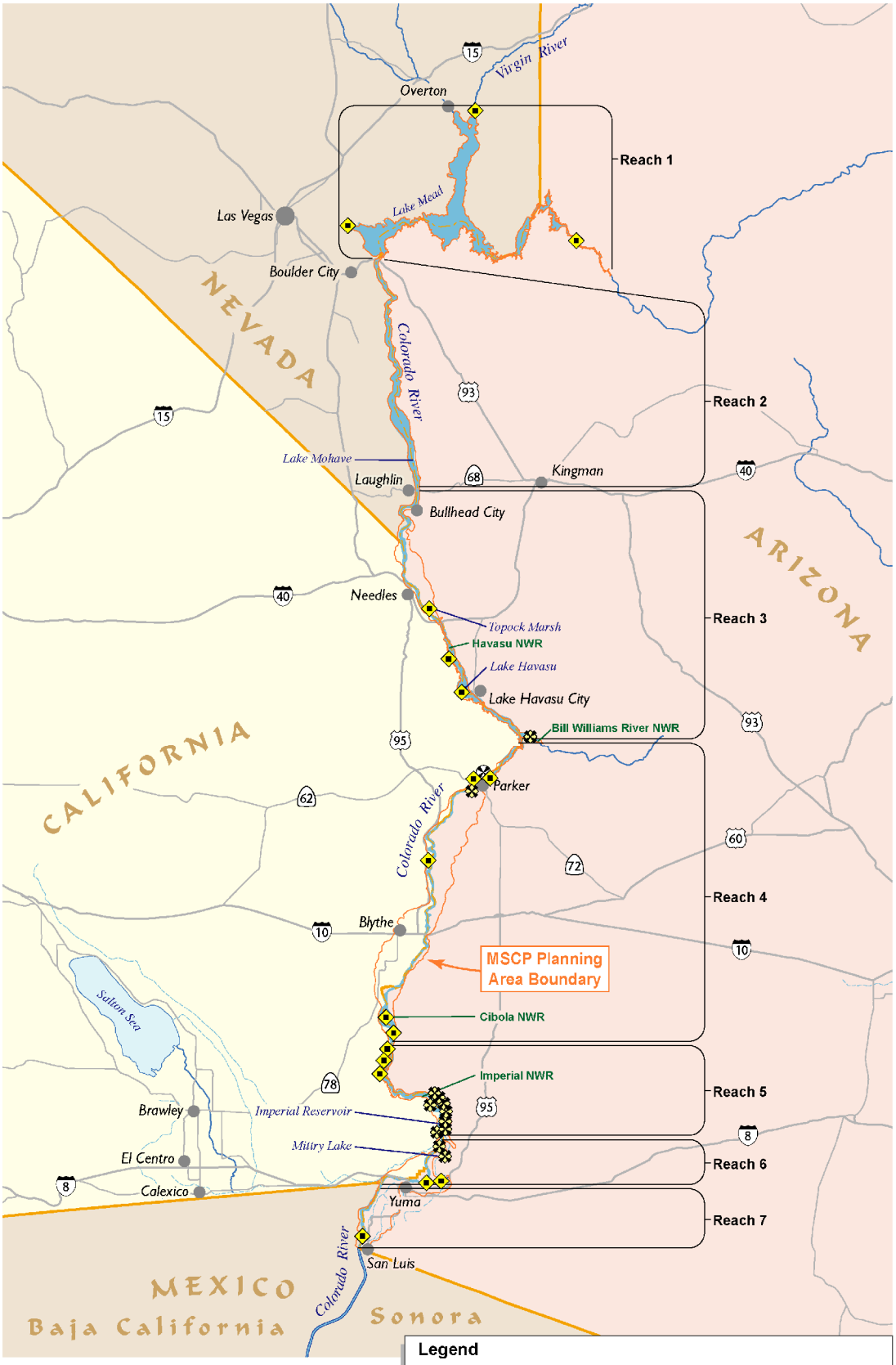


Figure 3-9a
Recent Observations of Selected Covered Species in the LCR MSCP Planning Area

00450.00-303

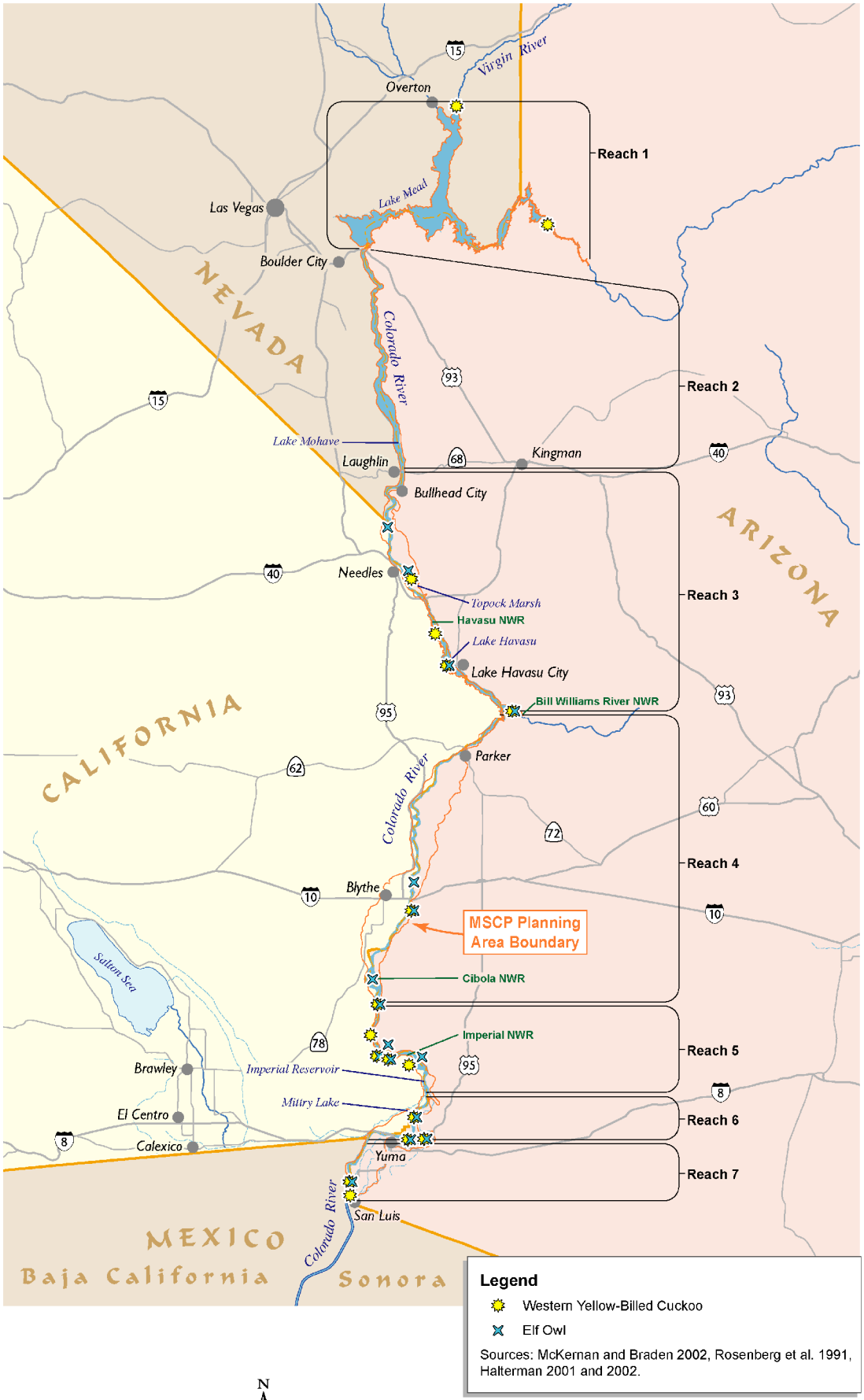


Figure 3-9b
Recent Observations of Selected Covered Species in the LCR MSCP Planning Area (1996–2001)

00450.00-303

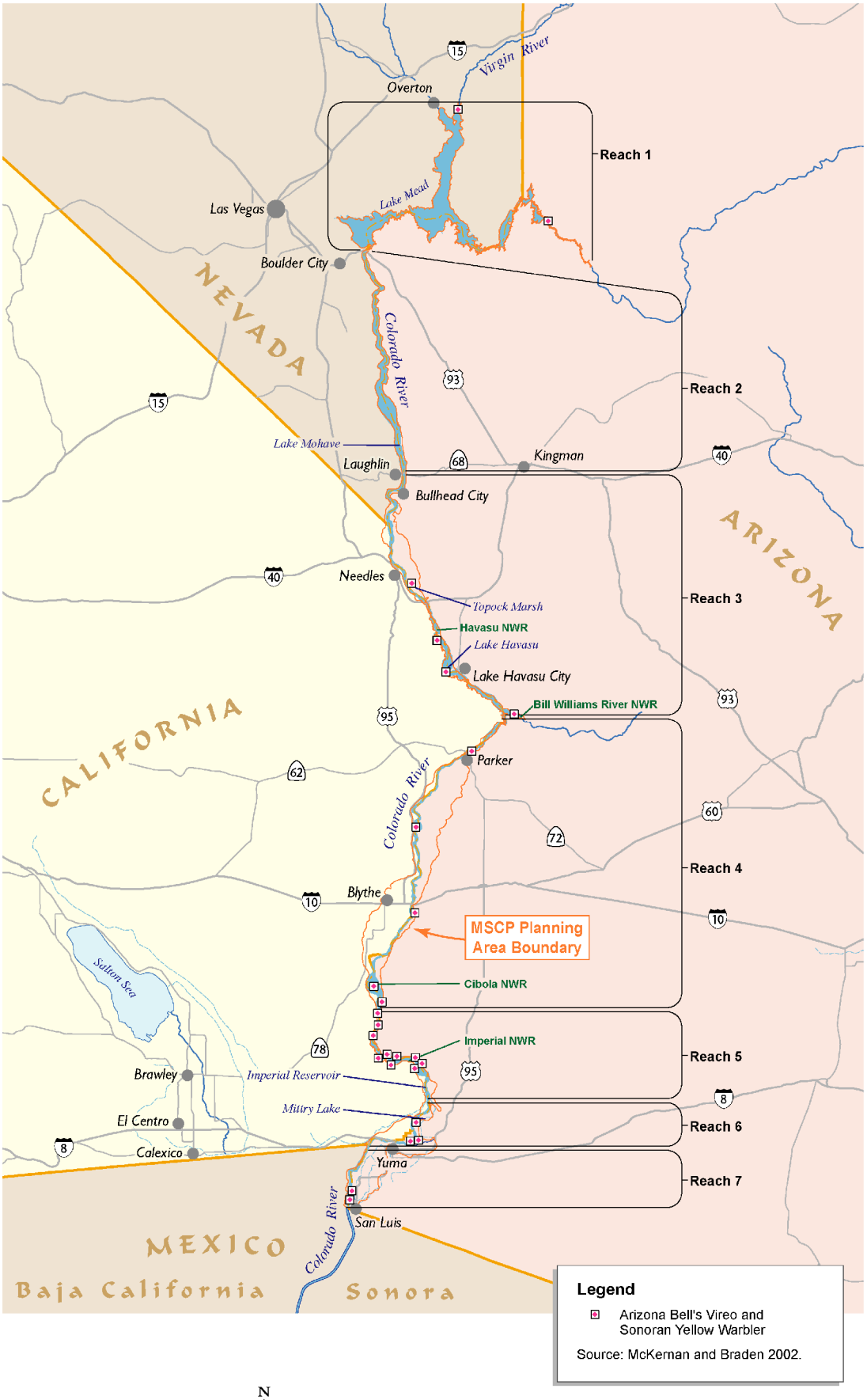


Figure 3-9c
Recent Observations of Selected Covered Species in the LCR MSCP Planning Area (1996–2001)

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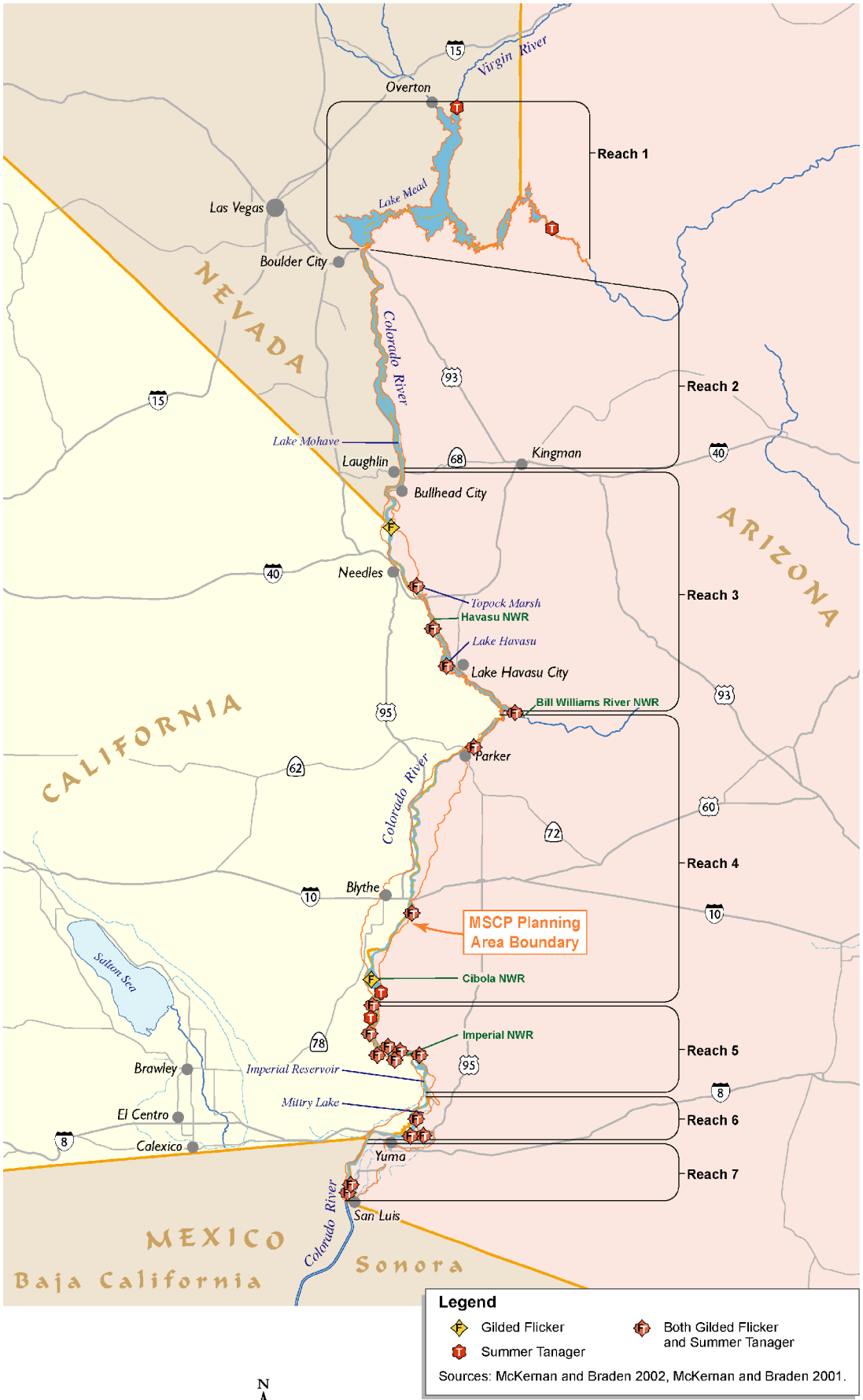

Figure 3-9d
Recent Observations of Selected Covered Species in the LCR MSCP Planning Area (1996–2001)

00450.00-303

Lower Colorado River Multi-Species Conservation Program

Figure 3-10a
Critical Habitat and Occurrence of Razorback Sucker in the LCR MSCP Planning Area

00450.00-303

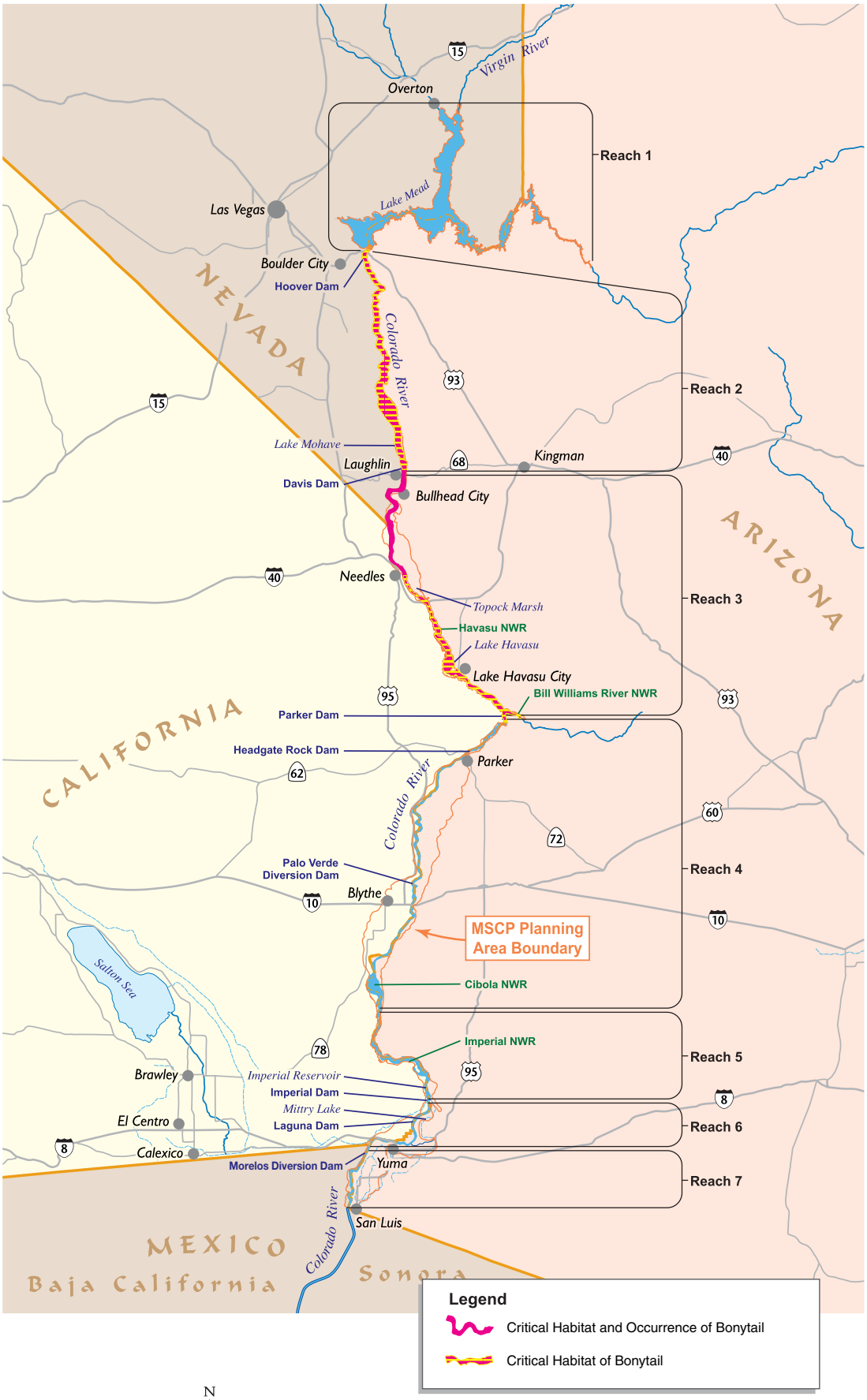

Figure 3-10b
Critical Habitat and Occurrence of Bonytail in the LCR MSCP Planning Area

00450.00-303 (9/04)

In addition, information collected on these surveys has substantially increased the knowledge of what is required to successfully restore southwestern willow flycatcher breeding habitat in the LCR MSCP planning area, as well as contributing to the overall understanding of what is likely required to recover the species.

In the LCR MSCP planning area, 6,548 acres of southwestern willow flycatcher occupied and unoccupied habitat have been delineated (Tables 3-10 and 3-11). Occupied southwestern willow flycatcher habitat is defined as "a contiguous area with consistent physical and biotic characteristics where territorial males or pairs of flycatchers have been documented during previous breeding seasons (generally after June 15) at least once since 1996, assuming the habitat has not been degraded or otherwise altered in the interim; if a portion of the contiguous habitat is or was used, the entire contiguous area is considered occupied" (Bureau of Reclamation 2000a). Nesting habitat is occupied habitat where nesting has been confirmed. No nesting has been confirmed below Parker Dam (Reaches 4-7) since 1996. Unoccupied habitat is defined as patches of vegetation with structural characteristics and surface water or soil moisture conditions similar to occupied habitats but where southwestern willow flycatchers have not been observed (McKernan and Braden 2002).

The distribution of known southwestern willow flycatcher occupied habitat is presented on Figure 3-11.

3.5.1.3 Other Covered Species

The habitat requirements for the desert pocket mouse, flat-tailed horned lizard, Colorado River toad, relict leopard frog, lowland leopard frog, humpback chub, sticky buckwheat, and threecorner milkvetch are very narrowly defined and cannot be reasonably correlated to LCR MSCP land cover types. Consequently, the LCR MSCP HCP assesses the presence or absence of these species based on the known range and habitat requirements of these species (Appendix I, "Status of LCR MSCP Covered Species"). Surveys will be implemented to determine if the desert pocket mouse is present before covered activities are implemented. The LCR MSCP impact assessment (Chapter 4) assumes that covered activities and LCR MSCP conservation measures that could affect habitat within the range of the flat-tailed horned lizard, relict leopard frog, humpback chub, sticky buckwheat, and threecorner milkvetch would affect these species. A summary description of the habitat requirements, known occurrences, and assumed distribution by river reach of these species in the LCR MSCP planning area is presented in Table 3-12.

3.5.2 Designated Critical Habitat

Section 7 of the ESA requires that the USFWS evaluate the impacts of implementing the LCR MSCP HCP on ESA-designated critical habitat. ESA-designated critical habitat for the bonytail, razorback sucker, and desert tortoise (Mojave population) occurs within the LCR MSCP planning area. Bonytail critical habitat was designated for the species in 1994. Critical habitat for this species in the LCR MSCP planning area encompasses the LCR from Hoover Dam to Davis Dam (Reach 2) (including Lake Mohave to its full-pool elevation) and the Colorado River and its 100-year floodplain between the northern

boundary of Havasu NWR to Parker Dam (Reach 3) (including Lake Havasu to its full-pool elevation) (Figure 3-10b).

Razorback sucker critical habitat was designated for the species in 1994. Critical habitat for this species in the LCR MSCP planning area encompasses Lake Mead to its full-pool elevation (Reach 1), the LCR from Hoover Dam to Davis Dam (Reach 2) (including Lake Mohave to its full-pool elevation), and the Colorado River and its 100-year floodplain from Parker Dam to Imperial Dam (Reaches 4 and 5) (Figure 3-10a).

Humpback chub critical habitat was designated for the species in 1994 along the Colorado River in the Grand Canyon. Humpback chub critical habitat, however, is not present in the LCR MSCP planning area.

Desert tortoise critical habitat was designated for the species in 1994. Designated critical habitat is present in or near the LCR MSCP planning area in California and Nevada west and north of the Colorado River in Reaches 1–4.

On October 12, 2004, the USFWS proposed critical habitat for the southwestern willow flycatcher (69 FR 60706). Critical habitat has been proposed within Reaches 1 and 3–6 (Figure 3-12). The proposed critical habitat for this species in the LCR MSCP planning area encompasses:

- the extent of the Colorado River from Separation Canyon to Pierce Ferry and the Virgin and Muddy Rivers within the full pool elevation of Lake Mead in Reach 1;
- from about thirteen miles below Davis Dam to Parker Dam, including Lake Havasu and Topock Marsh in Reach 3;
- Parker Dam to the upper end of the CRIT in Reach 4;
- all of Reach 5; and
- the portion of Reach 6 extending downstream to 3.5 miles north of the confluence of the Gila River and LCR.

Critical habitat has not been designated for the Yuma clapper rail.

Table 3-12. Distribution, Habitat Requirements, and Known Occurrences of Species with Narrow Habitat Requirements or Distribution in the LCR MSCP Planning Area

Covered Species	Assumed Distribution by River Reach[a, b]							Summary Habitat Description and Known Occurrences[a]
	1	2	3	4	5	6	7	
Humpback chub	X							Historically occupied the Little Colorado, Green, Yampa, White, and mainstem Colorado Rivers; may be present in up to an estimated 62 miles of transitory of Colorado River channel that could be present within the full pool elevation of Lake Mead when the Lake Mead reservoir is at the minimum planned elevation of 950 msl. The humpback chub is considered to have been extirpated from the LCR MSCP planning area below Hoover Dam.
Desert pocket mouse	X	X	X					Known from along the Muddy and Virgin Rivers in southern Nevada and from the Colorado River Valley (Virgin River Delta south to near Topock Gorge); occurs in association with hop-sage *(Grayia spinos*a) in Mojave mixed scrub, creosote-bursage, and salt desert scrub communities
Flat-tailed horned lizard						X	X	Occurs primarily in areas of sparsely vegetated creosote bush scrub or other open vegetation communities; the substrate typically is fine sand on relatively level desert pavement, although the species also can occur in pebbled areas, mudhills, and dune edges; in Arizona, occurs in the Yuma Desert (west of the Tinaja Altas and Gila Mountains) and south of the Gila River; in California, found in the Coachella Valley and south toward the head of the Gulf of California.
Relict leopard frog	X	X						Inhabits springs, marshes, and shallow ponds where water is available year-round; requires adjacent moist upland or wetland soils with a dense cover of grass or forbs and a canopy of cottonwoods or willows; at present, confirmed populations exist exclusively in geothermally influenced and perennial desert spring communities; three sightings occurred in springs near the Overton Arm of Lake Mead, and three sightings occurred in Black Canyon, below Hoover Dam.
Sticky buckwheat	X	X						Appears to be restricted to fine-grained soil habitats and may have a particular affinity for caliche-capped sand or sands containing weathered calcareous rock; range includes an estimated 60-mile area between the Muddy and Virgin River drainages; found from the Middle Point area of Lake Mead, in the southern portion of the species' range, to Weiser Wash in the northwest and Sand Hollow Wash and Coon Creek in the northeast
Threecorner milkvetch	X	X						Occurs in an estimated 75-mile-long (south to north) range extending from near Calville Bay at the Lake Mead NRA to Sand Hollow Wash in Mohave County, Arizona, and southeastern Lincoln County, Nevada; on an east-west axis, occurs across a 40-mile long area, from St. Thomas Gap to Dry Lake Valley.

Covered Species	Assumed Distribution by River Reach[a, b]							Summary Habitat Description and Known Occurrences[a]
	1	2	3	4	5	6	7	
Colorado River toad				?				Requires permanent or semipermanent water sources for breeding and is usually found near streams or other sources of water during periods of wet weather; generally associated with large, somewhat permanent streams, springs, temporary pools, watering holes, and irrigation ditches; historically found in the LCR MSCP planning area from Fort Yuma to the Blythe-Ehrenberg region; most recent observation in the LCR MSCP planning area occurred in 1984, at the Cibola National Wildlife Refuge (Reach 4); current distribution in the LCR MSCP planning area is unknown
Lowland leopard frog								Believed to be extirpated from the lower Gila and Colorado Rivers of Arizona and adjacent California but is known to occur near the LCR MSCP planning area at the Bill Williams River NWR, approximately 7 miles upstream of the Colorado River, in Reach 3

Notes:

X = Species is known or expected to be present in the river reach based on known habitat requirements for the species.

? = It is not known whether the species is present in the river reach. Species not observed in the LCR MSCP planning area in the past 20 years.

[a] From information presented in Appendix I, "Status of LCR MSCP Covered Species."

[b] River reach locations are shown in Figure 1-1 and described in Chapter 1, "Introduction."

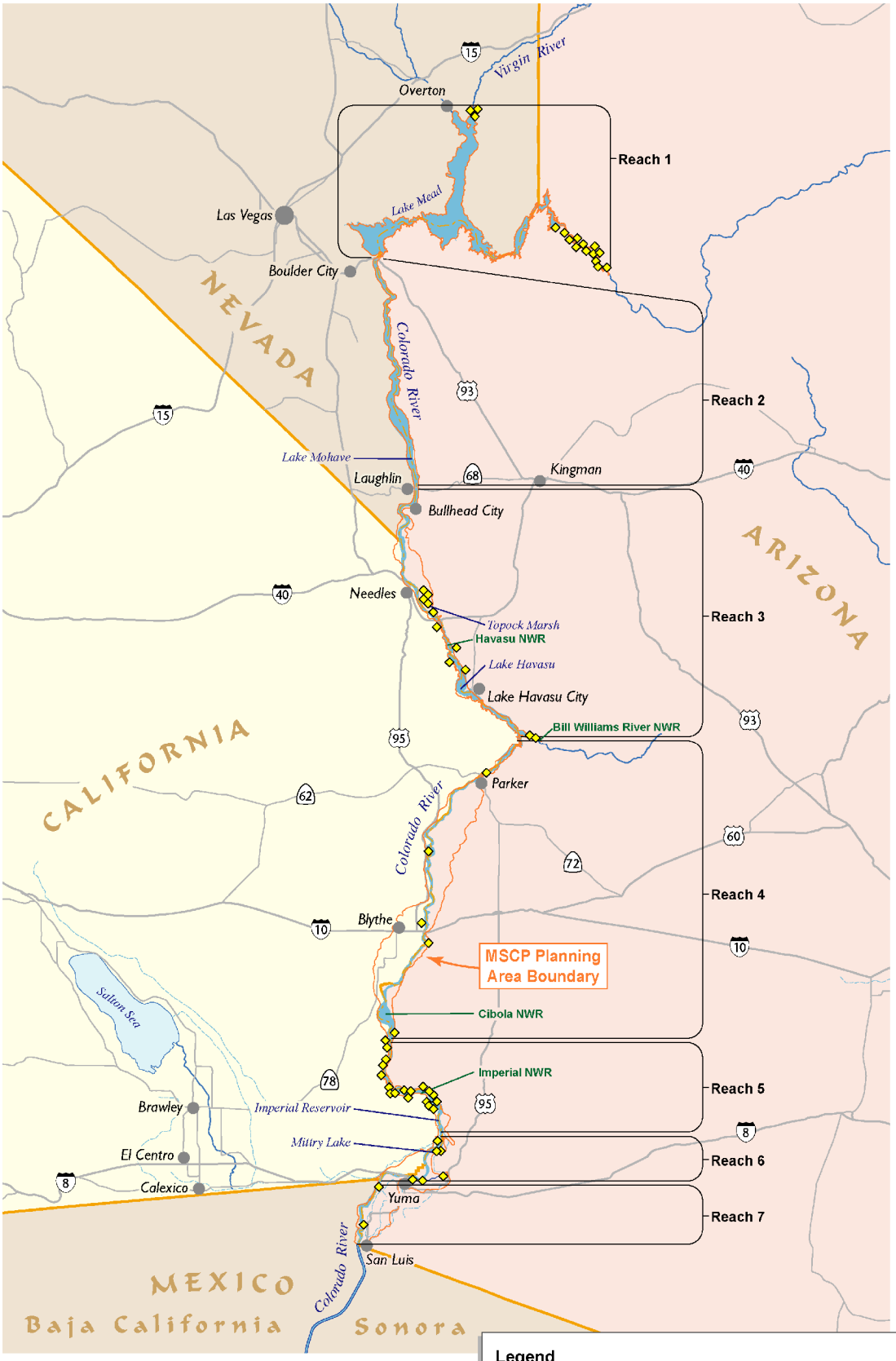

Figure 3-11
Documented Southwestern Willow Flycatcher Occupied Habitat Locations in the LCR MSCP Planning Area (1996–2001)

00450.00-303

Figure 3-12
Proposed Critical Habitat for Southwestern Willow Flycatcher in the LCR MSCP Planning Area

00450.00-303 (9/04)

Chapter 4

Analysis of Impacts and Level of Take

4.1 Introduction and Approach

The LCR MSCP HCP impact assessment describes the effects, within the LCR MSCP planning area, of implementing the flow-related and non-flow-related covered activities described in Chapter 2, "Description of Covered Activities," and implementing the LCR MSCP conservation measures described in Chapter 5, "Conservation Plan," on covered and evaluation species. The likely effects of flow-related and non-flow related covered activities and LCR MSCP conservation measures are assessed for each covered and evaluation species.

The analysis of the impacts of implementing the covered activities and the LCR MSCP reflect changes relative to the existing conditions described in Chapter 3. The focus of the impact assessment is to identify impacts of the covered activities and the LCR MSCP conservation measures on covered and evaluation species and their habitats.

The LCR MSCP HCP impact assessment is a stepwise process and analyzes the effects of flow-related covered activities, non-flow-related covered activities, and the combined indirect effects of ongoing OM&R flow-related and non-flow-related covered activities on covered species. First, the impact mechanisms are described for flow-related and non-flow-related covered activities and LCR MSCP conservation measures, and broad changes in environmental conditions are described. Second, the responses of species and species habitat to the affected impact mechanisms are described.

The assessment of impacts on each species, when applicable, identifies the level of incidental take (take) and changes in critical habitat. The quantification of effects on habitat is limited by the information available for each species. Where information on a covered species' occupied habitat is not available, the assumed impact is the degradation or loss of all the acreage of the land cover types that are assumed to provide habitat for the species (see Section 3.5.1.1). This "worst-case" assumption results in an overestimate of the actual effects on the species.

4.2 Assessment of the Flow-Related Covered Activities on Hydrologic Conditions

Flow-related covered activities are described in Chapter 2, "Description of Covered Activities." There are two categories of flow-related activities: 1) ongoing water deliveries, diversions, and returns of 7.5 mafy and surplus water; and 2) total future changes in points of diversion, including shortages, of 1.574 mafy. Reclamation has completed a hydrologic model and subsequent analysis of habitat impacts associated with these flow-related covered activities. The purpose of the model was to provide information regarding the changes to hydrologic conditions from flow-related covered activities to river surface elevations, reservoir elevations, and groundwater levels. This information was then applied in the subsequent steps to identify how changes in hydrologic conditions would affect habitat. Issues addressed through the modeling include:

- How impacts to groundwater, marsh and backwater may result from lower river surface elevations caused by changes in point of diversion. Changes to groundwater elevation in the floodplain may result in effects to the overlying vegetation and to backwaters and associated marsh that are not directly connected to the river by a surface connection. Changes in daily low river surface elevation may result in effects to backwaters and associated marsh that are directly connected to the river by a surface connection.
- How impacts to habitats associated with Lake Mead surface elevations may result from the probability of lower surface elevations caused by implementing future surplus and shortage criteria. Changes in Lake Mead surface elevations may result in effects to the aquatic environment in Lake Mead and vegetation communities around and near the lake shore.
- Possible reductions in beneficial flows past Morelos Diversion Dam into Reach 7. This reduction in beneficial flows may result from lower Lake Mead surface elevations reducing the probability of flood flow releases.

Information developed from existing Reclamation BAs and USFWS BOs has been incorporated as applicable (Bureau of Reclamation 1996, 2000a; U.S. Fish and Wildlife Service 1997, 2001). The effects of non-Federal flow-related activities addressed in the LCR MSCP HCP cannot be separated from the effects of Federal flow-related activities addressed in the LCR MSCP BA. Therefore, the impact analysis for flow-related activities encompasses both non-Federal and Federal flow-related activities, and the analysis and results are the same in the LCR MSCP HCP and the LCR MSCP BA.

The LCR MSCP analyzes and provides mitigation for the potential impacts resulting from changes in points of diversion and consequent annual reductions in flow totaling 1.574 mafy on the 27 covered species. The conservation and mitigation measures identified in the ISC/SIA BO cover the potential impacts from a portion (400,000 afy) of the 1.574 mafy changes in points of diversion on four (of 6 that are listed under the ESA) of the 27 LCR MSCP covered species. Despite the overlap in the impacts and mitigation measures, there are differences between the scopes of the ISC/SIA BO and the LCR MSCP (e.g., the terms are different) that preclude the LCR MSCP from superseding the

ISC/SIA BO. Although the LCR MSCP does not supersede the ISC/SIA BO, the effects of the 400,000 afy and accompanying conservation measures will be credited in the Conservation Plan for the LCR MSCP (see Chapter 5). The LCR MSCP conservation measures will provide coverage for all 27 covered species identified in the LCR MSCP.

This section describes the methods used to model the hydrological effects of the flow-related covered activities on surface water and groundwater (see Section 4.2.1); results of the hydrological modeling (see Section 4.2.2); the key assumptions used along with the modeling results to conduct the analysis of impacts of flow-related covered activities on covered species (see Section 4.2.3.1); and the subsequent potential effects of hydrologic changes as indicated in the modeling results on habitat conditions (see Sections 4.2.3.2 to 4.2.3.6).

4.2.1 Methods and Assumptions

This section describes the methodologies used to analyze effects to habitats for covered species from flow related covered activities. A detailed description of the hydrologic modeling and the assumptions used to conduct the analysis of effects of flow-related covered activities is presented in Appendix J, "Technical Documentation of Ongoing and Future Operations." Two different hydrologic models were utilized in carrying out the analysis of effects. The first, described in Section 4.2.1.1 below and in Appendix J (J.6.1) was used to determine the effect of the flow-related covered actions on Lake Mead water surface elevations and the resulting potential effect on flows in Reach 7. The second, described in Section 4.2.1.2 below and in Appendix J (J.6.2), was used to determine the effect to the river corridor based on reduced releases from Davis and Parker Dams.

The terms "Baseline scenario" and "Action Alternative scenario" are used throughout this section to facilitate the comparison between the detailed information presented in Appendix J as summarized in the following sections. The term "Baseline scenario" represents the modeling scenario for continuing operations in the future without the implementation of future flow-related covered activities. The term "Action Alternative scenario" is the modeling scenario for future conditions with implementation of future flow-related covered activities[1].

4.2.1.1 Description of Hydrologic Modeling for Reaches 1 and 7

Reservoir elevations may be affected by implementation of the flow-related covered activities. However, water elevations within Lake Mohave (i.e., Reach 2), Lake Havasu,

[1] The use of the phrase "Baseline scenario" in this HCP and the LCR MSCP BA regarding hydrologic modeling refers to the current operations of the LCR and should not be confused with the definition of "baseline" as used in the ESA regulations or CEQA. Similarly, the use of the phrase "Action Alternative scenario" in this HCP and the LCR MSCP BA regarding hydrologic modeling refers to the future operations of the LCR. See Appendix J for further details on the modeling assumptions.

Senator Wash Reservoir, and the relatively small reservoirs including Senator Wash Reservoir and those behind Headgate Rock, Palo Verde Diversion, Imperial, Laguna, and Morelos Diversion Dams will continue to be maintained to meet water diversion and other operational objectives. Consequently, the variability in storage and water surface elevation maintained by these dams with the future flow-related covered activities will be the same as under existing conditions.

Effects on Lake Mead (Reach 1) elevations were modeled using a commercial river modeling software called RiverWare (Bureau of Reclamation 2000c). RiverWare was developed by the University of Colorado through a cooperative process with Reclamation and the Tennessee Valley Authority. RiverWare is configured to simulate the Colorado River System and its operation and integrates the Colorado River Simulation System model that was developed by Reclamation in the early 1970s. River operation parameters modeled and analyzed includes the quantity of water entering the river system, storage in system reservoirs, releases from storage, river flows, and the water demands of and deliveries to the Upper and Lower Division States and Mexico. Flows in Reach 7 below Morelos Diversion Dam are primarily the result of flood control releases from Hoover Dam. These releases are directly affected by Lake Mead elevations and therefore the effects in Reach 7 are analyzed using the RiverWare model. Results of the modeling of effects on Lake Mead are described in Section 4.2.2.1 and on Reach 7 in Section 4.2.2.2.

To assess the potential hydrologic impacts on Reaches 1 and 7 from implementation of the flow-related covered activities, the modeling was conducted to identify changes in hydrologic conditions with and without future flow-related activities. The first model scenario, called the Baseline scenario, models river operations through 2051. In addition to the continuation of the ongoing operations conducted by Reclamation on an annual basis, this scenario also assumes: 1) transfers of up to 400,000 af annually from below to above Parker Dam by 2051, 2) Interim Surplus Guidelines (ISG) remain in place through 2016 and then revert back to previously used spill-avoidance guidelines, and 3) shortage assumptions as described in Appendix J.

To assess the potential changes to hydrological conditions from implementation of future flow-related covered activities a second modeling scenario was conducted. This scenario incorporates the future flow-related covered activities, described in Chapters 2 of the LCR MSCP BA and HCP, including: 1) 1.574 mafy of transfers by 2051, 2) extension of the ISG through 2051, and 3) modified shortage assumptions as described in Chapter 2 of the LCR MSCP BA and in Appendix J. In Appendix J, this modeled scenario is called the Action Alternative scenario.

The water supply used in the modeled scenarios consists of the historical record of natural flow from 29 individual inflow points in the river system over the 85-year period from 1906 to 1990[2]. Future hydrology was generated from 85 simulations of historical

[2] Public comments received during the comment period for the LCR MSCP Draft EIS/EIR, Draft BA, and Draft HCP noted that the modeling conducted by Reclamation for the LCR MSCP relied on hydrologic data that does not reflect the recent dry conditions in the Colorado River Basin. The comments suggested that because of the change in hydrologic conditions, the modeled results underestimate the magnitude of potential impacts to environmental resources within the LCR MSCP planning area. The historic record used by Reclamation in its hydrologic modeling includes periods of low flow on the Colorado River that are similar to the current drought. The following periods of low flow are included in the historic record: 1931–1935 (5-year average: 11.4 maf); 1953–1956 (4-year average:

natural flows using the Index Sequential Method (Bureau of Reclamation 2000c). Starting conditions for all system reservoirs are based on actual water-level elevations for December 31, 2002[3]. A detailed description of all modeling assumptions are presented in Appendix J, Section J.6.1.

4.2.1.2 Description of Hydrologic Modeling for Reaches 2–6

This section describes the modeling conducted to identify the effects of implementing the future flow-related covered activities for Reaches 2–6. The hydrologic effect of these future flow-related activities would be reductions in flows in these reaches due to total future changes in points of diversion, including shortages, of 1.574 mafy. To analyze the effects of reduction in flows more detail is necessary than is provided by the reservoir model described in Section 4.2.1.1. The methodology is used to translate these flow reductions into changes in elevation in river water surface (river stage), backwaters, and groundwater and the attendant potential impacts to habitats supported by these hydrologic conditions as described in the following sections and detailed in Appendices J and K.

The modeling assumed a "worst case scenario" which includes the assumption that all proposed changes in points of diversion are implemented at the same time immediately following approval of the LCR MSCP even though changes in points of diversion would be phased in over the term of the LCR MSCP (see LCR MSCP BA Chapter 2, Table 2-13). Furthermore, the analysis examined the effects in the months of April, August, and December because these periods correspond to sensitive periods of life cycles of listed species.

The hydrologic impacts of the future flow-related actions in Reach 2 (Hoover Dam to Davis Dam) were determined to be insignificant and consequently were not modeled. River stage in this reach is dominated by the reservoir pool of Lake Mohave. Furthermore, reductions in annual releases of up to 0.845 mafy from Hoover Dam represents a very small proportion of the annual releases. Additionally, Reach 2 is confined primarily by steep canyon walls that provide little habitat for marsh and riparian associated covered species.

Similarly, the hydrologic impacts of the future flow-related actions in Reach 6 (Imperial Dam to Morelos Diversion Dam) were determined to be insignificant and consequently

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10.2 maf); 1959–1964 (6-year average: 11.4 maf); 1988–1992 (5-year average: 10.9 maf). Current estimates of the most recent five years of data, 2000–2004 show that the 5-year average is 9.9 maf.

[3] As a result of public comments, the participating agencies prepared an evaluation, *Evaluation of Effects Associated with Updated Hydrologic Information*, which was based upon modeling that utilized updated hydrologic information. The new model runs were based on the actual September 30, 2004 elevations of Colorado River reservoirs (including Lake Mead) and updated natural flow data (including years 1991–1995). The evaluation is published in Volume V, *Responses to Comments on Volumes I–IV*, as Section III, and as Attachment E to Appendix J in Volume IV, *Appendices to Volumes I–III and V*.

The evaluation concluded that the inclusion of the updated hydrologic information does not identify any significant new impacts or change the conclusions of effect to covered species in the Draft BA/HCP, and that no changes are required to the LCR MSCP BA, HCP, and EIS/EIR.

were not modeled. This reach is dominated by drainage return flows, not releases from upstream reservoirs that would be affected by the covered activities. Moreover, the anticipated future changes in point of diversion would occur upstream of Imperial Dam, which is upstream of Reach 6, so that flows entering Reach 6 do not change.

The methodology used to determine the effects on Reaches 3–5 is explained below.

River Stage Analysis

The methodology used to determine the effects on downstream river flow and stage due to potential future reductions in releases from Davis and Parker Dams is summarized in this section. A detailed description of the methodology is provided in Appendix J (J.6.2).

The effects on downstream river flow and stage due to potential future reductions in releases from Davis and Parker Dams were analyzed. Flow reductions of 0.860 mafy in the river from Davis Dam to Parker Dam (Reach 3) and 1.574 mafy in the river from Parker Dam to Imperial Dam (Reaches 4 and 5) were considered. The methodology employed for Reaches 3–5 comprised the following general steps:

1. Estimate the hourly flows likely to be released from the dams, both before and after the flow reductions have been applied
2. Route the hourly releases downstream to locations of interest
3. Convert the modeled flows at each location to river stage (elevation) to determine the reduction in river stage due to the flow reduction
4. Determine the effects of the reduction in river stage to backwater area extent and depth, and to depth to groundwater proximate to the river

The river stage analysis calculated the reduction in water surface elevation for 33 river channel cross-section locations in Reaches 3–5.

These cross-section locations were selected to represent typical river stretches. These locations were distributed throughout Reaches 3–5 to appropriately cover the entire river between Davis Dam to Imperial Dam. Changes in river stage were calculated at each of these cross-section locations. Data were developed for flow reductions in three different months—April, August, and December, and for the annual median flow. The monthly data were used to calculate impacts to the river channel and backwaters directly connected to the river. The annual median reductions in water surface elevation were used to determine impacts to groundwater and to backwaters that are not directly connected to the river.

River Surface Area

River surface area is influenced by river stage and channel geometry. A change in river stage due to flow reduction would have an associated change in the surface area of the river. The maximum change in river stage at each location was used to compute the reduction in river surface water area. For the purposes of this analysis a uniform bank slope was assumed. Based on this method, the reduction of river acreage was calculated for each river reach. More detail is provided in Appendix K.

Backwaters

Depth and extent of backwaters could be affected by changes in river stage. For backwaters directly connected to the LCR, water surface elevations are assumed to be the same as the connected river surface elevation. For backwaters not directly connected to the river, backwater elevations are assumed to correspond to local groundwater elevation. A total of 380 backwaters were identified and analyzed to determine the potential effects of implementing the future flow-related covered activities. Each backwater was associated with one of the 33 river cross-sections used in the river stage analysis. Based on this methodology, reductions in the acreage of backwater emergent areas, and backwater open water areas were calculated for river Reaches 3–5. More detailed information is provided in Appendix K.

Groundwater

Groundwater adjacent to the river is assumed to be the same as the annual median river stage (see Appendix K). Because of the slow travel time for groundwater movement, changes in groundwater table elevations will lag changes in river stage changes. For that reason, the annual median river surface elevation changes were used in the analysis of groundwater changes. The projected changes in groundwater elevation at the 33 river stage locations were used to develop a contour map of potential groundwater changes.

4.2.2 Effects of Implementing the Flow-Related Activities on Hydrologic Conditions

This section describes the effects of implementing the flow-related covered activities on the hydrological conditions that support covered species habitats. The effects to hydrologic conditions from implementing flow-related activities include changes in Lake Mead reservoir elevation, river flow, and flow-related effects of ongoing OM&R.

4.2.2.1 Lake Mead Elevation[4]

The effects on Lake Mead elevations due to the flow-related covered activities were analyzed using the model described in Section 4.2.1.1. Lake Mead elevations have historically fluctuated due to the annual variability in hydrologic inflows (between elevation 1083 feet msl and 1225 feet msl since 1938). This variability will continue into the future regardless whether the covered activities are implemented. Neither the timing of water level variations between the highs and lows, nor the length of time the water level will remain high or low can be predicted.

As described in Appendix J, the model for both the Baseline scenario and the Action Alternative scenario is run using historical flow data to represent future inflows in order

[4] As more fully described in LCR MSCP BA Chapter 2, Lake Mead elevations are driven by downstream water demands and Glen Canyon Dam releases, except when the Lake Mead Water Control Manual for Flood Control dictates operations. Glen Canyon releases are primarily a function of operation for delivery of water from Lake Powell in accordance with the Colorado River Compact, and Hoover Dam releases are primarily a function of non-discretionary water deliveries from Lake Mead to the lower Division States and Mexico. Thus, Reclamation lacks discretion over the management of reservoir levels in Lake Mead, and lake levels may fluctuate greatly.

to quantify the probable future elevations of Lake Mead. The possible outcomes for future Lake Mead elevations are then statistically analyzed to compare the potential effects of the Action Alternative scenario to the Baseline scenario to provide a range of potential elevations through 2051. The results of the modeling showing the probable elevations under the various probabilities are provided in Table 4-1.

Table 4-1. Comparison of Lake Mead Surface Elevation for the Two Modeling Scenarios

	Baseline Scenario					Action Alternative Scenario				
Year	90th Percentile	75th Percentile	50th Percentile	25th Percentile	10th Percentile	90th Percentile	75th Percentile	50th Percentile	25th Percentile	10th Percentile
2003	1155	1147	1142	1140	1138	1156	1149	1144	1142	1140
2004	1170	1152	1135	1129	1125	1172	1155	1137	1132	1127
2005	1181	1158	1135	1119	1111	1185	1161	1137	1123	1115
2006	1188	1165	1134	1112	1101	1191	1168	1139	1116	1105
2007	1200	1172	1128	1104	1091	1207	1177	1136	1108	1092
2008	1207	1178	1132	1100	1082	1213	1184	1138	1100	1078
2009	1214	1185	1133	1096	1074	1214	1188	1140	1099	1068
2010	1215	1185	1135	1093	1068	1215	1190	1139	1088	1063
2011	1212	1181	1133	1089	1062	1214	1189	1136	1081	1056
2012	1214	1184	1131	1088	1049	1214	1191	1135	1083	1045
2013	1211	1186	1125	1089	1057	1213	1191	1132	1076	1055
2014	1214	1186	1115	1084	1050	1214	1191	1125	1076	1042
2015	1214	1190	1119	1076	1042	1214	1192	1125	1069	1037
2016	1212	1190	1115	1077	1034	1213	1193	1130	1070	1026
2017	1214	1191	1120	1076	1023	1215	1193	1128	1067	1022
2018	1214	1194	1116	1070	1020	1214	1193	1123	1059	1012
2019	1214	1190	1115	1067	1016	1214	1191	1120	1054	999
2020	1214	1193	1114	1062	1008	1214	1193	1119	1057	991
2021	1214	1193	1117	1058	1005	1214	1192	1117	1053	984
2022	1215	1196	1113	1053	1006	1215	1193	1105	1049	984
2023	1214	1194	1113	1051	1005	1214	1193	1109	1046	977
2024	1215	1192	1113	1054	1004	1215	1193	1109	1058	970
2025	1214	1193	1115	1062	1004	1214	1192	1109	1056	970
2030	1214	1194	1118	1050	1005	1214	1192	1107	1043	962
2035	1214	1191	1114	1018	1004	1214	1190	1104	1018	969
2040	1214	1191	1112	1045	1004	1212	1190	1103	1043	966
2045	1214	1187	1103	1052	1004	1213	1183	1101	1048	959
2050	1211	1185	1104	1037	1005	1210	1177	1102	1036	963

As indicated in Table 4-1, under the Baseline scenario, which assumes the continuation of ongoing flow-related covered activities, the elevations of Lake Mead will continue to fluctuate with a trend towards lower annual median levels (50th percentile) through 2051. This downward trend in Lake Mead elevations is due to projected development in the Upper Basin. This downward trend is also seen under the Action Alternative scenario because the Upper Basin depletions are identical for each scenario. The modeling results for the Action Alternative scenario show that median Lake Mead elevations are likely to

be slightly higher through 2021 and then slightly lower from 2022 through 2051 than under the Baseline scenario.

The modeling results show the probability that Lake Mead elevations will be within any particular range during the term of the LCR MSCP. However, for purposes of ESA coverage, a maximum reduction in Lake Mead elevation to 950 feet msl is assumed based on adoption of shortage guidelines within the range as described in Chapter 2 of the LCR MSCP BA.

4.2.2.2 River Flow

River flow is affected by operation of dam facilities and water diversions. These operations provide flood control and river regulation, storage delivery, and diversion of entitlement water, and power production. This results in variations in river flows on a seasonal, daily, and hourly basis. Continuation of these ongoing covered activities will not change the historical variations in river flows and river stage.

Implementation of future flow-related covered activities will result in a maximum reduction in flow of up to 0.860 mafy in Reach 3 and 1.574 mafy in Reaches 4 and 5. The effects to river stage of implementing the future flow-related covered activities were modeled as described above in Section 4.2.1.2 and presented in Table 4-2.

Table 4-2. Changes in River Stage during April, August, and December from Operations under Ongoing Flow-Related Activities and with Implementation of Future Flow-Related Activities, Including an 0.860-maf Flow Reduction in Reach 3 and a 1.574-maf Flow Reduction in Reaches 4 and 5

		Change in Stage (feet) from the Baseline Condition						
			April		August		December	
Reach	River Mile	Median Annual Change	Maximum Change	Minimum Change	Maximum Change	Minimum Change	Maximum Change	Minimum Change
3	270.5	-0.40	-2.09	-0.01	-0.04	-0.08	-0.12	-0.01
3	267.2	-0.43	-2.33	-0.01	-0.04	-0.09	-0.13	-0.01
3	262.9	-0.58	-3.03	-0.01	-0.06	-0.11	-0.18	-0.01
3	255.1	-0.60	-3.02	-0.01	-0.06	-0.11	-0.18	-0.01
3	259.6	-0.57	-2.82	-0.01	-0.06	-0.10	-0.17	-0.01
3	248.9	-0.60	-1.67	-0.20	-0.47	-0.55	-0.40	-0.24
3	243.9	-0.65	-1.82	-0.22	-0.52	-0.59	-0.43	-0.25
3	240.8	-0.61	-1.69	-0.20	-0.48	-0.56	-0.40	-0.24
3	237.6	-0.55	-1.53	-0.19	-0.45	-0.50	-0.36	-0.21
3	234.7	-0.51	-1.34	-0.28	-0.49	-0.49	-0.32	-0.21
3	229.8	-0.47	-1.22	-0.27	-0.48	-0.42	-0.27	-0.15
3	225.0	-0.35	-0.92	-0.21	-0.37	-0.31	-0.20	-0.10
3	220.2	-0.21	-0.55	-0.14	-0.24	-0.18	-0.12	-0.06
4	171.3	-1.14	-2.46	-1.47	-2.03	-0.21	-0.36	-0.29
4	167.6	-1.23	-2.65	-1.59	-2.19	-0.23	-0.39	-0.31
4	160.9	-1.20	-2.58	-1.46	-2.09	-0.23	-0.39	-0.33

		Change in Stage (feet) from the Baseline Condition						
			April		August		December	
Reach	River Mile	Median Annual Change	Maximum Change	Minimum Change	Maximum Change	Minimum Change	Maximum Change	Minimum Change
4	149.5	-1.22	-2.60	-1.32	-2.01	-0.25	-0.42	-0.42
4	146.9	-0.95	-2.01	-1.02	-1.56	-0.19	-0.32	-0.33
4	135.8	-0.13	-0.31	-0.32	-0.31	-0.02	-0.04	-0.02
4	119.7	-1.17	-1.54	-1.16	-1.68	-0.87	-0.72	-0.73
4	116.5	-1.55	-2.03	-1.52	-2.23	-1.16	-0.98	-1.00
4	114.6	-1.45	-1.87	-1.39	-2.06	-1.09	-0.93	-0.96
4	109.1	-1.44	-1.90	-1.44	-2.08	-1.07	-0.89	-0.90
4	103.1	-1.22	-1.65	-1.28	-1.79	-0.91	-0.74	-0.72
4	96.7	-1.43	-1.92	-1.48	-2.09	-1.06	-0.87	-0.85
5	86.1	-1.16	-1.43	-1.17	-1.55	-1.04	-0.81	-0.84
5	80.4	-0.96	-1.23	-1.03	-1.31	-0.86	-0.63	-0.63
5	72.2	-1.02	-1.32	-1.12	-1.40	-0.91	-0.65	-0.64
5	70.3	-1.04	-1.34	-1.12	-1.42	-0.92	-0.67	-0.66
5	66.1	-1.03	-1.39	-1.21	-1.44	-0.91	-0.61	-0.58
5	56.0	-0.88	-1.08	-1.03	-1.05	-0.94	-0.55	-0.55
5	53.6	-0.49	-0.73	-0.72	-0.61	-0.53	-0.23	-0.22
5	50.8	-0.08	-0.13	-0.13	-0.10	-0.08	-0.03	-0.03

Although there will continue to be variability in the seasonal daily and hourly flows in the river within the range of flows historically seen, there is a projected drop in river stage as a result of the reduced flows from implementing the future flow-related covered activities. The level of change is reflected in Table 4-2, for each of the affected river reaches.

Standard river operating procedures for water deliveries, flood control operations and other management activities would not be changed due to future flow-related covered activities. The full range of water releases historically part of these operations would occur in the future. Because the result of the total 1.574 mafy changes in points of diversion will result in less water flowing into Reaches 3–5, the reduction in flows will change the magnitude and/or duration of seasonal, daily, and hourly releases. Standard hourly release patterns for power generation will not change due to the reduced flows; however, as shown in Figures J-38 and J-40 in Appendix J, there will be small changes in the duration of high and low hourly flows. Major changes in the hourly flow releases in terms of duration or magnitude are not anticipated.

The reductions in river stage would affect the available extent of open water, both in the river itself and to connected backwaters. For purposes of ESA compliance, these effects were measured by the changes in river stage projected for the month of April, which are the largest shown by the modeling as presented in Table 4-2. The reduction in river stage for the month of April ranges from 0.73 foot to 3.03 feet.

To assess the effects on groundwater elevations and on backwaters not directly connected to the river, the annual median projected reduction in river stage was used. As shown in

Table 4-2, the annual median change from 0.08 foot to 1.55 feet would result from implementation of flow-related covered activities.

The occurrence of excess flow in Reach 7 results from flood control operations, unanticipated contributions from events such as flooding along the Gila River, and other factors resulting in canceled water orders by users downstream of Parker Dam. Flow-related activities, including Lake Mead water management operations, could affect the magnitude and frequency of excess flow downstream of Imperial Dam and Morelos Diversion Dam. Modeled flows, however, indicate that changes in excess flow due to the flow-related covered activities are likely inconsequential (see Appendix L). Mexico has the capacity to divert up to 200,000 af above its annual entitlement, reducing any excess flow downstream of Morelos Diversion Dam.

4.2.2.3 Flow-Related Effects of OM&R Covered Activities on the LCR

The LCR is one of the most highly controlled rivers in North America. The flow regime and channel of the LCR has been extensively modified for hydropower, flood control, and water supply. As a consequence, LCR flow and elevation are highly controlled by dams and diversions (Facilities), levees, and stabilized banks. Modifications to the LCR have been occurring continuously over the past century and the most significant effects occurred at the time the Facilities were constructed or shortly thereafter. The existence of these Facilities in the past, and their continued presence through the next 50 years, will continue to affect the physical characteristics of the LCR. As described in Chapter 3, the effects of the construction and existence of these Facilities are part of the baseline condition of the LCR, and thus are not considered effects of the covered activities.

This section addresses certain indirect effects of flow-related covered activities (flood control, water delivery, and power production) as operational activities within the definition of OM&R. This section also provides a qualitative analysis of the potential indirect effects of implementing the non-flow related ongoing and future OM&R covered activities on the LCR (the direct effects of these covered activities are addressed in Sections 4.3 and 4.5). These non-flow-related covered activities are described in Chapter 2 and are limited to localized bankline stabilization to protect facilities. Federal non-flow-related covered activities are described in LCR MSCP BA Chapter 2 and consist of: bankline stabilization and other maintenance, levee maintenance, and sediment control. Because the non-Federal ongoing non-flow-related covered activities would only affect extremely limited portions of the LCR channel that are immediately adjacent to existing facilities, potential indirect effects of these covered activities are expected to be negligible. As described below, a quantitative analysis of the indirect effects of ongoing OM&R and future OM&R that could occur in the future cannot be performed because the indirect effects resulting from those activities are confounded by similar effects resulting from the existence of the Facilities and past OM&R activities. Similarly, the indirect effects of flow-related covered activities on the LCR cannot be disaggregated from the indirect effects of the Federal the ongoing non-flow-related covered activities.

Indirect effects of the covered activities included in this section include effects on river flow and associated geomorphic processes (e.g., erosion, overbank flow, scour) that have

substantially altered the physical conditions in the LCR. The LCR channel was constrained by the past construction and continued existence of the Facilities, thus reducing the ability of the LCR to: 1) erode banks, 2) transport and deposit sediment, and 3) inundate its historical floodplain. For example, the past actions have resulted in LCR channel downcutting which has contributed to lowering of groundwater levels, and, in combination with levees, reduction in the frequency of overbank flood events that provide the conditions necessary for establishment of cottonwood and willow. Past OM&R activities, both flow and non-flow related, provided a further reduction in the regeneration of cottonwood and willow (e.g., less erosion and sedimentation inhibits the formation of channel bars that provide substrate for germination and establishment of seedlings) and degradation or loss of backwaters and marshes (i.e., reduction in overbank flows that scour accumulated sediment from backwaters and marshes facilitates successional processes, degrades their function as habitat for associated covered species, and can provide for their eventual replacement with upland land cover types). Further, the total impact of the past activities may not have yet been manifested in the current conditions seen in the LCR. For example, ongoing effects of past bank stabilization and levees continue to artificially constrain river flow and thus are a factor contributing to future incision of the LCR channel.

The combined flow-related effects of ongoing and future OM&R activities may result in continuing minor channel degradation through:

- loss of lateral channel movement (preventing meandering),
- additional channel downcutting in locations where the LCR substrate remains erodible,
- reduction of sediment load and transport (by dredging, bank stabilization), and
- a reduction in channel scouring events.

The contribution to these flow-related effects from ongoing OM&R cannot be quantitatively measured but is expected to be minimal. The effects of continuing the existing flow and non-flow related OM&R covered activities could contribute to existing backwaters and marshes undergoing successional changes toward upland conditions, with little or no natural replacement. Incisement of the LCR channel contributes to lowering groundwater levels thus potentially affecting riparian vegetation beyond the manifested and unmanifested effects of baseline conditions. It is also likely, however, that the flow-related effects of ongoing OM&R-related activities would be within the range of channel incisement attributable to baseline and thus would not be additive to those effects. Flood control regimes also reduce the likelihood of flooding that overtops existing banks and scours adjacent lands that create conditions providing for the establishment of desirable plant species. Based on the best available information, however, it is not possible to determine the degree to which ongoing flow-related covered activities may inhibit future regeneration of cottonwood and willow beyond that caused by the past actions. As described above, adverse changes in LCR conditions resulting from the combined effects of routine ongoing OM&R activities would be very gradual and unmeasurable from year to year, and would be minimal relative to the effects of past actions under the baseline. Although the minimal effects associated with the ongoing flow-related covered activities cannot be disaggregated from the effects of past actions under baseline, the LCR MSCP conservation measures are designed to provide sufficient benefits to the covered species

and their habitat, to ensure that the minimal effects of ongoing covered activities are also fully mitigated.

In addition, the effects of flow-related routine ongoing OM&R covered activities cannot be disaggregated from the larger effects of the future flow-related covered activities. As described in Section 4.5, implementation of future flow-related covered activities will result in the removal or degradation of covered species habitats, some of which, in the absence of implementing the future covered activities, may also be affected by the ongoing OM&R covered activities. For example, implementation of the future flow-related covered activities are assumed to remove or degrade all of the cottonwood-willow land cover types that provide covered species habitat where groundwater elevations are expected to be lowered. This effect would subsume the small incremental potential effects that ongoing OM&R covered activities would have on these same habitats. Although the minimal flow-related effects associated with the ongoing flow-related covered activities cannot be disaggregated from the effects of past actions under baseline and future covered activities, the LCR MSCP conservation measures are designed to provide sufficient benefits to the covered species and their habitat, in addition to that required to fully mitigate the effects of future covered activities, to ensure that the minimal effects of ongoing covered activities are also fully mitigated.

4.2.3 Effects of Hydrological Changes on Habitat Conditions

This section describes the potential effects of flow-related covered activities on environmental conditions that provide habitat for covered species. Effects of flow-related covered activities on each covered species' habitat are fully described in Section 4.5.

4.2.3.1 Key Assumptions Related to the Analysis of Flow-Related Effects on Covered Species

In addition to the results of the hydrologic modeling, the following assumptions were used to conduct the assessment of impacts of flow-related covered activities on covered and evaluation species.

- Proposed changes in points of diversion are assumed to take place and result in annual flow reductions of 0.860 mafy in Reach 3 and 1.574 mafy in Reaches 4 and 5. Although the analysis of flow-related effects assumed the changes in points of diversion are implemented in their entirety at the beginning of the term of the LCR MSCP, the actual timing of implementation of proposed changes in points of diversion is not known at this time.
- Groundwater levels in the river floodplain are most closely related to the annual median water surface elevations of the river. These effects are reduced by the presence of irrigated agriculture.
- Although change in groundwater elevation may affect soil moisture and other environmental conditions, the maximum predicted change in groundwater elevation

is assumed not to result in the loss of honey mesquite bosques that provide habitat for the elf owl, vermilion flycatcher, and Arizona Bell's vireo.

- An element of MacNeill's sootywing skipper habitat is the presence of moist microclimate conditions beneath adjacent patches of honey mesquite and quailbush. MacNeill's sootywing skipper habitat is assumed to be lost where groundwater elevations are predicted to be lowered beneath its habitat.

- An element of southwestern willow flycatcher breeding habitat is the presence of ponded water or moist soil surface conditions during the breeding season. Southwestern willow flycatcher breeding habitat is assumed to be lost, based on Reclamation's measurements of surface water depths in delineated breeding habitat and predicted effects of flow-related covered activities on groundwater elevations, where groundwater elevations are expected to decline in delineated habitat sufficiently to eliminate the surface soil moisture conditions required by the species to nest and rear young.

- The LCR MSCP species habitat models (see Section 3.5.1.1) do not consider that land cover types that may only receive low levels of use by individuals of a covered species (predominantly saltcedar and mixed saltcedar communities) constitute habitat. Effects of implementing flow-related covered activities could include the loss of moist surface soil conditions in stands of saltcedar that may be used by some covered bird species. As described in the previous assumption, the loss of moist surface soil conditions in saltcedar and mixed-saltcedar stands have been identified as part of the analysis of effects on the flycatcher. Habitat that will be created as mitigation for these effects on the flycatcher will also mitigate for any effects on the loss of these areas on other covered species.

- Federal non-flow-related activities will result in removal of habitat for covered species in Reaches 3–5 that would otherwise be adversely affected by flow-related activities. To avoid double counting of impacts, this analysis assumes that the Federal non-flow-related activities will, with the exception of Gila woodpecker habitat, remove covered species habitat before flow-related activities are implemented, and these effects, therefore, are not included as an effect of the flow-related covered activities. (These impacts of Federal non-flow-related covered activities on covered species habitat are evaluated in the LCR MSCP BA and included in the summary of impacts described in Tables 4-5 and 4-6.)

- Change in groundwater elevation associated with implementation of the flow-related covered activities is assumed to adversely affect the extent of cottonwood-willow, marsh, backwater, and river land cover types that provide covered species habitat under the area with declining groundwater. The assessment assumes that any predicted drop in groundwater elevation associated with flow-related covered activities will result in the degradation of the habitat provided by cottonwood-willow land cover. Because the range of groundwater elevations will not cause impacts to all overlying cottonwood-willow habitat, the approach to the analysis of impacts on covered species habitat that is provided by cottonwood-willow land cover may result in an overestimate of adverse effects on habitat for some species (e.g., if, following implementation of flow-related activities, the groundwater elevation beneath a patch of cottonwood-willow is still within the root zone of cottonwood and willow trees, the trees would survive, whereas this analysis assumes they would not). The habitat for species associated with affected cottonwood-willow land cover that will be

replaced with implementation of the LCR MSCP, therefore, inherently includes some level of habitat replacement beyond that required to mitigate impacts on those species and would contribute to the recovery of those species.

- Impacts on groundwater levels that support covered species habitat at Topock Marsh will be avoided by maintaining water deliveries for maintenance of water levels and existing conditions. At times, flow-related activities could lower river elevations to levels that could disrupt diversion of water from the river to the marsh. Improvements to intake structures that allow water to continue to be diverted or other measures to maintain the water surface elevation will avoid effects on groundwater elevation. The extent of covered species habitat impacts that will be avoided by maintaining water deliveries to Topock Marsh is presented in Table 4-3. Maintaining water deliveries to Topock Marsh will also avoid impacts on razorback sucker and bonytail habitat associated with disconnected backwaters managed for these species.

- The water surface elevation in backwaters not directly connected to the LCR by a surface connection is assumed to correspond to the local groundwater elevation. Consequently, the probable change in groundwater elevation related to the change in annual median river surface elevation with implementation of the covered activities was assumed to be the change in elevation of backwaters not directly connected to the LCR by a surface connection. Table 4-2 shows the annual median river surface elevations and April, August, and December maximum and minimum elevations for selected locations along the LCR in Reaches 3–5.

- Water surface elevations in backwaters directly connected to the LCR by surface connection are assumed to be the same as the connected river surface elevation. The probable minimum LCR elevations in April (the month in which the greatest probable decline in elevations would be manifested) with implementation of covered activities was assumed to be the probable change in elevation of backwaters directly connected to the LCR by a surface connection (see Table 4-2).

- Marsh vegetation that provides habitat for covered species and that can be affected by implementation of flow-related covered activities is emergent marsh vegetation that grows in association with open water provided in backwaters. Marsh vegetation supported by reservoirs or other locations where conditions would maintain existing water levels in Reaches 2–7 will not be affected by flow-related covered activities. The extent of change in marsh vegetation associated with backwaters with implementation of the flow-related covered activities is determined by the probable change in backwater elevations in April, the month in which modeling indicated flow-related covered activities would have the greatest affect (see Appendix K).

Table 4-3. Extent of Impacts on Covered Species Habitat Avoided with Implementation of Conservation Measures to Maintain Water Deliveries to Topock Marsh with a Reduction in Annual Flow of 0.860 maf in Reach 3

Species	Habitat Impacts Avoided (acres)
Threatened and Endangered Species	
Yuma clapper rail	16
Southwestern willow flycatcher	2,135
Other Covered Species	
Colorado River cotton rat	16[a]
Western least bittern	16[a]
California black rail	16[a]
Yellow-billed cuckoo	133
Gilded flicker	133
Vermilion flycatcher	133
Arizona Bell's vireo	133
Sonoran yellow warbler	2,224

[a] Results of modeling indicate that only 16 acres of marsh land cover type, which provides habitat for this species, could be affected by flow-related covered activities at Topock Marsh.

4.2.3.2 Cottonwood-Willow along the LCR

As described above, the reduction in river flow attributable to future flow-related covered activities may lower groundwater levels under several thousand acres of lands adjacent to the river. Stands of cottonwood-willow with the appropriate structure (see Table 3-9) provide habitat for the following species:

- southwestern willow flycatcher,
- western red bat,
- western yellow bat,
- Yuma hispid cotton rat,
- yellow-billed cuckoo,
- elf owl,
- gilded flicker,
- Gila woodpecker,
- vermilion flycatcher,
- Arizona Bell's vireo,

- Sonoran yellow warbler, and
- summer tanager.

Any drop in groundwater elevation under areas supporting cottonwood-willow is assumed to result in the degradation or loss of the vegetation that characterizes the elements of habitat for associated covered species. The extent and quality of cottonwood-willow land cover would be expected to decline relative to existing conditions. Seed dispersal, germination, and establishment of young plants—necessary to support recruitment in existing cottonwood-willow communities—require seasonal inundation of the floodplain that is currently not supported by existing flow over much of the LCR MSCP planning area. As described in Appendix K, implementation for the flow-related covered activities could affect up to 2,008 acres of cottonwood-willow land cover in Reaches 3–5.

Lower groundwater levels in Reaches 3, 4, and 5 could increase mortality of trees in existing cottonwood-willow stands and would be expected to reduce productivity of the understory. Within the projected range of groundwater lowering, existing saplings and mature trees will likely survive the gradual change in groundwater level because their roots are expected to grow downward at rates commensurate with the rate of groundwater lowering. The effect cannot be precisely determined because existing groundwater elevations are unknown, and the reduction in groundwater will occur over an extended period (i.e., 30 or more years). The analysis of flow-related effects, however, assumes that all patches of cottonwood-willow that overlay areas where groundwater elevations are expected to decline would be degraded or lost, resulting in the degradation or loss of covered species habitats that are provided by the affected patches of cottonwood-willow. The successful establishment of cottonwood and willow seedlings is closely correlated with spring floodflows that disperse seeds and inundate substrates that are suitable for cottonwood-willow germination and growth. River reaches in the LCR MSCP planning area upstream of the Gila River confluence are regulated by operation of reservoirs, and the periodicity and magnitude of floods have been substantially reduced from historical conditions. In addition, the extent of substrates suitable for seedling establishment has also been substantially reduced from historical conditions as a result of loss of sediments from the river, which establish sand and gravel bars, and the construction of levees. The present limited potential for cottonwood-willow seedlings to establish and survive on sites with suitable substrates and soil moisture conditions may be reduced in the future if groundwater levels drop sufficiently at those sites to preclude future establishment and growth of seedlings. Studies from the Hassayampa River indicate that Fremont cottonwood seedlings naturally established on suitable surfaces within 0.7–3.3 feet of groundwater. The studies indicate that the highest success of seedling recruitment occurred where groundwater is within 0.7–1.3 feet of the ground surface (Stromberg 1993b) and is within the range of the predicted reduction in groundwater elevations.

Reduction in groundwater levels could also affect the composition of understory vegetation in cottonwood-willow stands (Stromberg et al. 1996). Studies along the Hassayampa and San Pedro Rivers show that streamside herbaceous vegetation was associated with mean groundwater depths of 1.0–1.5 feet (Richter 1993; Stromberg et al. 1996). Lower groundwater elevations may affect the composition of understory vegetation, microhabitat conditions (e.g., higher temperature, lower humidity), percent plant cover, and type and biomass of invertebrate production in cottonwood-willow

stands. Food web support for covered species that forage on flying insects would be substantially reduced in cottonwood-willow stands that currently have saturated soils or pond water during some periods but which would no longer have these conditions following a reduction in groundwater elevation.

Cottonwood and willow seed dispersal, germination, and establishment depend primarily on inundation of soil with flood events. Although modeling indicates that future operation of Lake Mead with implementation of flow-related covered activities could have minimal effects on the probability of flood events in Reaches 3–7 (see Section 4.2.2.2, Appendix J, and Appendix L), these effects would be slight and would not affect habitat conditions for the covered species. However, existing stands will age and die out because the extent, frequency, duration, and timing of flood events have been substantially modified by existing facilities and ongoing operations that occur under the existing conditions.

4.2.3.3 Marsh along the LCR

Marsh is present in all river reaches in the LCR MSCP planning area and provides habitat for the Yuma clapper rail, California black rail, western least bittern, and Colorado River cotton rat. Marsh vegetation grows:

- along the margins of isolated and connected backwaters, the main and side channels of the LCR, and reservoir coves;
- behind dams on the mainstem of the river;
- on wildlife refuges that are managed to maintain marsh; and
- in drains and canals that maintain sufficient water to support the establishment and growth of emergent vegetation.

The quality and extent of marsh vegetation associated with backwaters in the LCR MSCP planning area are expected to decline relative to existing conditions with implementation of future flow-related covered activities. Future flow-related covered activities could affect marsh vegetation and the covered species habitats it provides by lowering mean groundwater elevations in backwaters in Reaches 3, 4, and 5 (see Appendix K). Based on supporting hydrology, two types of marsh are present in the LCR MSCP planning area: 1) marshes that are directly connected to the river or that are groundwater dependent, and 2) marshes that have been formed by reservoirs or impoundments (e.g., Lake Mead, Lake Havasu, Mittry Lake) (Bureau of Reclamation 1996). As described in Section 4.2.1.1, with the exception of Lake Mead, the frequency and rate of reservoir fluctuations will be similar to baseline conditions, so that the future flow-related activities will not cause effects to marshes supported by reservoirs.

The types of effects that could be expected if groundwater and river surface elevations are lowered sufficiently include:

- a change in marsh plant composition (e.g., replacement of cattail by common reed);
- a conversion of marsh land cover to woody riparian land cover types;

- an increase in plant density and extent, resulting in the loss of open water;
- a change in marsh function (e.g., change in invertebrate communities, species composition, or production); and
- dessication of emergent vegetation in drains and canals if water conveyed through a drain or canal is not sufficient to maintain the vegetation.

An increase in the range of daily fluctuations in surface water elevations in marshes with changes in points of diversion also could affect the quality of habitat provided for some covered species (e.g., lower water levels could reduce the availability of cover and food for Yuma clapper rails) (U.S. Fish and Wildlife Service 2001). As described in Appendix K, implementation of the flow related covered activities could affect up to 133 acres of emergent vegetation associated with backwaters.

4.2.3.4 Lake Mead Conditions

The analysis of effects of flow-related covered activities on Lake Mead reservoir elevations is based on information provided in Appendix J, "Technical Documentation of Ongoing and Future Operations," and Appendix M, "Effects of LCR MSCP Flow-Related Activities on Lake Mead."

As described in Section 4.2.2.1, "Lake Mead Elevation," implementation of future flow-related covered activities may affect Lake Mead reservoir elevations from existing conditions. Changes in reservoir elevations may affect the establishment of riparian and marsh vegetation at the deltas of rivers entering Lake Mead (see Appendix M); razorback sucker spawning habitat (see Appendix M); transitory river segments that may support humpback chub, razorback sucker, and flannelmouth sucker habitat; and the sticky buckwheat and threecorner milkvetch.

Riparian Vegetation

Riparian vegetation that could provide habitat for the southwestern willow flycatcher, western red bat, western yellow bat, yellow-billed cuckoo, Arizona Bell's vireo, Sonoran yellow warbler, and summer tanager may establish as Lake Mead reservoir elevations fluctuate over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Most of the Lake Mead shoreline, however, does not have the soil necessary for the establishment of riparian vegetation. The extent of riparian vegetation that could establish as reservoir elevations decline, however, cannot be predicted.

The Lake Mead delta areas have a great potential for use by covered species when present and habitat has developed, but are limited in their importance due to their ephemeral nature. When riparian vegetation develops as habitat for these species, abundance and productivity can rise substantially. Conversely, as vegetation dries out when reservoir elevations subsequently decline, or is inundated when elevations subsequently rise, species abundance and productivity decreases (Braden and McKernan

unpublished data 2002). This ephemeral habitat, thus, has a high productivity value when present and is beneficial to riparian-associated species as a whole.

Habitat in the delta areas may consist of predominantly native willow, predominantly exotic saltcedar (*Tamarisk* spp.) or mixed native/saltcedar. Establishment of native willow or cottonwood dominated stands would provide habitat for all of the covered species described above. Saltcedar dominated stands could provide habitat for the southwestern willow flycatcher and Sonoran yellow warbler when appropriate mosit surface soil conditions are also present. The Colorado River delta has previously produced a vegetation community largely composed of native willow with relatively little saltcedar (McKernan 1997). A major factor governing the types of riparian vegetation that could establish is the timing of when sediments suitable for establishment of riparian vegetation are exposed. Willow-dominated communities have become established in the deltas of Lake Mead only when declining reservoir elevations have coincided with the timing of willow seed dispersal. During periods when reservoir elevations have declined before or after the willow seed dispersal period, saltcedar-dominated riparian communities have become established (see Appendix M, Section M.5.3). Cottonwood and willow that do become established when reservoir elevations decline could be lost if reservoir elevations continue to decline and groundwater elevations drop below their root depths. Conversely, riparian vegetation that does become established on exposed sediments would be inundated and lost during wetter periods when Lake Mead reservoir elevations rise.

For example, while from 1990–1996 Lake Mead reservoir levels remained within the 1170–1200-foot range creating dense stands of willow (approximately 1000 acres) (McKernan and Braden 1998), the levels from 2000–2004 dropped drastically from 1214 feet to 1125 feet, creating a delta that does not support the same dense vegetation, and has created conditions in which the willows and even saltcedar are rapidly dying (Bureau of Reclamation unpublished data 2004). This would suggest that a sustained lake level would create the best suited habitat for LCR MSCP covered species, and that extreme rises or falls in reservoir elevations would not sustain covered species habitat in the Lake Mead delta areas. As lake levels continue to drop, new delta habitat may form lower in the lake. This would be limited by the Lake Mead shoreline as most of the shoreline does not have the soil necessary for the establishment of riparian vegetation. The extent of riparian vegetation that could establish as reservoir elevations decline, however, cannot be predicted.

Marsh Vegetation

Ephemeral marsh vegetation can periodically establish at inflow points of Lake Mead (e.g., Lake Mead delta, Virgin River delta, Muddy River delta, Las Vegas Wash), when Lake Mead water surface elevations are below full pool elevation. This ephemeral marsh vegetation can provide nesting and dispersal habitat for the Yuma clapper rail and western least bittern. Habitat that does become established could be lost if reservoir elevations decline and groundwater elevations drop below the rooting depths of emergent vegetation. Marsh vegetation that does become established on exposed sediments would be inundated and lost during wetter periods, when Lake Mead reservoir elevations rise. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations

over the term of the LCR MSCP cannot, however, be predicted based on the available information.

Razorback Sucker Spawning Habitat

Implementation of flow-related covered activities may result in adverse effects on razorback sucker spawning habitat and designated critical habitat for the razorback sucker in Lake Mead. The known spawning elevations that may be important for the razorback sucker occur between 1,120 and 1,150 feet msl in Lake Mead. Current information shows that during the spawning seasons of 1997–2001, razorback sucker spawned at or near the cliff spawning site at the back of Echo Bay. This site was dry in 2002 and spawning occurred in a different area along the south shore of Echo Bay. During the 2003 spawning season, the 2002 spawning site was dry. However, razorback sucker apparently spawned along the same shore just east of the 2002 spawning site on a gravelly point submerged in 2–5 feet of water. In 2004 larval concentrations and habitat use of a telemetered fish indicated the Echo Bay population spawned approximately 250 meters east of the 2003 site (Welker and Holden 2004). These changes in spawning location over the past few years indicate the razorback sucker will successfully move their spawning location into progressively lower elevations where suitable spawning substrate is present as the lake recedes. Findings of recent investigations (Twichell and Rudin 1999) indicate that it is unlikely that sediment accumulation over available spawning substrate will affect spawning habitat area. However, indications are that in 2004 sediment from the Las Vegas Bay Delta has moved further out and caused the presumptive spawning area in the bay to become covered with encroaching sediment and may have influenced spawning success (Welker and Holden 2004). This encroaching sediment is a result of outflow from Las Vegas Wash and is not typical of sediment encroachment in the rest of Lake Mead. That encroachment is not only a function of lowering lake levels, but is likely also related to high rainfall events and growing wastewater discharge as a result of growth in the Las Vegas area.

Results of razorback sucker studies indicate successful recruitment of minimal numbers of razorback suckers in Lake Mead during years that favorable rearing conditions are present. This makes the population of razorback suckers in Lake Mead unique in that it is the only population that has persisted over a long period of time in any portion of the LCR. However, these conditions are infrequent, and the numbers of fish naturally recruited to the population may not be sufficient to sustain the population under existing conditions. Reservoir operations and other factors that create the conditions that result in new fish successfully entering the population are not well understood. It has been postulated that during periods of lower lake elevations, vegetation becomes established along the shoreline. Then when the lake rises, the vegetation that becomes inundated provides cover for young razorback suckers. Recruitment has occurred fairly regularly from 1974–1998. Sufficient information is not available to determine if changes in reservoir elevation with implementation of the action alternative could adversely affect the current observed rate of recruitment. However, it can be postulated that due to the probability of lower lake levels in the foreseeable future, short term annual rises in lake elevation could inundate established vegetation that would provide cover for juvenile razorback suckers, thus maintaining a similar level of recruitment to the population.

Transitory River Segments

When Lake Mead reservoir elevations decline, segments of the Colorado River and Virgin River channels that existed prior to construction of Hoover Dam can become exposed within the full-pool elevation of Lake Mead (i.e., transitory river segments). These transitory river segments can provide for and be occupied by the humpback chub, razorback sucker, and the flannelmouth sucker, which are covered under the LCR MSCP. The few humpback chub currently occurring in the Grand Canyon could move downstream and utilize as much as an estimated 62 miles of transitory Colorado River channel that forms when reservoir elevations lower to an elevation of 950 feet msl. This is the elevation that is assumed to be protected by the modeled shortage assumptions. The razorback sucker and flannelmouth sucker could occur in transitory river segments of both the Colorado River and Virgin River that form when reservoir elevations are below full pool elevations. This transitory habitat could be lost during wetter periods when Lake Mead reservoir elevations increase and inundate habitat.

Sticky Buckwheat and Threecorner Milkvetch Habitat

Within the LCR MSCP planning area, sticky buckwheat and threecorner milkvetch can establish and occur along the Lake Mead shoreline on sites with the soil characteristics required by each of the plants that are exposed when Lake Mead water surface elevations are below full-pool elevation. Sticky buckwheat and threecorner milkvetch plants that establish on these sites would be inundated and lost during wetter periods when Lake Mead reservoir elevations increase.

4.2.3.5 River Conditions

Reach 2

As described in Section 4.2.1.2, river channel and Lake Mohave reservoir conditions are not expected to be affected with implementation of future flow-related covered activities and, therefore, habitat conditions are not expected to change.

Reach 3

The water surface elevation for minimum hourly river flows in April may fall as much as 3.0 feet with the implementation of future flow-related covered activities. The river edge, riffles, and side channels may be substantially affected. Depending on site-specific channel morphology, reduced depth in association with ongoing daily flow fluctuation could affect stranding of fish and desiccation of fish eggs and aquatic organisms in or on the substrate. The change in surface area in response to reduced depth under minimum flows indicates that the change in river surface area would be relatively small (i.e., 53 acres in the month of April representing about 1.5 percent of the total river surface area in Reach 3). The level of existing stranding and desiccation and how flow variability at a lower surface elevation interacts with channel morphology are currently unknown. The change in potential fish stranding losses and desiccation of aquatic

organisms, therefore, may be minor, especially relative to productivity for the entire reach. However, the reduced river depth, in combination with ongoing daily flow fluctuation, could increase stranding losses and desiccation relative to the existing condition.

The reduction in flow with implementation of future flow-related covered activities is not expected to measurably affect water temperature. Given that operations at Lake Mohave will not change, the temperature of the discharge from Davis Dam would not be affected.

River flow also affects contaminant concentration, which is the density of any undesirable physical, chemical, or biological constituent at concentrations not normally present in water. Dilution can be important if contaminants approach levels that are lethal or have chronic effects on aquatic species. Lower flow with implementation of future flow-related covered activities may result in higher contaminant concentrations. In addition to reduced flow, input of contaminants within Reach 3 may increase because LCR MSCP conservation areas that are established on currently unirrigated lands that will be irrigated to establish and maintain created covered species habitat, and could produce irrigation runoff. However, the level of contaminant input from these conservation areas is expected to be less than from irrigated farmlands. Although contaminant levels may increase, they have not been identified as a major factor affecting covered species in this reach, and effects of flow changes and the additional, relatively small, input from conservation areas may be inconsequential.

Diversions directly from the river may entrain aquatic organisms. River flow would be reduced in Reach 3 and result in an increase in the proportion of flow diverted. However, there are relatively few diversions directly from the river channel segment in Reach 3, and the diversions are small relative to river flow volume. The primary diversions in Reach 3 occur from Lake Havasu, including the Metropolitan and Central Arizona Water Conservation District (CAWCD) diversions. Diversions from Lake Havasu would increase with implementation of covered activities. Risk of entrainment of aquatic organisms related to the influence of the diversion will be minimally affected and will be similar to existing conditions.

Reach 4

With implementation of future flow-related covered activities, the reduction in river surface elevation for the minimum hourly flow in April may fall as much as 2.7 feet. As indicated for Reach 3, the river's edge, riffles, and side channels may be substantially affected. Depending on site-specific channel morphology, reduced depth in association with ongoing daily flow fluctuation could affect stranding of fish and desiccation of fish eggs and aquatic organisms in or on the substrate. The change in surface area in response to reduced depth under minimum flows indicates that the change in river surface area would be relatively small (i.e., 137 acres in the month of April in Reaches 4 and 5 representing about 1.5 percent of the total river surface area in these reaches). The level of existing stranding and desiccation and how flow variability at a lower surface elevation interacts with channel morphology are currently unknown. However, the reduced river depth, in combination with ongoing daily flow fluctuation, could increase stranding losses and desiccation relative to the existing condition.

The reduction in flow with implementation of covered activities is not expected to measurably affect water temperature. Given that variability in reservoir storage and water surface elevation would be the same as for existing conditions for Lake Havasu, the temperature of the discharge from Parker Dam with implementation of future flow-related covered activities would be similar to the temperature for existing conditions. Lower flow with implementation of future flow-related covered activities would not affect downstream water temperatures because temperatures reach ambient conditions in the pool created by Headgate Rock Dam.

Lower flow with implementation of future flow-related covered activities and LCR MSCP conservation measures may result in higher contaminant concentrations. In addition to reduced flow, input of contaminants within Reach 4 may increase from runoff from LCR MSCP conservation areas that are established on currently unirrigated lands that will be irrigated to establish and maintain created covered species habitat. The level of contaminant input from these conservation areas, however, is expected to be less than from irrigated farmlands. Although contaminant levels may increase, they have not been identified as a major factor affecting aquatic organisms in this reach, and effects of flow changes and the additional, relatively small, input from conservation areas may be inconsequential.

Diversions directly from the river may entrain aquatic organisms. Major diversions occur at Headgate Rock Dam and Palo Verde Diversion Dam. River flow would be reduced in Reach 4 by implementation of covered activities, and the proportion of flow diverted would increase.

Reach 5

With implementation of future flow-related covered activities, the reduction in river surface elevation in Reach 5 approaches 1.4 feet for minimum hourly flow in April. As indicated for Reaches 3 and 4, the river edge, riffles, and side channels may be substantially affected. The change in surface area in response to reduced depth under minimum flows indicates that the change in river surface area would be relatively small (i.e., 137 acres in the month of April in Reaches 4 and 5 representing about 1.5 percent of the total river surface area in these reaches). The reduced river depth, in combination with ongoing daily flow fluctuation, could increase stranding losses and desiccation of aquatic organisms and fish eggs relative to the existing condition.

Lower flow with implementation of covered activities may result in higher contaminant concentrations. In addition to reduced flow, input of contaminants in Reach 5 may increase from runoff from LCR MSCP conservation areas that are established on currently unirrigated lands that will be irrigated to establish and maintain created covered species habitat. The level of contaminant input from these conservation areas, however, is expected to be less than from irrigated farmlands. Diversions from Reach 5 are relatively minor, except for diversions at Imperial Dam, where most of the river flow is diverted into canals under both the existing conditions and with implementation of flow-related covered activities.

Reach 6

As described in Section 4.2.1.2, river channel conditions in Reach 6 are not expected to be affected with implementation of future flow-related covered activities and, therefore, habitat conditions are not expected to change.

Reach 7

As described in Section 4.2.2.2, river channel conditions in Reach 7 are not expected to be substantially affected with implementation of future flow-related covered activities and therefore habitat conditions are not expected to measurably change (see Appendix L).

4.2.3.6 Backwater

Open water and emergent vegetation components of backwaters provide habitat for the Yuma clapper rail, western least bittern, California black rail, bonytail, razorback sucker, and flannelmouth sucker. Natural maintenance of backwaters over the long term depends on river channel migration. Under existing conditions, the absence of annual high flows in excess of 40,000 cfs has virtually eliminated this river process. Long-term natural succession may gradually fill existing backwaters and will result in a net loss of backwaters that are gradually replaced by riparian vegetation.

The level of effect of flow-related covered activities on backwaters varies, depending on the connection to the river. The change in river flow described above for Reaches 3–5 (see Section 4.2.2.2, “River Flow”) would affect backwater water depth, surface area, flow continuity, and contaminant concentration. Environmental conditions in backwaters that depend on the frequency and rate of reservoir fluctuations will be similar to existing conditions, so that the future flow-related activities in reservoirs will not cause effects to backwaters (see Section 4.2.1.1).

Although the reduction in river surface elevation that relates to groundwater is relatively small for median flows, the elevation for minimum daily flow in April (see Table 4-2) may fall as much as 2.7 feet with the implementation of covered activities. The change in surface area in response to reduced depth indicates that the change in backwater area would be small relative to total backwater area and, for connected backwaters, river area (i.e., 209 acres in the month of April representing about 2 percent of the total surface area of backwaters in Reaches 3–5). Backwaters that are directly connected to the river are more sensitive to river flow changes than are backwaters dependent on groundwater elevation only. For connected backwaters, reduced backwater depth, in combination with ongoing daily flow fluctuation, could increase stranding losses, displacement of small juveniles from nursery habitat and cover, and desiccation of aquatic organisms and fish eggs relative to the existing condition. Effects depend on currently undocumented site-specific channel morphology and, given the relatively small proportion of backwater area affected, may be minor relative to productivity for all connected backwaters.

Reduced river flow may affect contaminant concentration in connected backwaters in Reaches 3, 4, and 5. In addition, input of contaminants within connected backwaters may

increase from runoff from irrigated conservation areas that were used to create habitat as part of the LCR MSCP.

River conditions in Reaches 6 and 7 attributable to flow-related covered activities associated with water supply and power generation would be unchanged relative to existing conditions. Therefore, no additional effects to backwaters due to future flow-related covered activities are anticipated.

4.3 Assessment of Non-Flow-Related Activities Effects

Non-flow-related covered activities are described in Chapter 2, "Description of Covered Activities." Non-flow-related activities primarily affect species and their habitat within the footprint of the activity. Future non-flow-related covered activities include the OM&R of existing water diversion and conveyance facilities and electrical generation and transmission facilities within the LCR MSCP planning area and programs and activities conducted by AGFD and NDOW. The indirect effects of non-flow-related covered activities on riverine processes (e.g., meandering) and the covered species habitats they support are described in Section 4.2.2.3.

This section describes the mechanisms through which non-flow-related covered activities could impact covered species and the assumptions used to conduct the assessment of those impacts.

4.3.1 Impact Mechanisms

The primary impact mechanisms for non-flow-related activities are physical and biological disturbance. These disturbances are described below.

4.3.1.1 Physical Disturbance

Physical disturbance is the removal or displacement of vegetation, topsoil, substrate, or overburden or the placement of topsoil, substrate, spoils, processed waste, or other material. Based on the description of the covered activities in Chapter 2 and the assumptions below in Section 4.3.2, physical disturbance associated with non-flow-related covered activities that could affect covered species primarily could result from operation of equipment to:

- periodically remove (e.g., chaining, dredging) marsh vegetation from canals, drains, and other water conveyance facilities;
- implement habitat restoration and maintenance projects; and
- maintain navigation aids, boat ramps, and boat docks and install artificial fish habitat structures.

Physical disturbance usually results from activities with a specific footprint, where the disturbance occurs within a specifiable area and time frame. The extent of species habitat affected can generally be quantified before the activity occurs. Operation of equipment to implement the non-flow-related activities described above will result in the temporary or permanent removal of existing habitat for covered species. Maintenance activities associated with navigation aids, boat ramps, and boat docks and artificial fish habitat structures could alter river and reservoir structure, but the area affected by these activities is likely only a fraction of an acre individually and likely only a few acres cumulatively.

In addition activities causing physical disturbance potentially introduce contaminants into the air, soil, and water. Potential contaminants include fertilizers, pesticides, paint, and petroleum products. The introduction of contaminants generally occurs during ongoing disturbance, such as occurs with construction and maintenance activities. Activities at intervals shorter than 1 year that introduce contaminants potentially have adverse effects on survival and growth, cumulatively affecting abundance, distribution, and production of species populations.

4.3.1.2 Biological Disturbance

All construction and maintenance activities would result in biological disturbance—the intentional or unintentional removal or displacement of individual organisms. Biological disturbances associated with these activities could be manifested in the location where the activities are undertaken or on adjacent lands. Biological disturbance may be temporary or permanent and includes effects on behavior. For example, operation of equipment in habitat occupied by covered species could cause direct mortality of or physical trauma to individuals, and noise and visual disturbances associated with operation of equipment could cause covered wildlife and fish species to move from the area of disturbance.

4.3.2 Assumptions

The non-flow-related covered activities described in Chapter 2, “Description of Covered Activities,” identify the non-flow-related activities that may be undertaken by the Applicants, but do not describe specific locations where the activities may be implemented. The assessment of non-flow-related impacts, therefore, is based on the assumptions described below. The timing of implementation of the proposed non-flow-related activities is not known at this time, and it is possible that some of the proposed activities may not be implemented within the term of the LCR MSCP, depending on whether the need to implement them develops as currently predicted. The Applicants intend to replace covered species habitat potentially affected by non-flow-related activities in advance of the implementation of these activities. In addition, ongoing and future activities related to conducting listed species surveys and capturing and handling species will be undertaken by qualified biologists authorized to conduct such activities under section 10(a)(1)(A) permits and, therefore, are not effects of and are not assessed in the LCR MSCP HCP.

The assessment of non-flow-related effects assumes that, to the extent practicable:

- Activities associated with OM&R of hydroelectric generation and transmission facilities will avoid impacts on covered species.
- A total of 234 miles of canals in the Yuma Valley, Arizona, that are currently maintained by the Yuma County Water Users Association will continue to be maintained such that emergent vegetation does not become established and, therefore, does not support Yuma clapper rail, western least bittern, or California black rail habitat. Consequently, these activities will not affect these species, and avoidance of maintenance activities during the breeding season is not required.
- Ongoing maintenance of 557 miles of canals, drains, and other water conveyance features in California and Arizona by water districts will include the periodic removal of patches of marsh vegetation that may become established in canals, drains, and other water conveyance features. Because of their design, only small patches of emergent vegetation are likely to become established in the 313 miles of canals and their periodic removal would have negligible effects on associated covered species. Periodic maintenance of 244 miles of drains however, are assumed to remove up to 30 acres of emergent vegetation.
- Sites for habitat restoration (including new infrastructure necessary to access or maintain restored habitat) covered activities will, to the extent practicable, be selected to avoid removal of existing cottonwood-willow, marsh, honey mesquite, and backwater land cover types that provide habitat for covered and evaluation species. Over the term of the LCR MSCP, however, some degraded covered species habitat could be removed to restore higher value habitat for other species. The assessment of impacts on covered species assumes that habitat restoration projects will avoid removing honey mesquite type III land cover and, over the term of the LCR MSCP, could remove up to:
  - 10 acres of degraded and low-value cottonwood-willow land cover types III and IV (types I and II will not be removed);
  - 10 acres of degraded and low-value marsh land cover; and
  - 10 acres of HM IV (type III will not be removed).
- Implementation of the non-flow-related covered activities (primarily those related to restoring habitat) would result in the removal of land cover types that may support some transitory or minor level of use (predominantly saltcedar and mixed saltcedar communities) by individuals of one or more covered species, but that do not constitute habitat under the LCR MSCP species habitat models. Implementation of the avoidance and minimization measures (AMMs) described in Section 5.6.1, “Avoidance and Minimization Measures,” however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.
- Habitat restoration projects will avoid removing desert pocket mouse habitat to restore habitat for other species.
- Ground-disturbing activities associated with OM&R of dams, diversions, powerlines and other water conveyance and hydroelectric generation facilities, including existing access and service roads, docks, boat ramps, and protected banklines that support OM&R of these facilities will not remove covered species habitat.

- Ground-disturbing activities associated with maintaining and creating habitats will avoid impacts on the sticky buckwheat and threecorner milkvetch.
- Covered activities will be implemented to avoid the breeding season of all covered bird species to prevent injury or mortality of eggs and young birds unable to avoid these activities.
- Implementation of the habitat creation projects will avoid take of individual desert tortoises and their burrows.

4.4 Assessment of LCR MSCP Implementation Effects

LCR MSCP conservation measures are described in Chapter 5, "Conservation Plan." The LCR MSCP conservation measures are intended to be beneficial to the covered and evaluation species. However, implementation of some conservation measures to create covered species habitats may have short-term adverse effects during construction or prior to development of habitat values. In addition, activities that benefit one covered species may be detrimental to other covered species. Activities that will be undertaken to maintain created habitats over the term of the LCR MSCP, such as dredging marshes and removing cottonwood trees to maintain habitat structure, may also have short-term adverse effects on covered species. The purpose of this section is to identify potential adverse effects on covered and evaluation species of implementing LCR MSCP conservation measures. Beneficial effects of implementing LCR MSCP conservation measures are described in Chapter 5, "Conservation Plan."

This section describes the mechanism through which implementation of the Conservation Plan could impact covered species and the assumptions used to conduct the assessment of those impacts.

4.4.1 Impact Mechanisms

The primary impact mechanisms related to LCR MSCP conservation measures are physical disturbance, biological disturbance, and irrigation drainage associated with establishing and managing created covered species habitats. The types of effects associated with physical disturbance and biological disturbance are the same as described for non-flow-related activities (see Section 4.3.1).

Drainage is the removal of excess surface water from a land surface by means of surface or subsurface drains and subsequent discharge to rivers, reservoirs, or backwaters (Nevada Division of Water Planning 1996). Drainage flow in the LCR MSCP planning area is primarily surface or subsurface runoff and return flows from irrigated agricultural lands. Conversion of existing land cover types to create covered species habitat could include irrigation of new lands, changes in irrigation patterns on existing irrigated lands, and potential additional changes in input of surface or subsurface flows and contaminants to the river and reservoirs. Expected changes in drainage volume associated with creation of 8,132 acres of habitat (see Chapter 5, "Conservation Plan"), or 3 percent of

the total agricultural lands present in the LCR MSCP planning area, have not been quantified but are not expected to exceed 3 percent of the existing volume of agricultural drainage.

4.4.2 Assumptions

The LCR MSCP conservation measures described in Chapter 5, "Conservation Plan," identify the types and extent of covered species habitat to be created but do not describe specific locations where the conservation measures would be implemented. The assessment of impacts of LCR MSCP conservation measures, therefore, is qualitative and based on the types of effects that such activities would likely have on covered and evaluation species if the activities are implemented in their habitat.

The timing of implementation of specific LCR MSCP conservation measures is not known at this time. It is the intent of the Applicants, however, to implement the LCR MSCP as quickly as is permitted by efficient staffing, funding, and the time required to conduct necessary research relative to creating covered species habitats and required to evaluate and acquire lands that are suitable for creating covered species habitat. Within these constraints, it is also the intent of the Applicants to replace covered species habitat potentially affected by covered activities in advance of the implementation of covered activities (see Section 5.10, "Timing of Implementing Conservation Measures").

LCR MSCP activities related to conducting species surveys and capturing and handling species will be undertaken, at the direction of the Program Manager, by qualified biologists authorized to conduct such activities under section 10(a)(1)(A) permits and, therefore, are not effects of and not assessed in the LCR MSCP HCP. LCR MSCP conservation measures that provide funds to other conservation programs and to management agencies to implement measures to benefit LCR MSCP covered species, including the maintenance of existing covered species habitats, will also be undertaken by qualified biologists authorized to conduct such activities under section 10(a)(1)(A) permits and, therefore, are not effects of and not assessed in the LCR MSCP HCP.

The assessment of LCR MSCP effects assumes that, to the extent practicable:

- Sites for habitat creation will be selected to avoid removal of existing cottonwood-willow, marsh, honey mesquite, and backwater land cover types that provide habitat for covered and evaluation species. Temporary disturbance of habitat and direct impacts on covered species, however, may be associated with creating habitats and subsequent habitat maintenance activities (e.g., controlled burning in marshes and removal of trees to maintain succession objectives on created habitat).
- LCR MSCP conservation measures will be implemented to avoid the breeding season of all covered bird species to prevent injury or mortality of eggs and young birds unable to avoid these activities.
- Sites for habitat creation will be selected to avoid removal of occupied southwestern willow flycatcher habitat.
- Implementation of the LCR MSCP Conservation Plan will avoid take of individual desert tortoises and their burrows.

- Ground-disturbing activities associated with maintaining and creating habitats will avoid impacts on the sticky buckwheat and threecorner milkvetch.

The assessment of LCR MSCP effects also assumes that, in addition to 8,132 acres of land that will be required to create covered species habitats, 81 acres (i.e., 1 percent of the total extent of LCR MSCP created habitat) will be required for construction of new infrastructure in support of the created habitats (i.e., a total of 8,213 acres of land will be needed to establish and maintain created covered species habitats). Based on current LCR MSCP estimates, the impact assessment assumes the following.

- Approximately two-thirds of LCR MSCP created habitat and associated infrastructure would be created on agricultural lands (4,964 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.
- Up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Conversion of existing degraded or former marsh to create habitat for these species, however, will not result in a loss of existing habitat. If individuals of these species are present in affected marshes, implementation of the AMMs described in Section 5.6.1 would reduce the likelihood and level of take.
- Up to 360 acres of existing degraded or former backwaters that may provide low-value habitat could be converted to create fully functioning backwaters that provides high-value bonytail, razorback sucker, and flannelmouth sucker habitat. Conversion of existing degraded or former backwaters to create habitat for these species, however, will not result in a loss of existing habitat.
- Approximately 2,377 acres (based on the previous three assumptions) of covered species habitat will be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered to be habitat. These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. Implementation of the AMMs described in Section 5.6.1, “Avoidance and Minimization Measures,” however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

4.5 Impacts on Covered Species

Impacts of implementing the covered activities and the LCR MSCP Conservation Plan on covered species are the effects of actions that result in the taking of a covered species as defined under the ESA. Take is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct” with respect to Federally listed species (ESA 3[9] and 50 C.F.R. §17.31[a]). The USFWS further defines “harm” to include the significant modification or degradation of habitat that results in the death or injury to a species by significantly impairing behavioral patterns, such as breeding, feeding, or sheltering (50 C.F.R. §17.3). “Harass” is defined as performing actions that create the likelihood of injury to listed species to such an extent as to

significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding or sheltering (50 C.F.R. §17.3).

Table 4-4 identifies the covered activities that could adversely affect the covered species. Table 4-5 summarizes the estimated extent of covered and evaluation species habitat that could be degraded or removed as a result of implementing covered activities and the LCR MSCP Conservation Plan. Table 4-6 summarizes all impacts on covered and evaluation species and the expected level of take associated with implementing covered activities and the LCR MSCP Conservation Plan. The following sections describe the impacts of implementing the non-flow- and flow-related covered activities and LCR MSCP conservation measures on each of the covered and evaluation species.

4.5.1 Yuma Clapper Rail

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of Yuma clapper rail habitat throughout its present range over the term of the LCR MSCP. The effects of covered activities and LCR MSCP conservation measures on the distribution and status of the Yuma clapper will be minimized with implementation of LCR MSCP AMMs and the creation of habitat to replace affected habitat. Creation of habitat in addition to that required to replace lost habitat with implementation of the LCR MSCP Conservation Plan is expected to contribute to recovery of the Yuma clapper rail.

4.5.1.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the Yuma clapper rail. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 133 acres of Yuma clapper rail habitat (see Table 4-5) provided by marshes associated with backwaters. Reservoir elevations in Reaches 3–5 would not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta [Reach 3]) or that are managed to support marsh vegetation (e.g., Imperial NWR [Reach 5]). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing habitat conditions (see Table 4-3). Lowering groundwater elevations could cause direct loss of these habitats through desiccation, fragmentation, or reduction in the extent of habitat patches.

As described in Section 4.2.3.3, implementation of flow-related covered activities may affect marsh vegetation that provides Yuma clapper rail habitat that may periodically establish at inflow points of Lake Mead (e.g., Colorado River delta, Virgin River delta, Muddy River delta, Las Vegas Wash) when Lake Mead water surface elevations are below full pool elevation. Marsh habitat below the full pool elevation will be created and lost based on water surface elevations. For example, marsh vegetation established at a certain elevation may be lost if the water surface elevation declines so that groundwater elevations drop below the rooting depths of emergent vegetation. Alternatively,

Table 4-4. Covered Activities that could Adversely Affect Covered Species

Common and Scientific Name	Flow-Related Covered Activities		Non-Flow-Related Covered Activities		LCR MSCP
	Ongoing	Future	Ongoing	Future	
Threatened and Endangered Species					
Yuma clapper rail *Rallus longirostris yumanensis*	X	X	X	X	X
Southwestern willow flycatcher *Empidonax trailii extimus*	X	X	X	X	X
Desert tortoise (Mojave population) *Gopherus agassizii*			X	X	X
Bonytail *Gila elegans*	X	X	X	X	X
Humpback chub *Gila cypha*	X	X			
Razorback sucker *Xyrauchen texanus*	X	X	X	X	X
Other Covered Species					
Western red bat *Lasiurus blossevillii*	X	X	X	X	X
Western yellow bat *Lasiurus xanthinus*	X	X	X	X	X
Desert pocket mouse *Chaetodipus penicillatus sobrinus*			X	X	X
Colorado River cotton rat *Sigmodon arizonae plenus*	X	X	X	X	X
Yuma hispid cotton rat *Sigmodon hispidus eremicus*			X	X	X
Western least bittern *Ixobrychus exilis hesperis*	X	X	X	X	X
California black rail *Laterallus jamaicensis coturniculus*	X	X	X	X	X
Yellow-billed cuckoo *Coccyzus americanus occidentalis*	X	X	X	X	X
Elf owl *Micrathene whitneyi*	X	X	X	X	X
Gilded flicker *Colaptes chrysoides*	X	X	X	X	X
Gila woodpecker *Melanerpes uropygialis*	X	X	X	X	X
Vermilion flycatcher *Pyrocephalus rubinus*	X	X	X	X	X

Table 4-4. Continued

Common and Scientific Name	Flow-Related Covered Activities		Non-Flow-Related Covered Activities		LCR MSCP
	Ongoing	Future	Ongoing	Future	
Arizona Bell's vireo *Vireo bellii arizonae*	X	X	X	X	X
Sonoran yellow warbler *Dendroica petechia sonorana*	X	X	X	X	X
Summer tanager *Piranga rubra*	X	X	X	X	X
Flat-tailed horned lizard *Phrynosoma mcalli*			X	X	X
Relict leopard frog *Rana onca*	X	X			
Flannelmouth sucker *Catostomus latipinnis*	X	X	X	X	X
MacNeill's sootywing skipper *Pholisora gracielae*	X	X	X	X	X
Sticky buckwheat *Eriogonum viscidulum*	X	X			
Threecorner milkvetch *Astragalus geyeri* var. *triquetrus*	X	X			
California leaf-nosed bat *Macrotus californicus*					
Pale Townsend's big-eared bat *Corynorhinus townsendii pallescens*					
Colorado River toad *Bufo alvarius*					
Lowland leopard frog *Rana yavapaiensis*					

Table 4-5. Summary of Estimated Extent of Covered Species Habitat Affected with Implementation of the Covered Activities, Including Reduction in Annual Flow of 0.860 Million Acre-Feet in Reach 3 and of 1.574 Million Acre-Feet in Reaches 4 and 5 (acres)

	Impacts of Non-Federal Covered Activities on Species Habitat				
Covered Species	Removed (Non-Flow-Related)	Degraded (Flow-Related)	Total Impacts of Implementation on Species Habitat	Impacts of Federal Non-Flow-Related Covered Activities[a]	Total Impacts on Species Habitat[b]
Threatened and Endangered Species					
Yuma clapper rail	40[c]	133	173	70	243
Southwestern willow flycatcher	10	1,784	1,794	59	1,853
Desert tortoise (Mojave population)	0	0	0	192	192
Bonytail	0	399	399	0	399
Humpback chub	0	ND[d]	ND[d]	0	ND[d]
Razorback sucker	0	399	399	0	399
Other Covered Species					
Western red bat (roosting habitat)	0	161	161	604	765
Western yellow bat (roosting habitat)	0	161	161	604	765
Desert pocket mouse	0	0	0	0	0
Colorado River cotton rat	5[e]	59	64	3	67
Yuma hispid cotton rat	5[f]	0	5	71	76
Western least bittern	40[c]	133	173	70	243
California black rail	35[g]	37	72	31	103
Yellow-billed cuckoo	10[h]	1,425	1,435	99	1,534
Elf owl	0	161	161	590	751
Gilded flicker	10[h]	1,425	1,435	99	1,534
Gila woodpecker	10[h]	819	829	26	855
Vermilion flycatcher	10[h]	1,890	1,900	714	2,614
Arizona Bell's vireo	20[i]	1,654	1,674	1,309[j]	2,983

Covered Species	Impacts of Non-Federal Covered Activities on Species Habitat			Impacts of Federal Non-Flow-Related Covered Activities[a]	Total Impacts on Species Habitat[b]
	Removed (Non-Flow-Related)	Degraded (Flow-Related)	Total Impacts of Implementation on Species Habitat		
Sonoran yellow warbler	10[h]	2,929	2,939	183	3,122
Summer tanager	0	161	161	14	175
Flat-tailed horned lizard	0	0	0	128	128
Relict leopard frog	0[k]	0[k]	0[k]	0	0[k]
Flannelmouth sucker	0	85	85	0	85
MacNeill's sootywing skipper	0	172	172	50	222
Sticky buckwheat	0	ND[l]	ND[l]	0	ND[l]
Threecorner milkvetch	0	ND[l]	ND[l]	0	ND[l]
Evaluation Species					
California leaf-nosed bat (roosting habitat)	0	0	0	0	0
Pale Townsend's big-eared bat (roosting habitat)	0	0	0	0	0
Colorado River toad	0	0	0	0	0
Lowland leopard frog	0	0	0	0	0

Note: LCR MSCP conservation measures to create habitat for covered species will avoid removal of cottonwood-willow, honey mesquite, marsh, and backwater land cover types that provide habitat for covered species, and, therefore, impacts of implementing the LCR MSCP conservation measures are not shown in this table. The LCR MSCP currently estimates that about two-thirds of LCR MSCP created habitat would be created on agricultural lands (5,045 acres), including associated infrastructure (estimated to be 1% of all habitat created, or 81 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.

The LCR MSCP impact assessment also assumes that up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Up to 360 acres of existing degraded or former backwaters could also be converted to create fully functioning backwaters that provides high-value habitat for the bonytail, razorback sucker, and flannelmouth sucker. Conversion of existing degraded or former marsh and backwaters to create habitat for these species, however, will not result in a loss of existing habitat.

The remainder of LCR MSCP habitat (currently estimated to be 2,377 acres) would be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered habitat. These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. Implementation of the avoidance

and minimization measures described in Section 5.6.1, "Avoidance and Minimization Measures," however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

[a] The estimated effects on covered species habitats that will result from implementation of the Federal non-flow-related covered activities addressed in the LCR MSCP BA. The amount of land cover types to be created to provide covered species habitats described in Chapter 5, "Conservation Plan," includes the creation of sufficient land cover to provide covered species habitat to mitigate both the impacts of implementing the LCR MSCP HCP and the Federal non-flow-related activities on covered species habitats.

[b] Includes the impacts of implementing non-Federal covered activities and Federal non-flow-related covered activities on covered species habitats.

[c] Includes the potential for periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains and for removal of up to 10 acres of degraded marsh land cover that could provide low-value habitat for this species could be restored as wildlife habitat for other species over the term of the LCR MSCP.

[d] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in reservoir elevations associated with implementation of flow-related covered activities, however, could result in the establishment of up to 62 miles of transitory Colorado River channel when the reservoir pool is maintained at lower elevations that could be occupied by humpback chub and subsequently lost when reservoir elevations rise.

[e] Assumes that up to 5 acres of degraded marsh land cover that could provide low-value habitat for this species could be restored in Reaches 3 and 4 as wildlife habitat for other species over the term of the LCR MSCP.

[f] Assumes that up to 5 acres of degraded cottonwood-willow land cover that could provide low-value habitat for this species could be restored in Reaches 6 and 7 as wildlife habitat for other species over the term of the LCR MSCP.

[g] Includes the potential for periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains and for removal of up to 5 acres of degraded marsh land cover that could provide low-value habitat for this species could be restored as wildlife habitat for other species over the term of the LCR MSCP.

[h] Assumes that up to 10 acres of degraded cottonwood-willow land cover that could provide low-value habitat for this species could be restored as wildlife habitat for other species over the term of the LCR MSCP.

[i] Assumes that up to 10 acres of degraded cottonwood-willow and 10 acres of honey mesquite type IV land cover that could provide low-value habitat for this species could be restored as wildlife habitat for other species over the term of the LCR MSCP.

[j] Includes 610 acres of honey mesquite type IV (which provides Arizona Bell's vireo habitat) that could be converted to agricultural uses and that are covered under the LCR MSCP. Up to an additional 3,832 acres of honey mesquite IV that provides habitat could be removed by Federal non-flow-related activities, however, these activities and resultant impacts are not covered under the LCR MSCP.

[k] Implementation of covered activities will not result in removal of this species habitat but could result in temporary disturbance of habitat or affect movement of individuals.

[l] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities, however, would result in periodic loss of habitat that is exposed along the Lake Mead shoreline when reservoir elevations are low and then is subsequently inundated when reservoir elevations rise.

Table 4-6. Summary of Impacts on Covered and Evaluation Species and Estimated Level of Take Associated with Implementation of Flow- and Non-Flow-Related Covered Activities and the LCR MSCP Conservation Plan

Species	Impacts and Estimated Level of Take
Threatened and Endangered Species	
Yuma clapper rail	▪ Loss of up to 133 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 70 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains ▪ Potential for disturbance of up to 512 acres of existing degraded or former marsh that may provide low-value habitat associated with converting it to fully functioning marsh that provides high-value habitat ▪ Potential for removal of some limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Southwestern willow flycatcher	▪ Loss of up to 1,784 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 59 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded low-value habitat associated with restoration of habitat and habitat-management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan
Desert tortoise (Mojave population)	▪ Loss of up to 192 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for direct mortality of individuals associated with operation of vehicles and other equipment with implementation of non-flow-related covered activities and implementation of the LCR MSCP Conservation Plan over the term of the LCR MSCP

Species	Impacts and Estimated Level of Take
Bonytail	▪ Loss of up to 399 acres of habitat associated with implementation of flow-related covered activities ▪ Potential temporary disturbance of habitat associated with creation of habitat and habitat management activities. ▪ Potential for entrainment of individuals at diversions over the term of the LCR MSCP ▪ Potential for direct mortality of individuals as a result of stranding over the term of the LCR MSCP
Humpback chub	▪ Periodic loss of up to 62 miles of transitory Colorado River channel habitat that may be present in Lake Mead when the reservoir is below full pool elevation and lost when reservoir elevations are raised
Razorback sucker	▪ Loss of up to 399 acres of habitat associated with implementation of flow-related covered activities ▪ Potential for periodic loss of razorback sucker spawning habitat in Lake Mead (Reach 1) with implementation of flow-related covered activities ▪ Potential temporary disturbance of habitat associated with creation of habitat and habitat management activities. ▪ Potential for entrainment of individuals at diversions over the term of the LCR MSCP ▪ Potential for direct mortality of individuals as a result of stranding over the term of the LCR MSCP
Other Covered Species	
Western red bat (roosting habitat)	▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 604 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of covered activities

Species	Impacts and Estimated Level of Take
Western yellow bat (roosting habitat)	▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 604 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of covered activities
Desert pocket mouse	▪ Potential temporary or permanent disturbance or loss of habitat associated with creation of habitat and habitat management activities[b] ▪ Potential temporary disturbance of habitat associated with creation of LCR MSCP habitats and habitat management activities ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Colorado River cotton rat	▪ Loss of up to 59 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 3 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 5 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for disturbance of up to 125 acres of existing degraded or former marsh that may provide low-value habitat associated with converting it to fully functioning marsh that provides high-value habitat ▪ Potential for removal of some limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP

Species	Impacts and Estimated Level of Take
Yuma hispid cotton rat	▪ Loss of up to 71 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 5 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Western least bittern	▪ Loss of up to 133 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 70 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains ▪ Potential for disturbance of up to 512 acres of existing degraded or former marsh that may provide low-value habitat associated with converting it to fully functioning marsh that provides high-value habitat ▪ Potential for removal of some limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP

Species	Impacts and Estimated Level of Take
California black rail	▪ Loss of up to 37 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 31 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 5 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains ▪ Potential for disturbance of up to 130 acres of existing degraded or former marsh that may provide low-value habitat associated with converting it to fully functioning marsh that provides high-value habitat ▪ Potential for removal of some limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Yellow-billed cuckoo	▪ Loss of up to 1,425 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 99 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP

Species	Impacts and Estimated Level of Take
Elf owl	▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 590 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Gilded flicker	▪ Loss of up to 1,425 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 99 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Gila woodpecker	▪ Loss of up to 819 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 26 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP

Species	Impacts and Estimated Level of Take
Vermilion flycatcher	▪ Loss of up to 1,890 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 714 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Arizona Bell's vireo	▪ Loss of up to 1,654 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 1,309 acres of habitat associated with implementation of Federal non-flow-related covered activities[a,c] ▪ Potential for loss of up to 20 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP

Species	Impacts and Estimated Level of Take
Sonoran yellow warbler	▪ Loss of up to 2,929 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 183 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Summer tanager	▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 14 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Flat-tailed horned lizard	▪ Loss of up to 128 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities and the LCR MSCP over the term of the LCR MSCP
Relict leopard frog	▪ Potential temporary disturbance of habitat associated with creation of habitat and habitat management activities ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP

Species	Impacts and Estimated Level of Take
Flannelmouth sucker	▪ Loss of up to 85 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic loss of transitory Colorado River and Virgin River channel habitat that may be present in Lake Mead when the reservoir is below full pool elevation and lost when reservoir elevations are raised ▪ Potential temporary disturbance of habitat associated with creation of habitat and habitat management activities ▪ Potential for entrainment of individuals at diversions over the term of the LCR MSCP ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
MacNeill's sootywing skipper	▪ Loss of up to 172 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 50 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential disturbance of or loss of a small, unquantifiable amount of habitat associated with creation of habitat and habitat management activities. ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP
Sticky buckwheat	▪ Potential for direct mortality of individuals associated with implementation of flow-related covered activities over the term of the LCR MSCP ▪ Periodic loss of habitat that is exposed along the Lake Mead shoreline when reservoir elevations are low and then is subsequently inundated when reservoir elevations rise (caused by changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities)
Threecorner milkvetch	▪ Potential for direct mortality of individuals associated with implementation of flow-related covered activities over the term of the LCR MSCP ▪ Periodic loss of habitat that is exposed along the Lake Mead shoreline when reservoir elevations are low and then is subsequently inundated when reservoir elevations rise (caused by changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities)

Species	Impacts and Estimated Level of Take
Evaluation Species	
California leaf-nosed bat (roosting habitat)	▪ Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of flow-related activities
Pale Townsend's big-eared bat (roosting habitat)	▪ Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of flow-related activities
Colorado River toad	▪ No impacts expected
Lowland leopard frog	▪ No impacts expected

Note:

[a] The estimated effects on covered species habitats that will result from implementation of the Federal non-flow-related covered activities addressed in the LCR MSCP BA. The amount of land cover types to be created to provide covered species habitats described in Chapter 5, "Conservation Plan," includes the creation of sufficient land cover to provide covered species habitat to mitigate the impacts of implementing both the LCR MSCP HCP and the Federal non-flow-related activities on covered species habitats.

[b] The LCR MSCP currently estimates that about two-thirds of LCR MSCP created habitat would be created on agricultural lands (5,045 acres), including associated infrastructure (estimated to be 1% of all habitat created, or 81 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.

The LCR MSCP impact assessment also assumes that up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Up to 360 acres of existing degraded or former backwaters could also be converted to create fully functioning backwaters that provides high-value habitat for the bonytail, razorback sucker, and flannelmouth sucker. Conversion of existing degraded or former marsh and backwaters to create habitat for these species, however, will not result in a loss of existing habitat.

The remainder of LCR MSCP habitat (currently estimated to be 2,377 acres) would be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered habitat. These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. Implementation of the avoidance and minimization measures described in Section 5.6.1, "Avoidance and Minimization Measures," however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

[c] Includes 610 acres of honey mesquite type IV (which provides Arizona Bell's vireo habitat) that could be converted to agricultural uses and that are covered under the LCR MSCP. Up to an additional 3,832 acres of honey mesquite IV that provides habitat could be removed by Federal non-flow-related activities. However, these activities and resultant impacts are not covered under the LCR MSCP.

established marsh vegetation would be inundated and lost during wetter periods, when Lake Mead reservoir elevations rise. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of these emphemeral marshes, however, could result in a low level of take of Yuma clapper rail over the term of the LCR MSCP.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities in Reaches 3–5 could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

4.5.1.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects, facilities and infrastructure maintenance, and operation of watercraft for law enforcement along the LCR may result in take of the Yuma clapper rail. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of Yuma clapper rail increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat and harassment or mortality of individuals. These activities, however, would be conducted, to the extent practicable, when nesting adults and young birds are not present. Effects on habitat would be temporary for restoration projects that restore or improve existing Yuma clapper rail habitat. The probability for permanent loss of habitat is considered minimal because restoration projects undertaken in existing Yuma clapper rail habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove Yuma clapper rail habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded or former marsh that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species (see Table 4-5).

Activities associated with maintaining facilities and infrastructure may result in the periodic removal of emergent vegetation growing in canals and drains that provides Yuma clapper rail habitat. Up to 557 miles of canals and drains that could support some patches of emergent vegetation could be subject to periodic maintenance activities that would remove emergent vegetation over the term of the LCR MSCP. As described in Section 44.2.3.1, it is unlikely that maintenance of canals would measurably affect the extent of species habitat. Periodic maintenance of the 244 miles of drains in the LCR MSCP planning area, however, could result in the removal of up to 30 acres of emergent vegetation that could provide habitat. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 70 acres of species habitat (see Table 4-5).

Operation of law enforcement patrol boats to enforce no-wake zone regulations that protect habitat (e.g., the Bill Williams Delta) will also generate boat wakes in the no-

wake zones for short periods when other watercraft are being pursued. During the breeding season, boat wakes could swamp nests, potentially resulting in mortality of eggs or nestlings. Because the frequency with which such incidents occur (AGFD estimates 150–200 person-days are expended annually enforcing no-wake zone regulations and NDOW estimates 25–30 person-days are annually expended operating watercraft in sensitive off-channel areas that could support habitat in the LCR MSCP planning area) and the duration with which patrol boats generate boat wakes in protected habitat (i.e., the period required to stop a boat) are likely low and, therefore, a low level of take is expected.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the Yuma clapper rail.

4.5.1.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created backwaters and marsh as habitat for covered species in Yuma clapper rail habitat may result in take of Yuma clapper rail. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to fully functioning marsh that provides high-value Yuma clapper rail habitat. Some additional limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species; however, with implementation of the AMMs described in Section 5.6.1, “Avoidance and Minimization Measures,” removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of Yuma clapper rail.

Habitat management–related activities, such as operating equipment to remove vegetation and maintain open water in backwaters and burning decadent marsh vegetation to stimulate vegetation growth, could result in temporary loss of habitat and harassment of individuals. To the extent practicable, these activities would be conducted when nesting adults and young birds are not present to avoid injury or mortality. The LCR MSCP will avoid removal of habitat to establish habitat for other covered species. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 512 acres (i.e., the extent of marsh land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of Yuma clapper rail increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.2 Southwestern Willow Flycatcher

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of southwestern willow flycatcher habitat throughout its present range over the term of the LCR MSCP. The effects of covered activities and LCR MSCP conservation measures on the distribution and status of the southwestern willow flycatcher will be minimized with implementation of LCR MSCP AMMs and the creation of habitat to replace affected habitat. Creation of habitat in addition to that required to replace lost habitat with implementation of the LCR MSCP Conservation Plan is expected to contribute to recovery of the southwestern willow flycatcher.

Critical habitat for the southwestern willow flycatcher has been proposed within Reaches 1 and 3–6. For the reasons described below, implementation of the covered activities and the LCR MSCP could impact proposed southwestern willow flycatcher critical habitat. These impacts, however, are not expected to appreciably diminish the value of critical habitat for species conservation (see the LCR MSCP BA for a full description of potential impacts of the covered activities and the LCR MSCP on proposed southwestern willow flycatcher critical habitat).

4.5.2.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the southwestern willow flycatcher. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,784 acres of occupied (1,643 acres) and unoccupied (141 acres) southwestern willow flycatcher habitat (see Table 4-7). Breeding habitat will be affected primarily as a result of a loss of moist surface soil conditions during the breeding season with the lowering of groundwater elevations. The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 2,135 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing conditions (see Table 4-3). Southwestern willow flycatcher nesting habitat is assumed to be lost if the predicted reduction of groundwater elevation with implementation of changes in points of diversion are sufficient to cause the loss of surface water or moist soil surface conditions in nesting habitat during the breeding season.

Table 4-7. Reduction in Extent of Southwestern Willow Flycatcher Nesting Habitat (1996–2001) by Land Cover Type (0.860-million-acre-foot flow reduction in Reach 3 and 1.574-million-acre-foot flow reduction in Reaches 4 and 5)

	Reach			
Habitat Status	3	4	5	Total
Occupied	168	187	1,288	1,643
Unoccupied	12	102	27	141
Total	**180**	**289**	**1,315**	**1,784**

As described in Section 4.2.3.4, riparian vegetation that could provide habitat for the southwestern willow flycatcher may establish as Lake Mead reservoir elevations change over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. However, the amount, type, quality, and longevity of this habitat depends on how much soil is exposed, the quality of the soil, when drawdowns occur, and how long habitat is exposed and/or inundated. Hydrologic modeling (see Appendix J) predicts that Lake Mead elevations will fluctuate between full level and progressively lower levels during the 50-year period of analysis. Therefore, there may be a possible benefit from the proposed action, because of fluctuations in Lake Mead, willow flycatcher habitat will develop at the Colorado, Muddy, and Virgin river deltas of lake Mead. Yet, it is unknown how long this habitat will persist, if it develops at all.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities in Reaches 3–5 could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

4.5.2.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects and facilities and infrastructure maintenance in the LCR MSCP planning area may result in take of the southwestern willow flycatcher. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 59 acres of species habitat (see Table 4-5). The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of southwestern willow flycatchers increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species.

Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the southwestern willow flycatcher. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing southwestern willow flycatcher habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove southwestern willow flycatcher habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the southwestern willow flycatcher.

4.5.2.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the southwestern willow flycatcher. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary southwestern willow flycatcher habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage the development of multiage stands of trees and to maintain edge habitat and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of southwestern willow flycatcher increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.3 Desert Tortoise (Mojave Population)

The desert tortoise occurs in arid vegetation communities, typically in association with creosote bush scrub, that are not dependent on groundwater. Consequently, flow-related activities will not affect the desert tortoise and are, therefore, not expected to result in take or adverse modification of its designated critical habitat. The potential effects of implementing non-flow-related covered activities and LCR MSCP conservation measures on distribution and status of the Mojave population of desert tortoise are expected to be minor, potentially affecting a small number of individuals and small patches of habitat. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the desert tortoise.

4.5.3.1 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects and facilities and infrastructure maintenance may result in take of the desert tortoise. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of 192 acres of species habitat (see Table 4-5).

Restoration projects are not expected to be implemented in desert tortoise habitat because it is unlikely the desert scrub communities the tortoise inhabits will be restored as aquatic, wetland, or riparian land cover. Removal of relatively small amounts of habitat, however, could be required if access roads and other infrastructure required to install and maintain restored habitats are constructed in desert tortoise habitat. The level of habitat removal, however, is expected to be minimal and is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take. Injury or mortality of individual tortoises associated with implementing restoration projects, to the extent practicable, will be avoided. Over the term of the LCR MSCP, however, these activities are expected to result in some low level of take (i.e., mortality) of individuals associated with operation of vehicles and equipment in habitat.

Activities associated with maintaining facilities and infrastructure are generally expected to avoid effects on desert tortoise habitat. Over the term of the LCR MSCP, however, these activities are expected to result in some low level of take (i.e., mortality) of individuals associated with operation of vehicles and equipment in habitat.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the desert tortoise.

4.5.3.2 Effects of LCR MSCP Implementation

Activities associated with establishing and managing LCR MSCP–created covered species habitat may result in take of the desert tortoise. Some or all LCR MSCP conservation areas that are established on the west side of the Colorado River in Reaches 2–6 could affect desert tortoise habitat. It is unlikely that LCR MSCP covered species habitats would be created in desert tortoise habitat because site conditions associated with its habitat would likely be unsuitable for creation of habitat for covered species. However, depending on existing infrastructure associated with conservation areas that are established in the range of the desert tortoise, the LCR MSCP may be required to construct and maintain roads, install and maintain utility lines, and construct other infrastructure in desert tortoise habitat that are necessary to establish and maintain the conservation areas. Such activities could result in removal of and disturbance to habitat. The extent of habitat likely to be affected by these activities is expected to be minimal relative to the extent of existing habitat. Injury or mortality of individual tortoises associated with implementing the LCR MSCP Conservation Plan, to the extent practicable, will be avoided. Over the term of the LCR MSCP, however, these activities are expected to result in some low level of take (i.e., mortality) of individuals associated with operation of vehicles and equipment in habitat.

4.5.4 Bonytail

Although the bonytail is known only to exist in the mainstem and connected backwaters in Reaches 2–3 and High Levee Pond in Reach 4, it may be reintroduced into Reaches 4 and 5 in future years under the LCR MSCP or other programs.

Implementation of the covered activities and LCR MSCP conservation measures would affect flows and water levels in a substantial proportion of bonytail habitat along the LCR (i.e., Reaches 3–5). The degree to which changes in points of diversion would affect the future distribution and status of bonytail in Reaches 3–5 compared to existing conditions is uncertain. The LCR MSCP Conservation Plan, however, includes conservation measures to replace affected bonytail habitat and stock bonytail in sufficient numbers over the term of the LCR MSCP to fully mitigate effects and contribute to recovery of the species.

For the reasons described below, implementation of the covered activities and the LCR MSCP could impact bonytail critical habitat in Reaches 2 and 3. These impacts, however, are not expected to appreciably diminish the value of critical habitat for species conservation (see the LCR MSCP BA for a full description of potential impacts of the covered activities and the LCR MSCP on bonytail critical habitat).

4.5.4.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the bonytail. Changes in flow in Reaches 3–5 will result in the loss of 399 acres of habitat, including the designated critical habitat between the northern boundary of Havasu NWR and Lake Havasu (see Table 4-5). Although the bonytail is known only to exist in the mainstem and connected backwaters in Reaches 2 and 3 and High Levee Pond in Reach 4, it may be reintroduced into Reaches 4 and 5 in future years under the LCR MSCP or other programs. The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 225 acres of bonytail habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing conditions.

Ongoing operations of reservoirs for hydropower generation result in river flow fluctuations that can vary substantially over a 24-hour period and could result in stranding or desiccation of bonytail. The potential for stranding or desiccation of bonytail to occur is governed by two primary factors. The first factor is the site-specific channel morphology, including the presence of gravel and cobble bars, side channels, or shallow backwaters within the river reach affected by the fluctuating flows. The closer to the dam these physical channel features are located, the amount of water level fluctuation will be greater, since fluctuations attenuate downstream (see Appendix J) and water levels stabilize. The second factor is the current distribution and abundance of bonytail in the LCR MSCP planning area. The number of individual bonytail in the areas of greatest fluctuations is low, and most of the bonytail in the LCR do not inhabit areas subject to significant fluctuations.

Implementation of future flow-related covered activities would reduce river flow. Consequently, although river operations related to hydropower generation will not

change (see Section 4.2.3.1), the range of high and low flows will be lower than under existing conditions. Changes to the water elevations below Davis Dam (Reach 3) and Parker Dam (Reach 4) are depicted in Table 4-2. These changes differ seasonally and range between –2.09 and –0.01 feet at Davis Dam and –2.46 and –0.21 feet at Parker Dam. The pattern of fluctuations does not change, and once reduced flows are expressed, no additional changes to elevations would be expected. The result of these changes is not substantial related to existing conditions. The change in the potential for stranding and desiccation, therefore, is expected to be minimal. The level of take associated with stranding and desiccation could increase in future years with LCR MSCP stocking of up to 620,000 subadults. The potential for take associated with stranding and desiccation would increase in Reach 4 for bonytail would develop after the species is stocked there, the overall of effect on the abundance of bonytail would be minimal because only a small proportion of bonytail present in the LCR MSCP planning area would be stocked in this reach.

Implementation of future flow-related covered activities would reduce river depth during the spawning period. The reduced depth could reduce potential spawning habitat area. Bonytail prefer backwaters and occupy pools and eddies away from strong currents (Pimentel and Bulkley 1983; Vanicek 1967). Backwaters are warmer and more productive than the main river channel, potentially supporting faster growth rates. In addition, backwaters with emergent vegetation provide cover and potential refuges from predators. Reduced flow, and subsequent shallower depth, could reduce rearing habitat area in the river and backwaters.

Based on known entrainment of razorback suckers in water diversions (Bureau of Reclamation 1996), diversions from the LCR may entrain the bonytail. There are relatively few diversions directly from the river segment of Reach 3, with the exception of large diversions (i.e., Metropolitan and the CAWCD) from Lake Havasu. The diversions from the river channel are small relative to river flow, and potential individual entrainment losses would be small; however, any entrainment of bonytail could affect the population because of the low population numbers. Entrainment of bonytail with flow-related covered activities (i.e., the area with measurable velocity toward the diversion intake) will be similar to existing conditions. The number of bonytail that could be entrained in Reach 3, however, is expected to increase with implementation of the LCR MSCP, which will include augmenting the existing population by stocking up to 620,000 bonytail in the LCR. Bonytail, if introduced into Reaches 4 and 5, could be entrained in the canals and other diversions (e.g., Senator Wash Reservoir), resulting in a loss of individuals. Canals at Headgate Rock Dam, Palo Verde Diversion Dam, and Imperial Dam divert most of the flow from the river. High diversions at Headgate Rock Dam and Palo Verde Diversion Dam would coincide with the potential occurrence of the planktonic larval life stage of bonytail in the summer, a period of potentially high entrainment vulnerability. In addition, reintroduced bonytail would be affected by the day-to-day operations and environmental conditions in the river, reservoirs, and backwaters. Eggs may be desiccated and stranding losses could occur because daily flow variability would isolate and subsequently desiccate occupied habitat. Increasing the abundance of bonytail through LCR MSCP conservation measures to augment bonytail in Reach 3 and possibly stock bonytail in Reaches 4 and 5 is expected to result in take associated with entrainment.

4.5.4.2 Effects of Non-Flow-Related Covered Activities

Covered activities related to construction and maintenance of fish attraction structures and navigation structures and stocking of nonnative fish species may result in take of bonytail in Reaches 2–5. Adverse effects of construction and maintenance activities on bonytail would be temporary, generally occurring during the period of construction. Construction and maintenance activities may temporarily increase turbidity and could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and temporarily reduce production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction of bonytail. Although construction and maintenance activities could adversely affect the bonytail and its habitat, the effects would be minimal. Implementation of these activities is expected to result in some low level of take over the term of the LCR MSCP. As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the bonytail.

In addition to construction and maintenance effects on habitat, implementation of all non-flow-related covered activities could cause direct mortality or cause fish to temporarily avoid using affected habitat during periods of disturbance. Establishment of artificial habitat for nonnative fish species may result in take associated with increasing predation levels on bonytail by increasing local predator density.

Stocked nonnative species may prey on larvae and juvenile bonytail (i.e., assuming that bonytail larvae and juveniles occur). However, stocked rainbow trout are not expected to establish self-sustaining populations, and the bonytail's temperature preference of near 75°F for bonytail in their first year of life (Bulkley et al. 1981) is near the upper limit for survival of rainbow trout (Raleigh et al. 1984). There will be a low level of take.

If bonytail is reintroduced into Reaches 4 and 5, the effects of non-flow-related activities on the bonytail in these reaches would be the same as described for Reaches 2 and 3.

4.5.4.3 Effects of LCR MSCP Implementation

Construction-related activities associated with establishing and managing LCR MSCP–created covered species habitat in Reaches 2 and 3 may result in take of bonytail. Adverse effects of habitat construction and maintenance activities on the bonytail would be temporary, generally occurring during the period of construction. Habitat creation–related construction and maintenance activities may:

- cause juvenile and adult fish to temporarily avoid using affected habitat;
- increase turbidity and cause sedimentation of spawning and rearing habitat, which could suffocate eggs and larvae and temporarily reduce production and availability of food organisms; and

- result in accidental discharge of contaminants or cause resuspension of contaminants from disturbed sediments that could adversely affect survival, growth, and reproduction of bonytail.

Although construction and maintenance activities could adversely affect the bonytail and its habitat, the extent of habitat disturbed would be small, the disturbance would be temporary, and the effects would be minimal. Control of competitor and predator species in created backwaters occupied by the bonytail may also inadvertently capture, injure, or result in mortality of individual bonytail.

Stocking bonytail to augment the existing population could introduce and spread diseases and parasites. However, modern fish culture practices that strive to minimize disease and parasite spread through fish health, BMPs, and other means will minimize the risk. In addition, transport and handling of bonytail during activities supporting augmentation may result in direct mortality of individual fish.

Buhl and Hamilton (1996) found that mixtures of inorganics derived from irrigation activities may have an adverse effect on larval and juvenile bonytail in the Green River. Establishment and maintenance of LCR MSCP–created habitats, however, are not expected to increase contaminant concentrations above existing levels. Establishment and maintenance of LCR MSCP habitats are not expected to require pesticide use that could diminish habitat value for terrestrial species, so creation of habitat on agricultural lands would likely result in an overall decrease in contaminant concentrations or no net change for nonagricultural sites. Runoff/return-flow from habitat creation sites will be minimized to the greatest extent possible. Contaminants associated with runoff from LCR MSCP habitats, therefore, are unlikely to adversely affect bonytail.

If bonytail are reintroduced into Reaches 4 and 5, the effects of LCR MSCP implementation on the bonytail in these reaches would be the same as described for Reaches 2 and 3.

4.5.5 Humpback Chub

Based on efforts to recover the humpback chub in the Colorado River upstream of Lake Mead, humpback chub may occur in up to an estimated 62 miles of transitory river channel of the Colorado River that could form within the full-pool elevation of Lake Mead when reservoir elevations are lowered to 950 feet msl. The potential effects of implementing covered activities and LCR MSCP conservation measures on distribution and status of the humpback chub are expected to be minor, potentially affecting a relatively small number of individuals that may periodically move into and use transitory river segments when they are present in Lake Mead.

Non-flow-related covered activities and LCR MSCP implementation are not expected to result in take of humpback chub.

4.5.5.1 Effects of Flow-Related Covered Activities

Implementation of flow-related covered activities may result in take of humpback chub. Changes in reservoir elevations associated with implementation of flow-related covered activities could result in the establishment of up to 62 miles of transitory Colorado River channel that may form when the reservoir pool is maintained at lower elevations that could be occupied by humpback chub. These transitory river segments would be lost when the reservoir pool elevation is increased. Over the term of the LCR MSCP, however, reservoir operations are expected to result in some low level of take.

4.5.6 Razorback Sucker

Implementation of the covered activities and LCR MSCP conservation measures could affect razorback sucker habitat in Lake Mead and a substantial proportion of its habitat along the LCR (i.e., Reaches 3–5). The degree to which changes in points of diversion would affect the future distribution and status of razorback sucker in Reaches 3–5 compared to existing conditions is uncertain. The LCR MSCP Conservation Plan, however, includes conservation measures to replace affected razorback sucker habitat and stock razorback sucker in sufficient numbers over the term of the LCR MSCP to fully mitigate effects and contribute to recovery of the species.

For the reasons described below, implementation of the covered activities and the LCR MSCP could impact razorback sucker critical habitat in Reaches 1, 2, 4 and 5. These impacts, however, are not expected to appreciably diminish the value of critical habitat for species conservation (see the LCR MSCP BA for a full description of potential impacts of the covered activities and the LCR MSCP on razorback sucker critical habitat).

4.5.6.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of razorback sucker. Future flow-related covered activities that change flow in Reaches 3–5 will result in the loss of 399 acres of habitat, including designated critical habitat (see Table 4-5). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 225 acres of created razorback habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing conditions.

The spawning habitat for razorback sucker in Lake Mead may be affected with changes in reservoir operations (see Appendix M). The known spawning elevations that may be important for the razorback sucker occur between 1,120 and 1,150 feet msl in Lake Mead. Current information shows that during the spawning seasons of 1997–2001, razorback sucker spawned at or near the cliff spawning site at the back of Echo Bay. This site was dry in 2002 and spawning occurred in a different area along the south shore of Echo Bay. During the 2003 spawning season, the 2002 spawning site was dry. However, razorback sucker apparently spawned along the same shore just east of the 2002 spawning site on a gravelly point submerged in 2–5 feet of water. In 2004 larval

concentrations and habitat use of a telemetered fish indicated the Echo Bay population spawned approximately 250 meters east of the 2003 site (Welker and Holden 2004). These changes in spawning location indicates the razorback sucker will successfully move their spawning location into progressively lower elevations where suitable spawning substrate is present as the lake recedes. With the exception of sediment accumulation from Las Vegas Wash, recent investigations (Twichell and Rudin 1999) indicate that it is unlikely that sediment accumulation over available spawning substrate in the remainder of Lake Mead will affect spawning habitat area. The encroachment of sediment on spawning habitat from Las Vegas Wash, however, is not only a function of lowering lake levels, but is likely also related to high rainfall events and growing wastewater discharge as a result of growth in the Las Vegas area. Changes in Lake Mead reservoir operations are expected to result in some low level of take over the term of the LCR MSCP.

Razorback suckers require clean gravel in shallow areas of quiet water for spawning during January–April/May (Langhorst and Marsh 1986). Implementation of future flow-related covered activities would reduce river depth during the spawning period. The reduced depth could reduce potential spawning habitat area. Connected backwaters and low-velocity channel types, such as pool edges and side channels, provide rearing habitat for larval and juvenile razorback sucker. Stocked razorback show a preference for backwaters over the main channel habitats (Gurtin and Bradford 2000). Backwaters are warmer and more productive than the main river channel, potentially supporting faster growth rates. In addition, backwaters with emergent vegetation provide cover and potential refuges from predators. Reduced flow, and subsequent shallower depth, could reduce rearing habitat area in the river and backwaters.

Ongoing operations of reservoirs for hydropower generation result in river flow fluctuations that can vary substantially over a 24-hour period and could result in stranding or desiccation of razorback sucker. The potential for stranding or desiccation of razorback sucker to occur is governed by two primary factors. The first factor is the site-specific channel morphology, including the presence of gravel and cobble bars, side channels, or shallow backwaters within the river reach affected by the fluctuating flows. The closer to the dam these physical channel features are located, the amount of water level fluctuation will be greater, since fluctuations attenuate downstream (see Appendix J) and water levels stabilize. The second factor is the current distribution and abundance of razorback sucker in the LCR MSCP planning area. The number of individual razorback sucker in the areas of greatest fluctuations is low, and most of the razorback sucker in the LCR do not inhabit areas subject to significant fluctuations. Implementation of future flow-related covered activities would reduce river flow. Consequently, although river operations related to hydropower generation will not change (see Section 4.2.3.1), the range of high and low flows will be lower than under existing conditions. Changes to the water elevations below Davis Dam (Reach 3) and Parker Dam (Reach 4) are depicted in Table 4-2. These changes differ seasonally and range between –2.09 and –0.01 feet at Davis Dam and –2.46 and –0.21 feet at Parker Dam. The pattern of fluctuations does not change, and once reduced flows are expressed, no additional changes to elevations would be expected. The result of these changes is not substantial related to existing conditions. The change in the potential for stranding and desiccation, therefore, is expected to be minimal. The level of take associated with stranding and desiccation could increase in future years with LCR MSCP stocking of up to 660,000 subadults.

Diversions from the LCR may entrain razorback sucker. Razorback suckers have been observed in the CRIT canal system (Bureau of Reclamation 1996). Razorback suckers have been entrained in and captured with the CAP canal (Bureau of Reclamation 1996). Razorback suckers have also been observed in Senator Wash Reservoir, which may indicate entrainment with water diverted from the LCR. Razorback suckers observed in the reservoir, however, may also have been surviving fish from those stocked in the reservoir by CDFG between 1987 and 1990. There are relatively few diversions directly from the river in Reach 3, with the exception of large diversions from Lake Havasu. Entrainment of razorback sucker, with changes in points of diversion, would be similar to existing conditions. In Reach 4, canals at Headgate Rock Dam and Palo Verde Diversion Dam divert a substantial proportion of flow from the river. The increased proportion of river flow diverted could increase entrainment losses of razorback sucker. The level of entrainment of razorback suckers in Reach 5 is not expected to increase from existing conditions because nearly all of the river flow in this Reach is diverted into canals and power generation facilities at Imperial Dam, and diversions to Senator Wash Reservoir will not change. The number of razorback suckers that could be entrained is expected to increase with implementation of the LCR MSCP Conservation Plan, which will include augmenting the existing population by stocking up to 660,000 razorback suckers in the LCR. Increasing the abundance of razorback suckers through LCR MSCP conservation measures to augment the existing population is expected to result in a low level of take associated with entrainment.

4.5.6.2 Effects of Non-Flow-Related Covered Activities

Covered activities related to construction and maintenance of fish attraction structures and navigation structures and stocking of nonnative fish species may result in take of razorback sucker in Reaches 1–5. Adverse effects of construction and maintenance activities on razorback sucker would be temporary, generally occurring during the period of construction. Construction and maintenance activities could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and temporarily reduce local production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction of razorback sucker. Although construction and maintenance activities could adversely affect the razorback sucker and its habitat, the effects would be minimal because of the small extent of disturbance from these activities. Implementation of these activities is expected to result in some low level of take over the term of the LCR MSCP. As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the razorback sucker.

In addition to construction and maintenance effects on habitat, implementation of non-flow-related covered activities could cause direct mortality or cause fish to temporarily avoid using affected habitat during periods of disturbance. Establishment of artificial habitat for nonnative fish species may result in take associated with increasing predation levels on razorback sucker by increasing local predator density.

Stocked nonnative fish species may prey on larvae and juvenile razorback sucker. However, stocked rainbow trout are not expected to establish self-sustaining populations, and effects, relative to existing nonnative fish interactions, are expected to be minimal. There will be a low level of take.

4.5.6.3 Effects of LCR MSCP Implementation

Construction-related activities associated with establishing and managing LCR MSCP–created covered species habitat in Reaches 1–5 may result in take of razorback sucker. Adverse effects of habitat construction and maintenance activities on the razorback sucker would be temporary, generally occurring during the period of construction. Habitat creation–related construction and maintenance activities may:

- cause juvenile and adult fish to temporarily avoid using affected habitat;
- disturb substrate and cause sedimentation of spawning and rearing habitat, which could suffocate eggs and larvae and temporarily reduce local production and availability of food organisms; and
- result in accidental discharge of contaminants or cause resuspension of contaminants from disturbed sediments that could adversely affect survival, growth, and reproduction of razorback sucker.

Although construction and maintenance activities could adversely affect the razorback sucker and its habitat, the extent of habitat disturbed would be small, the disturbance would be temporary, and the effects would be minimal. Control of competitor and predator species in created backwaters occupied by the razorback sucker may also inadvertently capture, injure, or result in mortality of individual razorback suckers.

Stocking razorback suckers to augment the existing population could introduce and spread diseases and parasites and adversely affect the genetic and ecological distinctiveness of the existing razorback sucker population. However, modern fish culture practices that strive to minimize disease and parasite spread through fish health, BMPs, and other means will minimize the risk. In addition, genetic monitoring and management will be incorporated. In addition, transport and handling of razorback sucker during activities supporting augmentation may result in direct mortality of individual fish. Stocking bonytail to augment the existing population could also adversely affect the razorback sucker population through competition and predation.

Buhl and Hamilton (1996) found that mixtures of inorganics derived from irrigation activities may have an adverse effect on larval and juvenile razorback sucker in the Green River. Establishment and maintenance of LCR MSCP–created habitats, however, are not expected to increase contaminant concentrations above existing levels. Establishment and maintenance of LCR MSCP habitats are not expected to require pesticide use that could diminish habitat value for terrestrial species, so creation of habitat on agricultural lands would likely result in an overall decrease in contaminant concentrations or no net change for nonagricultural sites. Runoff/return-flow from habitat creation sites will be minimized to the greatest extent possible. Contaminants associated with runoff from LCR MSCP habitats, therefore, are unlikely to adversely affect razorback sucker.

4.5.7 Western Red Bat

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the western red bat are expected to be minor, affecting a relatively small number of individuals and proportion of its roosting habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the western red bat, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.7.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the western red bat in Reaches 3–5. Changes in points of diversion in Reaches 3–5 will reduce groundwater sufficiently in these reaches to reduce the extent or quality of 161 acres of cottonwood-willow types I and II that provide western red bat habitat (see Table 4-5). Lowering of groundwater elevations could reduce the production and abundance of insect prey as a result of changes in the extent, frequency, and duration that surface water or moist soil surface conditions are present in patches of riparian land cover. There is currently insufficient information to determine whether reduction in groundwater levels would reduce the abundance of insect prey species sufficiently to affect the western red bat. For purposes of this assessment, however, it is assumed that there would be a low level of take associated with effects on prey species over the term of the LCR MSCP.

As described in Section 4.2.3.4, cottonwoods and willows that could provide roosting habitat for the western red bat may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide roosting habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Western red bat roosting habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of western red bat. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral roosting habitat, however, could result in a low level of take of western red bat over the term of the LCR MSCP.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the western red bat.

4.5.7.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects along the LCR may result in take of the western red bat. Disturbances associated with implementing covered activities (e.g., operation of equipment) could result in harassment of individuals, if these activities are undertaken near roosts. Habitat restoration projects, however, will avoid removal of cottonwood-willow types I and II and honey mesquite type III land cover that provide roosting habitat for this species to restore habitat for other species. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 604 acres of roosting habitat (see Table 4-5).

As described in Section 4.2.2.3, it is unlikely that ongoing non-flow-related covered activities would indirectly contribute to the degradation of habitat over the term of the LCR MSCP.

4.5.7.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the western red bat. To the extent practicable, habitat creation–related activities will avoid removal of cottonwoods, willows, and honey mesquite that could serve as roosts. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

The maximum extent of habitat that could be affected by habitat management activities is estimated to be 7,260 acres (i.e., the extent of cottonwood-willow and honey mesquite land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. Disturbances associated with creating covered species habitat (e.g., operation of equipment) and ongoing maintenance of created habitats and conservation area infrastructure could result in harassment of individuals if these activities are undertaken near roosts.

4.5.8 Western Yellow Bat

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the western yellow bat are expected to be minor, affecting a relatively small number of individuals and proportion of its roosting habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the western yellow bat, and

the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.8.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the western yellow bat in Reaches 3–5. Changes in points of diversion in Reaches 3–5 will reduce groundwater sufficiently in these reaches to reduce the extent or quality of 161 acres of cottonwood-willow types I and II that provide western yellow bat habitat (see Table 4-5). Lowering of groundwater elevations could affect the production of insect prey as a result of changes in the extent, frequency, and duration that surface water or moist soil surface conditions are present in patches of riparian land cover. There is currently insufficient information to determine whether reduction in groundwater levels would reduce the abundance of insect prey species sufficiently to affect the western red bat. For purposes of this assessment, however, it is assumed that there would be a low level of take associated with effects on prey species over the term of the LCR MSCP.

As described in Section 4.2.3.4, cottonwoods and willows that could provide roosting habitat for the western yellow bat may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide roosting habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Western yellow bat roosting habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of western yellow bat. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral roosting habitat, however, could result in a low level of take of western yellow bat over the term of the LCR MSCP.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

4.5.8.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects along the LCR may result in take of the western yellow bat. Disturbances associated with implementing covered activities (e.g., operation of equipment) could result in harassment of individuals, if these activities are undertaken near roosts. Habitat restoration projects, however, will avoid removal of cottonwood-willow types I and II and honey mesquite type III land

cover that provide roosting habitat for this species to restore habitat for other species. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 604 acres of roosting habitat (see Table 4-5).

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the western yellow bat.

4.5.8.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the western yellow bat. To the extent practicable, habitat creation–related activities will avoid removal of cottonwoods, willows, and honey mesquite that could serve as roosts. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

The maximum extent of habitat that could be affected by habitat management activities is estimated to be 7,260 acres (i.e., the extent of cottonwood-willow and honey mesquite land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. Disturbances associated with creating covered species habitat (e.g., operation of equipment) and ongoing maintenance of created habitats and conservation area infrastructure could result in harassment of individuals if these activities are undertaken near roosts.

4.5.9 Desert Pocket Mouse

The desert pocket mouse inhabits fluvial soil in the transitional zone between desert and desert scrub communities in Reaches 1 and 2, and in Reach 3 south to Topock Gorge (Jameson and Peeters 1988; Genoways and Brown 1993). Flow-related covered activities would not affect land cover types that provide desert pocket mouse habitat and, therefore, would not result in take of desert pocket mouse.

The potential effects of implementing non-flow-related covered activities and LCR MSCP conservation measures on the distribution and status of the desert pocket mouse are expected to be minor, potentially affecting a relatively small number of individuals and proportion of its habitat over the term of the LCR MSCP. The desert pocket mouse would be affected only if LCR MSCP habitat creation and maintenance activities are implemented in its habitat. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize effects on habitat and provides for the restoration of any habitat that may be disturbed as a result of these activities.

4.5.9.1 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects in Reaches 1–3 may result in take of the desert pocket mouse if implemented in the species' habitat. Restoration-related activities undertaken in or near desert pocket mouse habitat, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment, injury, or mortality of individuals. Habitat restoration projects, however, will avoid removing desert pocket mouse habitat to restore habitat for other species, and, therefore, effects on habitat associated with these projects would be temporary. As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the desert pocket mouse.

4.5.9.2 Effects of LCR MSCP Implementation

Activities associated with establishing and managing LCR MSCP–created covered species habitat in desert pocket mouse habitat in Reaches 1–3 may result in take of the desert pocket mouse. Habitat creation- and management-related activities, such as operation of equipment to remove vegetation and maintain roads, could result in temporary or permanent loss of habitat and harassment, injury, or mortality of individuals. To the extent practicable, desert pocket mouse habitat would not be removed to create habitat for other species. These activities, however, could inadvertently result in some low level of take over the term of the LCR MSCP. The level of adverse effects on habitats and individuals will depend on the extent of LCR MSCP–created habitat that is established in desert pocket mouse habitat.

4.5.10 Colorado River Cotton Rat

Although the Colorado River cotton rat is only known from along the LCR (Reaches 3 and 4), the potential effects of implementing covered activities and LCR MSCP conservation measures on distribution and status of the Colorado River cotton rat are expected to be minor, potentially affecting less than 2 percent of marsh land cover that provides habitat. The LCR MSCP Conservation Plan includes conservation measures to minimize and mitigate the potential effects of habitat loss with the creation of replacement habitat.

4.5.10.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the Colorado River cotton rat. Changes in points of diversion in Reaches 3 and 4 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 59 acres of habitat (see Table 4-5) provided by marshes associated with backwaters. Reservoir elevations in Reaches 3–4 would not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta [Reach 3]) or that are managed to support marsh vegetation (e.g., Cibola

NWR [Reach 4]). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing habitat conditions (see Table 4-3). Lowering groundwater elevations could cause direct loss of habitat through desiccation, fragmentation, or reduction in the extent of habitat patches.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

4.5.10.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects along the LCR in Reaches 3 and 4 may result in take of the Colorado River cotton rat. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 3 acres of species habitat (see Table 4-5). Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat and harassment, injury, or mortality of individuals. Effects on habitat would be temporary for restoration projects that restore or improve existing Colorado River cotton rat habitat. Because habitat restoration sites have not yet been identified, it is assumed that up to 5 acres of degraded or former marsh that provide low-value habitat in Reaches 3 and 4 could be removed over the term of the LCR MSCP to restore habitat for other species.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the Colorado River cotton rat.

4.5.10.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created backwaters and marsh as habitat for covered species may result in take of the Colorado River cotton rat. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Up to 125 acres of existing degraded or former marsh that may provide low-value habitat could be type converted to fully functioning marsh that provides high-value Colorado River cotton rat habitat. Some additional limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species.

Habitat management–related activities, such as operation of equipment to remove vegetation and maintain open water in backwaters and burning decadent marsh vegetation to stimulate vegetation growth, could result in temporary loss of habitat and harassment, injury, or mortality of individuals. The LCR MSCP will avoid removal of habitat to create habitat for other covered species. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 512 acres (i.e., the

extent of marsh land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.11 Yuma Hispid Cotton Rat

The Yuma hispid cotton rat is present in Reaches 6 and 7, which will not be affected by flow-related covered activities. Flow-related covered activities, therefore, will not result in take of the Yuma hispid cotton rat.

The potential effects of implementing non-flow-related covered activities and LCR MSCP conservation measures on the distribution and status of the Yuma hispid cotton rat are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to minimize and mitigate the potential effects of habitat loss with the creation of replacement habitat.

4.5.11.1 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects along the LCR in Reaches 6 and 7 may result in take of the Yuma hispid cotton rat. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 71 acres of species habitat (see Table 4-5). Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat and harassment, injury, or mortality of individuals. Effects on habitat would be temporary for restoration projects that improve existing Yuma hispid cotton rat habitat. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the Yuma hispid cotton rat. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Yuma hispid cotton rat habitat will be designed to maintain or improve patches of cottonwood-willow that provide its habitat. However, because habitat restoration sites have not yet been identified, it is assumed that up to 5 acres of degraded cottonwood-willow land cover that provide low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. This could result in a low level of take.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the Yuma hispid cotton rat.

4.5.11.2 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created habitat for covered species may result in take of the Yuma hispid cotton rat. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. This could result in some low level of take.

Habitat management–related activities, such as operation of equipment to remove vegetation to set back succession, could result in temporary loss of habitat and harassment, injury, or mortality of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be no more than 1,000 acres (i.e., the extent of cottonwood-willow land cover likely to be created as habitat for associated covered species in Reaches 6 and 7) over the term of the LCR MSCP. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.12 Western Least Bittern

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the western least bittern are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the western least bittern, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.12.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the western least bittern. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 133 acres of habitat (see Table 4-5) provided by marshes associated with backwaters. Reservoir elevations in Reaches 3–5 would not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta [Reach 3]) or that are managed to support marsh vegetation (e.g., Imperial NWR [Reach 5]). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing habitat conditions (see Table 4-3). Lowering groundwater elevations could cause direct loss of these habitats through desiccation, fragmentation, or reduction in the extent of habitat patches.

As described in Section 4.2.3.3, implementation of flow-related covered activities may affect marsh vegetation that provides western least bittern habitat that periodically establish at inflow points of Lake Mead (e.g., Colorado River delta, Virgin River delta, Muddy River delta) when Lake Mead water surface elevations are below full pool. Marsh habitat below the full pool elevation will be created and lost based on water surface elevations. For example, marsh vegetation established at a certain elevation may be lost if the water surface elevation declines so that groundwater elevations drop below the rooting depths of emergent vegetation. Alternatively, established marsh vegetation would be inundated and lost during wetter periods, when Lake Mead reservoir elevations rise. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of these ephemeral marshes, however, could result in a low level of take of western least bittern over the term of the LCR MSCP.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

4.5.12.2 Effects of Non-Flow-Related Covered Activities

Proposed activities that are related to habitat restoration and maintenance projects, facilities and infrastructure maintenance, and operation of watercraft for law enforcement along the LCR may result in take of the western least bittern. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of western least bittern increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat and harassment, injury, or mortality of individuals. These activities, however, would be conducted, to the extent practicable, when nesting adults and young birds are not present. Effects on habitat would be temporary for restoration projects that restore or improve existing western least bittern habitat. Because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded or former marsh that provide low-quality habitat could be removed over the term of the LCR MSCP to restore habitat for other species (see Table 4-5).

Activities associated with maintaining facilities and infrastructure may result in the periodic removal of emergent vegetation growing in canals and drains that provides western least bittern habitat. Up to 557 miles of canals and drains that could support some patches of emergent vegetation could be subject to periodic maintenance activities that would remove emergent vegetation over the term of the LCR MSCP. As described in Section 4.2.3.1, it is unlikely that maintenance of canals would measurably affect the extent of species habitat. Periodic maintenance of the 244 miles of drains in the LCR MSCP planning area, however, could result in the removal of up to 30 acres of emergent vegetation that could provide habitat. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 70 acres of species habitat (see Table 4-5).

Operation of law enforcement patrol boats to enforce no-wake zone regulations that protect habitat (e.g., the Bill Williams Delta) will also generate boat wakes in the no-wake zones for short periods when other watercraft are being pursued. During the breeding season, boat wakes could swamp nests, potentially resulting in mortality of eggs or nestlings. Because the frequency with which such incidents occur (AGFD estimates 150–200 person-days are expended annually enforcing no-wake zone regulations and NDOW estimates 25–30 person-days are annually expended operating watercraft in sensitive off-channel areas that could support habitat in the LCR MSCP planning area) and the duration with which patrol boats generate boat wakes in protected habitat (i.e., the period required to stop a boat) are likely low, and therefore a low level of take is expected.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the western least bittern.

4.5.12.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created backwaters and marsh as habitat for covered species may result in take of the western least bittern. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to fully functioning marsh that provides high-value western least bittern habitat. Some additional limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species; however, with implementation of the AMMs described in Section 5.6.1, “Avoidance and Minimization Measures,” removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of western least bittern.

Habitat management–related activities, such as operation of equipment to remove vegetation and maintain open water in backwaters and burning decadent marsh vegetation to stimulate vegetation growth, could result in temporary loss of habitat and harassment, injury, or mortality of individuals. To the extent practicable, these activities would be conducted when nesting adults and young birds are not present to avoid injury or mortality. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 512 acres (i.e., the extent of marsh land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of western least bittern increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.13 California Black Rail

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the California black rail are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the California black rail, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.13.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the California black rail. Reservoir elevations in Reaches 3–6 will not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta [Reach 3]) or that are managed to support marsh vegetation (e.g., Imperial NWR [Reach 5]). In Reaches 3 and 4, with the exception of Topock Marsh, California black rails are associated with marshes that will not be affected by flow-related covered activities. The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing habitat conditions (see Table 4-3). Lowering groundwater elevations could result in the loss of 37 acres of California black rail habitat in Reach 5 through desiccation, fragmentation, or reduction in extent (Table 4-5) provided by marshes associated with backwaters.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

4.5.13.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects, facilities and infrastructure maintenance, and operation of watercraft for law enforcement along the LCR in or near habitat may result in take of the California black rail. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of California black rail increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat and harassment or mortality of individuals. These activities, however, would be conducted, to the extent practicable, at times when nesting adults and young birds are not present. Effects on habitat would be temporary for restoration projects that restore or improve existing California black rail habitat. The probability for permanent loss of habitat is considered minimal because restoration projects undertaken

in existing California black rail habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove California black rail habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 5 acres of degraded or former marsh that provide low-quality habitat could be removed over the term of the LCR MSCP to restore habitat for other species (see Table 4-5).

Activities associated with maintaining facilities and infrastructure may result in the periodic removal of emergent vegetation growing in canals and drains that provides California black rail habitat. Up to 557 miles of canals and drains that could support some patches of emergent vegetation could be subject to periodic maintenance activities that would remove emergent vegetation over the term of the LCR MSCP. As described in Section 4.2.3.1, it is unlikely that maintenance of canals would measurably affect the extent of species habitat. Periodic maintenance of the 244 miles of drains in the LCR MSCP planning area, however, could result in the removal of up to 30 acres of emergent vegetation that could provide habitat. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 31 acres of species habitat (see Table 4-5).

Operation of law enforcement patrol boats to enforce no-wake zone regulations that protect habitat (e.g., the Bill Williams Delta) will also generate boat wakes in the no-wake zones for short periods when other watercraft are being pursued. During the breeding season, boat wakes could swamp nests, potentially resulting in mortality of eggs or nestlings. Because the frequency with which such incidents occur (AGFD estimates 150–200 person-days are expended annually enforcing no-wake zone regulations and NDOW estimates 25–30 person-days are annually expended operating watercraft in sensitive off-channel areas that could support habitat in the LCR MSCP planning area) and the duration with which patrol boats generate boat wakes in protected habitat (i.e., the period required to stop a boat) are likely low, and therefore a low level of take is expected.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the California black rail.

4.5.13.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created backwaters and marsh as habitat for covered species may result in take of the California black rail. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Up to 130 acres of existing degraded or former marsh that may provide low-value habitat could be converted to fully functioning marsh that provides high-value California black rail habitat. Some additional limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species; however, with implementation of the AMMs described in Section 5.6.1, “Avoidance and Minimization Measures,” removal of these low-quality

habitats is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of California black rail.

Habitat management–related activities, such as operation of equipment to remove vegetation and maintain open water in backwaters and burning decadent marsh vegetation to stimulate vegetation growth, could result in temporary loss of habitat and harassment of individuals. To the extent practicable, these activities would be conducted when nesting adults and young birds are not present to avoid injury and mortality. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 512 acres (i.e., the extent of marsh land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of California black rail increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.14 Yellow-Billed Cuckoo

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the yellow-billed cuckoo are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the yellow-billed cuckoo, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.14.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the yellow-billed cuckoo. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,425 acres of yellow-billed cuckoo breeding, foraging, and migration habitat (Table 4-5). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing habitat conditions (see Table 4-3).

As described in Section 4.2.3.4, cottonwoods and willows that could provide habitat for the yellow-billed cuckoo may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Yellow-billed cuckoo habitat is not currently

present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of yellow-billed cuckoo. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of yellow-billed cuckoo over the term of the LCR MSCP.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

4.5.14.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects along the LCR in the LCR MSCP planning area may result in take of the yellow-billed cuckoo. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA also could result in the loss of 99 acres of species habitat (Table 4-5). The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of yellow-billed cuckoo increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the yellow-billed cuckoo. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing yellow-billed cuckoo habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove yellow-billed cuckoo habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provide low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the yellow-billed cuckoo.

4.5.14.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the yellow-billed cuckoo. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of yellow-billed cuckoo increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.15 Elf Owl

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the elf owl are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the elf owl, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.15.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the elf owl. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 161 acres of elf owl habitat (Table 4-5). As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

4.5.15.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the elf owl. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could also result in the loss of 590 acres of species habitat (Table 4-5). The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of elf owl increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Habitat restoration projects will avoid removal of cottonwood-willow types I and II and honey mesquite type III land cover that provide habitat for this species to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the elf owl.

4.5.15.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the elf owl. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of elf owl increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in the species habitat.

4.5.16 Gilded Flicker

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of gilded flicker habitat throughout its present range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the gilded flicker, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.16.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the gilded flicker. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,425 acres of gilded flicker habitat (Table 4-5). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing habitat conditions (see Table 4-3). As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

4.5.16.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the gilded flicker. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could also result in the loss of 99 acres of species habitat (Table 4-5). The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of gilded flicker increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the gilded flicker. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing gilded flicker habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove gilded flicker habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provide low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some

transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the gilded flicker.

4.5.16.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the gilded flicker. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of gilded flicker increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.17 Gila Woodpecker

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of Gila woodpecker habitat provided by cottonwood-willow land cover within the LCR MSCP planning area. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the Gila woodpecker. The potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.17.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the Gila woodpecker. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 819 acres of Gila woodpecker habitat (Table 4-5). As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

4.5.17.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the Gila woodpecker. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could also result in the loss of 26 acres of species habitat (Table 4-5). The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of Gila woodpecker increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the Gila woodpecker. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Gila woodpecker habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove Gila woodpecker habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provide low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the Gila woodpecker.

4.5.17.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the Gila woodpecker. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish

habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of Gila woodpecker increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.18 Vermilion Flycatcher

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the vermilion flycatcher are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the vermilion flycatcher, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.18.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the vermilion flycatcher. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,890 acres of cottonwood-willow types I–V that provide vermilion flycatcher nesting, foraging, and migration habitat (Table 4-5). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing habitat conditions (see Table 4-3).

As described in Section 5.2.3.3, cottonwoods and willows that could provide habitat for the vermilion flycatcher may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide habitat would not likely establish except when the timing of when

suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Vermilion flycatcher habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of vermilion flycatcher. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot, however, be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of vermilion flycatcher over the term of the LCR MSCP.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

4.5.18.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the vermilion flycatcher. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could also result in the loss of 714 acres of species habitat (Table 4-5). The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of vermilion flycatcher increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the vermilion flycatcher. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing vermilion flycatcher habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove vermilion flycatcher habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provide low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Habitat restoration projects will avoid removal of honey mesquite type III that provides habitat for this species to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the vermilion flycatcher.

4.5.18.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the vermilion flycatcher. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 7,260 acres (i.e., the extent of cottonwood-willow and honey mesquite land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of vermilion flycatcher increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.19 Arizona Bell's Vireo

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the Arizona Bell's vireo are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the Arizona Bell's vireo, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.19.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the Arizona Bell's vireo. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,654 acres of Arizona Bell's vireo habitat (Table 4-5). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing habitat conditions (see Table 4-3).

As described in Section 4.2.3.4, cottonwoods and willows that could provide habitat for the Arizona Bell's vireo may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Arizona Bell's vireo habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of Arizona Bell's vireo. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of Arizona Bell's vireo over the term of the LCR MSCP.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

4.5.19.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the Arizona Bell's vireo. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of 1,309 acres of species habitat (Table 4-5). Up to an additional 3,832 acres of honey mesquite IV that provides habitat could be removed by Federal non-flow-related activities; however, these activities and resultant impacts are not covered under the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of Arizona Bell's vireo increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the Arizona Bell's vireo. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Arizona Bell's vireo habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove Arizona Bell's vireo habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 20 acres of degraded cottonwood-willow and HM IV land cover that provide low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals,

could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the Arizona Bell's vireo.

4.5.19.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the Arizona Bell's vireo. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 7,260 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of Arizona Bell's vireo increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.20 Sonoran Yellow Warbler

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of Sonoran yellow warbler habitat throughout its present range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the Sonoran yellow warbler, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.20.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the Sonoran yellow warbler. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 2,929 acres of Sonoran yellow warbler habitat (Table 4-5). The LCR MSCP will avoid potential effects of lowering groundwater elevations on an additional 2,224 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh for maintenance of water levels and existing conditions (see Table 4-3).

As described in Section 4.2.3.4, riparian vegetation that could provide habitat for the Sonoran yellow warbler may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Sonoran yellow warbler habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of Sonoran yellow warbler. Riparian vegetation that provides habitat could establish under favorable reservoir conditions in the future and could be lost or degraded when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of Sonoran yellow warbler over the term of the LCR MSCP.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

4.5.20.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the Sonoran yellow warbler. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of 183 acres of species habitat (Table 4-5). The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of Sonoran yellow warbler increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the Sonoran yellow warbler. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Sonoran yellow warbler habitat will be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove Sonoran yellow warbler habitat to restore habitat for other species. However, because habitat restoration sites have not yet been

identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provide low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the Sonoran yellow warbler.

4.5.20.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the Sonoran yellow warbler. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of Sonoran yellow warbler increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.21 Summer Tanager

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the summer tanager are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation

measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the summer tanager, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat.

4.5.21.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the summer tanager. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 161 acres of habitat (Table 4-5).

As described in Section 4.2.3.4, cottonwoods and willows that could provide habitat for the summer tanager may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Summer tanager habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of summer tanager. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of summer tanager over the term of the LCR MSCP.

As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

4.5.21.2 Effects of Non-Flow-Related Covered Activities

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the summer tanager. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of 14 acres of species habitat (Table 4-5). The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of summer tanager increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Habitat restoration projects will avoid removal of cottonwood-willow types I and II land cover that provide habitat for this species to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-

dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the summer tanager.

4.5.21.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of the summer tanager. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities will avoid removal of primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to create habitat. Implementation of the AMMs described in Section 5.6.1, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood for take is expected to increase over the term of the LCR MSCP if the abundance of summer tanager increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

4.5.22 Flat-Tailed Horned Lizard

Flow-related activities will not affect the desert scrub communities inhabited by the flat-tailed horned lizard. Flow-related covered activities, therefore, are unlikely to result in take of the flat-tailed horned lizard. The potential effects of implementing non-flow-related covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the flat-tailed horned lizard are expected to be minor, potentially affecting a small number of individuals and small patches of habitat. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the flat-tailed horned lizard.

4.5.22.1 Effects of Non-Flow-Related Covered Activities

Maintenance and replacement of facilities and infrastructure could result in take of the flat-tailed horned lizard. Operation of vehicles and equipment necessary to conduct these activities along and near roads in flat-tailed horned lizard habitat may result in harassment and mortality of individuals. These activities, therefore, could result in a low level of take over the term of the LCR MSCP. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of 128 acres of species habitat (see Table 4-5) and direct mortality of lizards.

Habitat restoration and maintenance projects are not expected to affect the desert scrub communities inhabited by the flat-tailed horned lizard because it is unlikely the desert scrub communities it inhabits will be restored as aquatic, wetland, or riparian land cover. Removal of relatively small amounts of habitat, however, could be required if access roads and other infrastructure required to install and maintain restored habitats are constructed in flat-tailed horned lizard habitat. The level of habitat removal, however, is expected to be minimal and is not expected to result in harm (i.e., injury or mortality of individuals), and, therefore, is not expected to result in take. Over the term of the LCR MSCP, however, these activities are expected to result in some low level of take (i.e., mortality) of individuals associated with operation of vehicles and equipment in habitat.

Implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the flat-tailed horned lizard.

4.5.22.2 Effects of LCR MSCP Implementation

Activities associated with establishing and managing LCR MSCP–created covered species habitat may result in take of the flat-tailed horned lizard. It is unlikely that LCR MSCP covered species habitats would be created in flat-tailed horned lizard habitat because site conditions associated with its habitat would be likely unsuitable for creation of habitat. To the extent practicable, construction of new infrastructure that may be required to establish and maintain conservation areas established in Reaches 6 and 7 will be designed to avoid flat-tailed horned lizard habitat. In addition, harassment and mortality of individuals could be associated with habitat establishment and maintenance activities (e.g., operation of vehicles and equipment). These activities, therefore, could result in a low level of take.

4.5.23 Relict Leopard Frog

The potential effects of implementing the covered activities and LCR MSCP conservation measures on distribution and status of the relict leopard frog are expected to be minor, potentially affecting a small number of individuals and small patches of habitat. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the relict leopard frog.

4.5.23.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the relict leopard frog. The relict leopard frog inhabits springs in Black Canyon in Reach 2. Although the relict leopard frog breeds in springs, it has been observed in the mainstem of the LCR in Reach 2, which likely serves as a movement corridor for individuals among patches of habitat. Changes in flow releases from Hoover Dam associated with implementation of flow-related covered activities could disrupt use of the corridor (e.g., cold water flow releases) and may result in a low level of take of the relict leopard frog. Effects of ongoing flow releases from Hoover Dam on the use of the LCR as a movement corridor by the relict leopard frog will be the same as those associated with past operations.

4.5.23.2 Effects of Non-Flow-Related Covered Activities

Wetland restoration projects in the LCR MSCP planning area may result in take of the relict leopard frog if undertaken in occupied habitat. Restoration-related activities designed to benefit the species, such as controlling nonnative predators/competitors or increasing the size of occupied springs, could result in an unquantifiable temporary loss of habitat and harassment, injury, or mortality of individuals. As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the relict leopard frog.

4.5.23.3 Effects of LCR MSCP Implementation

It is unlikely that LCR MSCP created habitats will be established in or near relict leopard frog habitat. However, if created habitat were to be established in occupied relict leopard frog habitat, the created habitat would be designed to provide habitat for the relict leopard frog as well as for other appropriate covered species. Maintenance of created habitats that are occupied by relict leopard frogs, or located near occupied habitat, could result in some unquantified level of harassment and mortality of individuals.

4.5.24 Flannelmouth Sucker

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the flannelmouth sucker are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to replace habitat affected by covered activities and research to collect information necessary to direct future management of the species.

4.5.24.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of flannelmouth sucker. Changes in flow in Reach 3 will result in the loss of 85 acres of flannelmouth sucker habitat (Table 4-5). Spawning during the spring has been observed in Reach 3 in glides or slow riffles, over medium-coarse gravel substrate. The reduced depth associated with reduced flows could result in the loss of up to 53 acres of spawning habitat. Juvenile flannelmouth suckers use sheltered shorelines and backwaters. Backwaters are warmer and more productive than the main river channel, potentially supporting faster fish growth rates. In addition, backwaters with emergent vegetation provide cover and potential refuges from predators. Reduced flow, and subsequent shallower depth, could result in the loss of up to 32 acres of rearing habitat. Reduced flow may also increase stranding losses where daily flow variability isolates and subsequently desiccates occupied habitat. Effects of ongoing flow-related covered activities on the flannelmouth sucker would be the same as those described in Section 4.5.6 for the razorback sucker, except that the analysis is limited to Reach 3.

Based on the potential for entrainment of razorback suckers in water diversions (Bureau of Reclamation 1996), diversions from the river could entrain flannelmouth sucker, but potential entrainment losses would be minimal. There are relatively few diversions directly from the river segment of Reach 3, and the diversions are small relative to river flow.

Changes in reservoir elevations associated with implementation of flow-related covered activities could result in the establishment of transitory segments of the Colorado River and Virgin River, when the reservoir pool is maintained at lower elevations that could be occupied by flannelmouth sucker. These transitory river segments would be lost when the reservoir pool elevation is increased. Over the term of the LCR MSCP, however, reservoir operations are expected to result in some low level of take.

4.5.24.2 Effects of Non-Flow-Related Covered Activities

Covered activities related to construction and maintenance of fish attraction structures and navigation structures and stocking of nonnative fish species may result in take of flannelmouth sucker in Reach 3. Adverse effects of construction and maintenance activities on flannelmouth sucker would be temporary, generally occurring during the period of construction. Construction and maintenance activities may temporarily increase turbidity and could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and temporarily reduce production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction of flannelmouth sucker. Although construction and maintenance activities could adversely affect the flannelmouth sucker and its habitat, the effects would be minimal. Implementation of these activities is expected to result in some low level of take over the term of the LCR MSCP.

In addition to construction and maintenance effects on habitat, implementation of all covered activities could cause direct mortality or cause fish to temporarily avoid using affected habitat during periods of disturbance. Establishment of artificial habitat for nonnative fish species may result in take associated with increasing predation levels on flannelmouth sucker by increasing local predator density.

Stocked nonnative species may prey on larvae and juvenile flannelmouth, compete for food organisms, or alter foodweb dynamics. However, stocked rainbow trout are not expected to establish self-sustaining populations, and effects, relative to existing nonnative fish interactions, are expected to be minimal. There will be a low level of take.

As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the flannelmouth sucker.

4.5.24.3 Effects of LCR MSCP Implementation

Construction-related activities associated with establishing and managing LCR MSCP–created covered species habitat in Reach 3 may result in take of flannelmouth sucker. Adverse effects of habitat construction and maintenance activities on the flannelmouth sucker would be temporary, generally occurring during the period of construction. Habitat creation–related construction and maintenance activities may:

- cause juvenile and adult fish to temporarily avoid using affected habitat;
- increase turbidity and cause sedimentation of spawning and rearing habitat, which could suffocate eggs and larvae and temporarily reduce production and availability of food organisms; and
- result in accidental discharge of contaminants or cause resuspension of contaminants from disturbed sediments that could adversely affect survival, growth, and reproduction of the flannelmouth sucker.

Although construction and maintenance activities could adversely affect the flannelmouth sucker and its habitat in Reach 3, the extent of habitat disturbed would be small, the disturbance would be temporary, and the effects would be minimal.

Control of competitor and predator species in created backwaters occupied by the flannelmouth sucker may also inadvertently capture, injure, or result in mortality of individual flannelmouth suckers. Stocking razorback suckers into flannelmouth sucker habitat may result in hybridization, which may affect the flannelmouth population.

Buhl and Hamilton (1996) found that mixtures of inorganics derived from irrigation activities may have an adverse effect on larval and juvenile bonytail and razorback sucker in the Green River. Establishment and maintenance of LCR MSCP–created habitats, however, are not expected to increase contaminant concentrations above existing levels. Establishment and maintenance of LCR MSCP habitats are not expected to require pesticide use that could diminish habitat value for terrestrial species, so creation of habitat on agricultural lands would likely result in an overall decrease in contaminant concentrations or no net change for nonagricultural sites. Runoff/return-flow from

habitat creation sites will be minimized to the greatest extent possible. Contaminants associated with runoff from LCR MSCP habitats, therefore, are unlikely to adversely affect flannelmouth sucker.

4.5.25 MacNeill's Sootywing Skipper

Implementation of covered activities and the LCR MSCP conservation measures could affect a substantial proportion of the extent of known MacNeill's sootywing skipper habitat. The degree to which changes in points of diversion would affect the future distribution and status of MacNeill's sootywing skipper compared to existing conditions is uncertain. The effects of covered activities on the distribution and status of the MacNeill's sootywing skipper, however, are expected to be minimized over the term of the LCR MSCP because the effects of changes in points of diversion on moist soils required by the species will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan also includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the MacNeill's sootywing skipper and research to collect information necessary to direct future management of the species.

4.5.25.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the MacNeill's sootywing skipper. Changes in flow in Reaches 3 and 4 will result in the degradation or loss of 172 acres of adjoining patches of atriplex and honey mesquite land cover that provide MacNeill's sootywing skipper habitat (Table 4-5). Reductions in groundwater elevations are not expected to affect quail bush or honey mesquite plants used by the species. Reduction in groundwater elevations, however, could be sufficient to degrade or eliminate the microhabitat conditions necessary to sustain the MacNeill's sootywing skipper and that are maintained by high groundwater elevations. As described in Section 4.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

4.5.25.2 Effects of Non-Flow-Related Covered Activities

Restoration-related covered activities will, to the extent practicable, avoid removal of MacNeill's sootywing skipper habitat. These activities, however, may result in some low level of disturbance or loss of habitat over the term of the LCR MSCP. Restoration-related activities associated with operation of equipment near existing populations may result in direct take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA, however, could result in the loss of up to 50 acres of species habitat (Table 4-5). As described in Section 4.2.2.3, implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the MacNeill's sootywing skipper.

4.5.25.3 Effects of LCR MSCP Implementation

Habitat creation–related activities may result in take of the MacNeill's sootywing skipper. LCR MSCP habitat creation–related activities will avoid removal of MacNeill's sootywing skipper habitat. LCR MSCP activities related to establishment and management of created habitat, such as operation of vehicles and equipment, however, could result in mortality of individuals if they are present when such activities are undertaken. It is likely that activities associated with the creation of MacNeill's sootywing skipper habitat would result in such take because it will be desirable to locate created habitat adjacent to or near occupied habitat to facilitate use of the new habitat by MacNeill's sootywing skippers.

4.5.26 Sticky Buckwheat

The sticky buckwheat is a rare annual plant, and its distribution is centered in the Muddy and Virgin River drainages, and regionally significant populations occur around the Overton Arm shoreline of Lake Mead, including some that are below the full-pool elevation (Niles et al. 1995, 1997; National Park Service 1999). Non-flow-related covered activities and LCR MSCP implementation are not expected to result in take of the sticky buckwheat. This species occurs in mixed Mojave desert scrub communities that are not expected to be affected by non-flow-related covered activities, and implementation of the LCR MSCP Conservation Plan will avoid effects on the species.

The potential effects of implementing covered activities and LCR MSCP conservation measures on distribution and status of the sticky buckwheat are expected to be minor, only affecting plants that become established in transitory shoreline habitats that are created when Lake Mead reservoir elevations are below full pool and that are inundated when reservoir elevations subsequently rise.

4.5.26.1 Effects of Flow-Related Covered Activities

Implementation of flow-related covered activities may result in impacts on the sticky buckwheat. The sticky buckwheat can establish on suitable soils that become exposed when the Lake Mead reservoir is below its full-pool elevation. Changes in reservoir elevations associated with flow-related covered activities could result in some low level of impact on sticky buckwheat plants that have established below the full-pool elevation, when reservoir elevations rise to elevations that inundate plants.

4.5.27 Threecorner Milkvetch

The threecorner milkvetch is an annual plant whose distribution is limited, and, within and adjacent to the LCR MSCP planning area, it is rare and localized along the lower Muddy, Virgin, and Colorado Rivers. Non-flow-related covered activities and LCR MSCP implementation are not to result in take of the threecorner milkvetch. It is typically associated with creosote bush scrub, which is not expected to be affected by

non-flow-related covered activities, and implementation of the LCR MSCP Conservation Plan will avoid effects on the species.

The potential effects of implementing covered activities and LCR MSCP conservation measures on distribution and status of the threecorner milkvetch are expected to be minor, only affecting plants that become established in transitory shoreline habitats that are created when Lake Mead reservoir elevations are below full pool and that are inundated when reservoir elevations subsequently rise.

4.5.27.1 Effects of Flow-Related Covered Activities

Implementation of flow-related covered activities may result in impacts on the threecorner milkvetch. The threecorner milkvetch can establish on suitable soils that become exposed when the Lake Mead reservoir is below its full-pool elevation. Changes in reservoir elevations associated with implementation of flow-related covered activities could result in some low level of impact on threecorner milkvetch plants that have established below the full-pool elevation, when reservoir elevations rise to elevations that inundate plants.

4.6 Impacts on Evaluation Species

4.6.1 California Leaf-Nosed Bat

The California leaf-nosed bat is a year-round resident in all reaches of the LCR. It roosts in caves or mines close to riparian areas and forages near open water in all land cover types where insect prey are abundant. Lowering of groundwater elevations could reduce the production and abundance of insect prey as a result of changes in the extent, frequency, and duration that surface water or moist soil surface conditions are present in patches of riparian land cover. There is currently insufficient information to determine whether reduction in groundwater levels would reduce the abundance of insect prey species sufficiently to affect the California leaf-nosed bat. Non-flow-related covered activities and LCR MSCP implementation are not expected to affect roost sites and, therefore, are not expected to result in take of the California leaf-nosed bat.

4.6.2 Pale Townsend's Big-Eared Bat

The pale Townsend's big-eared bat is a year-round resident along all reaches of the MSCP planning area (Hall 1946). Maternity and day roosts are generally located in mines or caves; night roosts may be in buildings or other structures. Lowering of groundwater elevations could reduce the production and abundance of insect prey as a result of changes in the extent, frequency, and duration that surface water or moist soil surface conditions are present in patches of riparian land cover. There is currently insufficient information to determine whether reduction in groundwater levels would reduce the abundance of insect prey species sufficiently to affect the pale Townsend's big-eared bat. Non-flow-related covered activities and LCR MSCP implementation are

not expected to affect roost sites and, therefore, are not expected to result in take of the pale Townsend's big-eared bat.

4.6.3 Colorado River Toad

The Colorado River toad is a semiaquatic amphibian associated with Sonoran desert habitats that was last observed in the LCR MSCP planning area in 1984 in Reach 4 on the Arizona side of the Cibola NWR. Because the Colorado River toad is not present in the LCR MSCP planning area, implementation of flow-related covered activities, non-flow-related covered activities, and the LCR MSCP will not result in take of the Colorado River toad.

4.6.4 Lowland Leopard Frog

The lowland leopard frog is not known to occur in the LCR MSCP planning area but does occur near the LCR MSCP planning area at the Bill Williams River NWR, approximately 7 miles upstream from the Colorado River in Reach 3.

Because the lowland leopard frog is not present in the LCR MSCP planning area, implementation of flow-related covered activities, non-flow-related covered activities, and the LCR MSCP will not result in take of the lowland leopard frog.

Chapter 5

Conservation Plan

5.1 Introduction

This chapter presents the LCR MSCP Conservation Plan. The Conservation Plan is a comprehensive plan to conserve, monitor, and manage populations and habitat of covered species. The Conservation Plan is designed to address and meet the overall goals of the LCR MSCP (Section 1.2, "LCR MSCP Goal"). The Conservation Plan provides conservation measures for covered species that address the effects of all non-Federal covered activities described in Chapter 2 of this HCP and all Federal covered activities described in the companion LCR MSCP BA.

The LCR MSCP has adopted a habitat-based approach to the conservation of covered species. The LCR MSCP established conservation goals to avoid, minimize, and fully mitigate impacts on all covered species and their habitat; contribute to the recovery of listed covered species; and reduce the likelihood for future listing of nonlisted covered species.

Conservation measures are specific actions designed to achieve goals for covered species and research objectives for evaluation species. Most conservation measures are directed toward creation of species habitat, maintenance of existing species habitat, and augmentation of species populations. In some instances, additional species-specific conservation measures are required elements of the LCR MSCP to ensure achievement of the LCR MSCP goals. The conservation plan is based on the best scientific information available. Sources that were used to develop conservation measures included:

- *Final Southwestern Willow Flycatcher Recovery Plan* (U.S. Fish and Wildlife Service 2002b),
- *Yuma Clapper Rail Recovery Plan* (U.S. Fish and Wildlife Service 1983),
- *Bonytail* (Gila elegans) *Recovery Goals: Amendment and Supplement to the Bonytail Recovery Plan* (U.S. Fish and Wildlife Service 2002c),
- *Razorback Sucker* (Xyrauchen texanus) *Recovery Goals: Amendment and Supplement to the Razorback Sucker Recovery Plan* (U.S. Fish and Wildlife Service 2002e),
- *Humpback Chub* (Gila cypha) *Recovery Goals: Amendment and Supplement to the Humpback Chub Recovery Plan* (U.S. Fish and Wildlife Service 2002d).

- conservation recommendations presented in BOs (U.S. Fish and Wildlife Service 1997, 2001),
- state and Federal resource planning documents,
- scientific literature, and
- input from resource specialists.

In accordance with the LCR MSCP adaptive management process (Section 5.12), as new information is learned through monitoring and research (Section 5.11) conducted under the LCR MSCP or by others, conservation measures may be modified or new conservation measures developed to better ensure the efficient and timely achievement of goals for covered species.

5.2 Approach to Developing Conservation and Biological Goals

5.2.1 Conservation Goals

Three conservation goals were used to guide the LCR MSCP Conservation Plan. These goals are consistent with the overall LCR MSCP goals (Chapter 1). Conservation goals for each covered species are presented in Table 5-1. One or more of the following conservation goals applies to each species.

- **Avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the species.** This goal applies to all covered species that could be adversely affected by covered activities or LCR MSCP implementation. This goal is consistent with the ESA section 10 incidental take regulations, which require that the Conservation Plan, to the maximum extent practicable, minimize and mitigate the impacts of the covered activities on covered species (50 C.F.R. §17.22(b)(2)(B)).
- **Contribute to recovery of listed species.** This goal applies to Federally listed species:
  - that depend on the aquatic, wetland, or riparian environments present in the LCR MSCP planning area and
  - for which implementation of the LCR MSCP is reasonably certain to measurably benefit the species.
- **Reduce the likelihood of future Federal listing of nonlisted species.** This goal applies to species that are not currently listed under the ESA:
  - that depend on the aquatic, wetland, or riparian environments present in the LCR MSCP planning area and
  - for which implementation of the LCR MSCP is reasonably certain to measurably benefit the species.

Table 5-1. LCR MSCP Conservation and Biological Goals for Covered Species

Covered Species	Conservation Goals: Avoid, Minimize, and Fully Mitigate Adverse Effects of Covered Activities and LCR MSCP Implementation on Species[a]	Conservation Goals: Contribute to Recovery of Listed Species[b]	Conservation Goals: Reduce the Likelihood of Future Federal Listing of Nonlisted Species[b]	Biological Goal
Yuma clapper rail	X	X		Create and maintain 512 acres of species habitat.
Southwestern willow flycatcher	X	X		Create and maintain 4,050 acres of species habitat.
Desert tortoise (Mojave population)	X			Protect 230 acres of unprotected occupied species habitat.
Bonytail	X	X		Create and maintain 360 acres of species habitat and rear and release up to 620,000 juvenile bonytail along the LCR over the term of the LCR MSCP.
Humpback chub	X	X		Provide $500,000 in funding to support existing species conservation programs.
Razorback sucker	X	X		Create and maintain 360 acres of species habitat and rear and release up to 620,000 juvenile razorback sucker along the LCR over the term of the LCR MSCP.
Western red bat	X			Create and maintain 765 acres of species roosting habitat.
Western yellow bat	X			Create and maintain 765 acres of species roosting habitat.
Desert pocket mouse	X			Fully restore occupied habitat that is disturbed as a result of implementing covered activities that create, restore, or maintain habitat.
Colorado River cotton rat	X			Create and maintain 125 acres of species habitat in Reaches 3 and 4.
Yuma hispid cotton rat	X			Create and maintain 76 acres of species habitat in Reaches 6 and 7.
Western least bittern	X		X	Create and maintain 512 acres of species habitat.
California black rail	X		X	Create and maintain 130 acres of species habitat.
Yellow-billed cuckoo	X		X	Create and maintain 4,050 acres of species habitat.

Covered Species	Conservation Goals: Avoid, Minimize, and Fully Mitigate Adverse Effects of Covered Activities and LCR MSCP Implementation on Species[a]	Conservation Goals: Contribute to Recovery of Listed Species[b]	Conservation Goals: Reduce the Likelihood of Future Federal Listing of Nonlisted Species[b]	Biological Goal
Elf owl	X		X	Create and maintain 1,784 acres of species habitat in Reaches 3–5.
Gilded flicker	X		X	Create and maintain 4,050 acres of species habitat in Reaches 3–7.
Gila woodpecker	X		X	Create and maintain 1,702 acres of species habitat in Reaches 3–6.
Vermilion flycatcher	X		X	Create and maintain 5,208 acres of species habitat.
Arizona Bell's vireo	X			Create and maintain 2,983 acres of species habitat.
Sonoran yellow warbler	X		X	Create and maintain 4,050 acres of species habitat.
Summer tanager	X		X	Create and maintain 602 acres of species habitat.
Flat-tailed horned lizard	X			Protect 230 acres of unprotected occupied species habitat.
Relict leopard frog	X		X	Provide $100,000 in funding to support existing species conservation programs.
Flannelmouth sucker	X		X	Create and maintain 85 acres of species habitat in Reach 3 and provide $400,000 in funding to support existing species conservation programs.
MacNeill's sootywing skipper	X			Create and maintain 222 acres of species habitat in Reaches 1–4.
Sticky buckwheat	X		X	Provide $10,000 per year until 2030 to support sticky buckwheat and threecorner milkvetch conservation programs.
Threecorner milkvetch	X		X	Provide $10,000 per year until 2030 to support threecorner milkvetch and sticky buckwheat conservation programs.

Notes:

[a] This goal applies to all species that could be adversely affected by covered activities or LCR MSCP implementation.

[b] This goal applies to species that depend on the aquatic, wetland, or riparian environments present in the LCR MSCP planning area, and for which implementation of the LCR MSCP is reasonably certain to measurably benefit the species.

For the first goal listed above, the LCR MSCP participants will undertake actions within their legal authority and jurisdiction to avoid or minimize habitat loss and will replace lost habitat for covered species that depend on the aquatic, wetland, and riparian environments present in the LCR MSCP planning area. Conservation measures in the LCR MSCP Conservation Plan are designed to contribute to the recovery of five listed species and to reduce the likelihood for the future listing of 13 species. The LCR MSCP also addresses nine covered species for which the only goal is to avoid, minimize, and fully mitigate the effects of covered activities. The LCR MSCP Conservation Plan does not include conservation measures to contribute to the recovery of or help reduce the likelihood for future listing of nine of the covered species for the following reasons:

- the species is not associated with the aquatic, wetland, or riparian land cover types that are the focus of the LCR MSCP (i.e., desert tortoise, flat-tailed horned lizard);
- the ecology of the species, factors that are limiting to the species, and/or the species' microhabitat requirements are not sufficiently understood to provide a reasonable expectation that conservation measures can be developed that will reduce the likelihood for future listing of the species (i.e., western red bat, western yellow bat, desert pocket mouse, Colorado River cotton rat, Yuma hispid cotton rat, and MacNeill's sootywing skipper);
- the extent of cottonwood-willow structural types created to provide habitat for the species is limited, and increasing the extent of creation of these cottonwood-willow structural types would reduce the extent of creation of cottonwood-willow structural types necessary to benefit other covered species (i.e., Arizona Bell's vireo).

5.2.2 Biological Goals

Under its Five-Point Policy, USFWS recommends that the HCP identify biological goals and specifically states that "…the Services and HCP Applicants will clearly and consistently define the expected outcome, i.e., biological goal(s)." (65 FR 106:35256, June 1, 2000). Goals and conservation measures for LCR MSCP covered species are presented in this chapter. These goals are consistent with the overall LCR MSCP goals (Chapter 1) and the conservation goals (Section 5.2.1). The biological goals for covered species are presented in Table 5-1. Species biological goals are quantitative, measurable, and are based primarily on the creation of new species habitat and augmentation of populations.

The LCR MSCP has not established goals for the conservation of evaluation species. The LCR MSCP, however, identifies research that will be undertaken to determine the status, conservation needs, and feasibility of implementing conservation measures that would benefit evaluation species. LCR MSCP goals will be developed for the evaluation species if they are proposed for coverage under the LCR MSCP in future years.

5.2.3 Noncovered Species Benefits

Creation of 5,940 acres of cottonwood-willow and 1,320 acres of honey mesquite land cover under the LCR MSCP is expected to benefit many other riparian-associated bird

species that are not covered under the LCR MSCP. Table 5-2 lists some of the bird species that breed or migrate through the LCR MSCP planning area that are expected to substantially benefit from the creation of covered species habitats.

Implementation of the LCR MSCP Conservation Plan is expected to improve the function of the LCR as stopover habitat for neotropical migrant birds during critical periods of migration movements and provide essential resting and foraging habitat for these riparian-associated species during migration. The LCR is one of four primary avian migration corridors near the U.S.–Mexico border for neotropical birds that annually migrate from wintering habitats in Mexico and South America to breeding habitats in the United States and Canada. Most migrant birds must stop periodically to rest and consume food and water. Desert riparian habitats, such as the LCR, provide essential stopover sites for a high diversity of neotropical migrant birds, such as flycatchers, vireos, warblers, tanagers, and grosbeaks. Because of its strategic location in an otherwise arid landscape, the LCR is especially important to a diversity of migrant bird species that breed in the western United States (Rosenberg et al. 1991; Riparian Habitat Joint Venture 2000). For example, of the 12 wood warbler species on the USFWS Partners in Flight Watch List, nine species annually migrate through the LCR (U.S. Fish and Wildlife Service 1999).

Maintaining critical stopover habitats has become recognized as an integral component in the conservation of neotropical tropical migrant birds species (Yong and Finch 2002). Within the LCR MSCP planning area, most of the native riparian vegetation that historically supported stopover habitat has been lost, and the remnant habitat is highly fragmented. The creation of 7,260 acres of new cottonwood-willow- and honey mesquite–dominated land cover under the LCR MSCP is expected to provide substantial benefits to these species, substantially improving the existing condition of riparian sites along the LCR that are currently dominated by nonnative, invasive species, such as saltcedar (*Tamarix* spp.).

In addition to providing habitat for the covered species and neotropical migrant birds, establishment of cottonwood-willow, honey mesquite, marsh, and backwater land cover types will also create native habitats for many other species of wildlife that inhabit the LCR. Patches of created cottonwood-willow and honey mesquite land cover will provide:

- habitat for several species of mammals, including rodents (which are prey for snakes, raptors, and mammalian predators), desert mule deer, desert cottontail, and ringtail;
- foraging and nesting habitat for many native birds, including game birds (e.g., mourning dove and Gambel's quail) and raptors (e.g., Cooper's hawk, American kestrel, and red-tailed hawk); and
- habitat for native reptiles, such as the tree lizard, gopher snake, common kingsnake, and western ground snake.

Creation of 872 acres of marsh and backwater land cover types will provide habitat for many species of resident and migrant shorebirds (e.g., American avocet, western plover), wading birds (e.g., great blue heron, great egret), waterfowl, and other water birds.

Table 5-2. Sensitive Noncovered Bird Species that Are Expected to Benefit from Implementation of the LCR MSCP Conservation Plan

Species	Likely to Benefit Breeding	Likely to Benefit Migrants
Abert's towhee *Pipilo aberti*	X	
Ash-throated flycatcher *Myiarchus cinerascens*	X	X
American bittern *Botaurus lentiginosus*		X
American kestrel *Falco sparverius*	X	
Blue grosbeak *Guiraca caerulea*	X	X
Brown-crested flycatcher *Myiarchus tyrannulus*	X	X
Bullock's oriole *Icterus bullockii*	X	X
Common nighthawk *Chordeiles minor*		X
Common yellowthroat *Geothrypis trichas*		X
Cooper's hawk *Accipiter cooperii*	X	
Greater roadrunner *Geococcyx californianus*	X	
Great horned owl *Bubo virginianus*	X	
Lesser nighthawk *Chordeiles acutpennis*	X	
Long-eared owl *Asio otus*	X	
Lucy's warbler *Vermivora luciae*	X	X
Phainopepla *Phainopepla nitens*	X	X
Yellow-breasted chat *Icteria virens*	X	X

5.3 Approach to Conservation

5.3.1 Conservation Measures

The LCR MSCP includes the following types of conservation measures that, in combination, achieve the conservation and biological goals for regulatory compliance and contributing to species recovery stated in Section 5.2:

- maintenance of an important portion of existing habitat for covered species in the LCR MSCP planning area,
- creation of habitat to establish new habitat, including long-term management of created habitat to maintain and preserve ecological functions,
- avoidance and minimization of impacts on covered species and their habitat resulting from covered activities and LCR MSCP implementation,
- population enhancement measures that directly or indirectly increase abundance of covered species, and
- monitoring and research necessary to assess and improve conservation measure effectiveness and adaptively manage implementation of the LCR MSCP Conservation Plan over time.

The LCR MSCP Conservation Plan is designed to fully mitigate adverse effects on all covered species resulting from covered activities described in Chapter 2 and to meet the ESA section 10 standard to minimize and mitigate the impacts of the covered activities on covered species to the maximum extent practicable (50 C.F.R. §17.22(b)(2)(B)) (Section 5.9).

5.3.2 Science Strategy

The LCR MSCP is a multifaceted, long-range program to conserve covered species that depend on the aquatic, wetland, and riparian environments present in the LCR floodplain. In general, these species are rare, their habits and habitats are not well known, and experience in development and creation of their habitats and management of their populations is limited. The LCR MSCP has used the best available scientific information to develop the LCR MSCP Conservation Plan and will use sound scientific principles and standards to implement the conservation measures.

The LCR MSCP has a commitment to use scientific information, methods, principles, and standards to implement the LCR MSCP Conservation Plan throughout the term of the LCR MSCP. This science-based strategy for implementing the LCR MSCP primarily applies to four major elements of the LCR MSCP Conservation Plan: fish augmentation, habitat creation, monitoring and research, and adaptive management. The LCR MSCP planning processes for implementing conservation measures will incorporate both internal and external science review.

Internal reviews will focus on cost effectiveness of techniques for implementing conservation measures, chronology of implementation, and interrelationships of LCR MSCP Conservation Plan components. Internal reviews will consider:

- the current knowledge of the ecology and life requirements of covered species,
- knowledge gained through applied research undertaken by the LCR MSCP and others, and
- the effectiveness of conservation measures and the status of the species and their habitats, including the results and progress of concurrent research, conservation, restoration, and recovery programs for LCR MSCP covered species undertaken elsewhere in the Colorado River Basin.

External reviews will be conducted by recognized experts in the field of study or program under review. The need for and timing of external review of specific elements of the LCR MSCP will be determined by the Program Manager, and the number of reviewers required will be determined by the complexity of the LCR MSCP element under review.

Baseline conditions will be assessed before implementing conservation measures that create covered species habitats, augment populations, or other species-specific conservation measures (e.g., control brown-headed cowbirds to reduce the incidence of nest parasitism). This assessment of baseline conditions will provide the basis for assessing the success of conservation measures. Methods to implement conservation measures will be developed based on the best available scientific information, the efficacy of the methods will be monitored during implementation, and the effectiveness of the conservation measures will be monitored following implementation (Section 5.11, “Monitoring and Research”). Ineffective measures will be evaluated and, if feasible, modified to improve their effectiveness. Where conservation measures cannot be effectively modified, replacement conservation measures will be developed and implemented.

5.4 Conservation Concepts

5.4.1 Introduction

This section describes the conservation concepts for achieving goals for covered species. These concepts include:

- maintaining important existing habitat areas,
- creating and maintaining new habitat for covered species,
- augmenting populations of covered fish species,
- supporting other programs to implement conservation measures to benefit covered species, and
- timing of implementing conservation measures.

Implementation of the conservation concepts described in this section will serve to mitigate effects of covered activities and LCR MSCP implementation on covered species and to contribute to the recovery of some species. The conservation concepts described in this section and the conservation measures described in Section 5.6, "General Species Conservation Measures," Section 5.7, "Species-Specific Conservation Measures," and Section 5.8, "Evaluation Species Conservation Measures," will be implemented by the Program Manager. A full description of the responsibilities of the Program Manager is presented in Chapter 6, "Governance and Implementation Structure."

5.4.2 Maintenance of Existing Habitat

The existing distribution and abundance of many of the covered species in the LCR MSCP planning area depend on the extent, distribution, and quality of existing habitat, much of which is under Federal and state management. Consequently, to ensure the continued existence of covered species in the LCR MSCP planning area and to allow for future increases in their abundance, it is important that existing habitat areas are maintained by implementing actions that will prevent the future degradation or loss of habitat.

The LCR MSCP will contribute to maintaining the condition of a portion of important existing habitat for southwestern willow flycatcher, yellow-billed cuckoo, Yuma clapper rail, and California black rail within the LCR MSCP planning area. Maintaining important existing habitat areas is necessary to help ensure the continued existence of these species in the LCR MSCP planning area. Maintaining existing habitat will also help ensure the continued existence of source populations from which individuals will be available to colonize LCR MSCP–created habitats as they develop. Maintenance of important existing habitat areas is part of the strategy to mitigate adverse effects of ongoing and future covered activities and to contribute to the recovery of these species. In addition, the existing habitat that is maintained under the LCR MSCP will provide significant benefits to other covered species that use riparian and marsh habitats. The key elements of the LCR MSCP approach to maintain existing important habitat areas are described below.

- The LCR MSCP will establish a $25 million fund contribution early in the term of the LCR MSCP in an interest-bearing account to be expended on assessing and implementing projects for maintaining existing habitat.
- Habitat maintenance activities could occur anywhere within the LCR MSCP planning area and may be implemented through funding projects by any appropriate agency in the LCR MSCP planning area.
- Habitat maintenance activities will be developed and implemented in cooperation with the managing agency for the property on which the activity will occur.
- Selection of habitat maintenance activities funded by the LCR MSCP will be determined based on a set of detailed criteria to be developed by the LCR MSCP in conjunction with the USFWS. Criteria will be designed to ensure the activities are consistent with the goal of habitat maintenance, goals for covered species, and overall goals of the LCR MSCP.

Table 5-3. Minimum Requirements for Achieving Covered Species Habitat Creation Goals

Species	Habitat Creation Goal (acres)	Created Land Cover Type that will Provide Species Habitat	Minimum Patch Size of Created Land Cover that will Provide Habitat (acres)[a]
Threatened and Endangered Species			
Yuma clapper rail	512	Marsh with water depths no greater than 12 inches	5[b]
Southwestern willow flycatcher	4,050	Cottonwood-willow types I–IV with moist surface soil conditions during the breeding season	10[c]
Desert tortoise	0	Not applicable	Not applicable
Bonytail	360	Backwaters that contain the physical, chemical, and biological conditions required to support native LCR fishes in a healthy condition	Not applicable
Humpback chub	0	Not applicable	Not applicable
Razorback sucker	360	Backwaters that contain the physical, chemical, and biological conditions required to support native LCR fishes in a healthy condition	Not applicable
Other Covered Species			
Western red bat (roosting habitat)	765	Combination of cottonwood-willow types I and II and honey mesquite type III	No minimum requirement[d]
Western yellow bat (roosting habitat)	765	Combination of cottonwood-willow types I and II and honey mesquite type III	No minimum requirement[d]
Desert pocket mouse	0	Not applicable	Not applicable
Colorado River cotton rat	125	Marsh	No minimum requirement[d]
Yuma hispid cotton rat	76	Cottonwood-willow with a moist herbaceous understory	No minimum requirement[d]
Western least bittern	512	Marsh with water depths no greater than 12 inches	No minimum requirement[d]
California black rail	130	Marsh with water depths no greater than 1 inch	5[e]
Yellow-billed cuckoo	4,050	Cottonwood-willow types I–III	25[f]
Elf owl	1,784	Combination of cottonwood-willow types I and II and honey mesquite type III	No minimum requirement[d]

Species	Habitat Creation Goal (acres)	Created Land Cover Type that will Provide Species Habitat	Minimum Patch Size of Created Land Cover that will Provide Habitat (acres)[a]
Gilded flicker	4,050	Cottonwood-willow types I–III	No minimum requirement[d]
Gila woodpecker	1,702	Cottonwood-willow types I–IV	50[g]
Vermilion flycatcher	5,208	Combination of cottonwood-willow types I–IV and honey mesquite type III	No minimum requirement[d]
Arizona Bell's vireo	2,983	Combination of cottonwood-willow types III and IV and honey mesquite type III	No minimum requirement[d]
Sonoran yellow warbler	4,050	Cottonwood-willow types I–IV	2.5[h]
Summer tanager	602	Cottonwood-willow types I and II	No minimum requirement[d]
Flat-tailed horned lizard	0	Not applicable	Not applicable
Relict leopard frog	0	Not applicable	Not applicable
Flannelmouth sucker	85	Backwaters that contain the physical, chemical, and biological conditions required to support native LCR fishes in a healthy condition	Not applicable
MacNeill's sootywing skipper	222	Honey mesquite type III created with quail bush to create honey mesquite–quail bush	No minimum requirement
Sticky buckwheat	0	Not applicable	Not applicable
Threecorner milkvetch	0	Not applicable	Not applicable

Note: Failure to achieve the minimum habitat creation requirements for each species could require implementation of remedial measures (see Section 5.12.3).

Not applicable = Habitat will not be created for this species under the LCR MSCP Conservation Plan and minimum habitat patch size requirements do not apply, or, if habitat will be created for the species, patch size is not a constituent element of the species habitat.

[a] Minimum extent of habitat patches that must be created to be considered species habitat. It is the intent, however, of the LCR MSCP to create habitat in the largest patch sizes possible within the site specific constraints that are associated with conservation areas.

[b] Minimum habitat patch size is based on research indicating that the density of Yuma clapper rail is independent of habitat patch size (Anderson and Ohmart 1985) and the subspecies will use relatively small patches of habitat. Habitat will be created in patches as large as possible but will not be created in patches smaller than 5 acres. Smaller patches are likely to support isolated nesting pairs and be within the range of habitat patch sizes used by the species for foraging and dispersal. Larger patches would be expected to support multiple nesting pairs.

[c] Minimum habitat patch size can vary widely (Sogge et al. 1997a; Spencer et al. 1996; Paradzick et al. 2000; McKernan 1997; U.S. Fish and Wildlife Service 2001). Saltcedar-dominated riparian vegetation at southwestern willow flycatcher breeding sites in the Grand Canyon ranged from 1.48 to 2.22 acres (Sogge et al. 1997a). The minimum habitat patch size was selected based on the assumption that up to a

total of 10 acres of habitat may be required to sustain a nesting pair, accounting for variances in habitat quality among sites and years and periodic loss of habitat to wildfire and other unforeseeable factors.

[d] Minimum habitat patch size requirements for this species is not known or is not well understood. To meet the minimum patch requirements for species for which minimum habitat patch size requirements are established, however, created cottonwood-willow and marsh land cover types will be created, at a minimum, in the following patch sizes:

		Minimum Extent to Be Created by Patch Size (acres)			
Land Cover Type	Total Extent of Land Cover Type to Be Created (acres)	50-acre patches	25-acre patches	10-acre patches	5-acre patches
Cottonwood-willow	5,940	1,702	2,348	1,890	0
Marsh	512	0	0	0	512

[e] The minimum patch size requirements for the California black rail in the LCR MSCP planning area is not known. Tecklin (1999), however, found that in the foothills of the central Sierra Nevada the species used marshes as small as 0.5 acre and 32% of occupied wetlands were less than 0.75 acre. Habitat will be created in patches as large as possible but will not be created in patches smaller than 5 acres. Smaller patches are likely to support one to several nesting pairs and be within the range of habitat patch sizes used by the species for foraging and dispersal. Larger patches would be expected to support multiple nesting pairs.

[f] Recent research along the LCR has found that the minimum nesting habitat patch size provided by cottonwood-willow forest for the yellow-billed cuckoo was 25 acres (Halterman pers. comm.). Habitat will be created in patches as large as possible but will not be created in patches smaller than 25 acres, which at a minimum, is expected to provide suitable nesting habitat for 1–2 pairs. Creation of larger patches are expected to provide sufficient habitat to support multiple nesting pairs.

[g] Gila woodpeckers appear to need large blocks of woody riparian vegetation for nesting; isolated patches of woody riparian vegetation less than 49 acres do not support this species (Rosenberg et al. 1991).

[h] Grinnell (1914) reported observing from one to four Sonoran yellow warbler singing males per 2.5 acres in cottonwood-willow stands along the LCR. The smallest patches of cottonwood-willow land cover that will be created are 10 acres (to meet the minimum patch size requirement for the southwestern willow flycatcher) and, therefore, are expected to support several nesting pairs, with larger patches providing the capacity to support larger numbers of nesting pairs.

- General criteria that will be developed to select habitat maintenance projects to be funded under the LCR MSCP would include but are not be limited to, documented evidence that the:
  - habitat has degraded following approval of the LCR MSCP,
  - habitat can be improved to meet the same standards as described for covered species habitats to be created under the LCR MSCP Conservation Plan (Table 5-3),
  - extent of the habitat area encompassed by the project is sufficient to meet the needs of the covered species,
  - project is economically justified, and
  - cost sharing from the applicant is sufficient.

  Special consideration may be given to award grants for equipment and other items to support continuous maintenance programs on a broad scale.
- The habitat maintenance fund would be administered by the Program Manager, primarily through award of grants to participating agencies.
- Types of activities that could be conducted include construction of infrastructure for water delivery or movement; maintenance of marsh vegetation by burning, water delivery, and other means; maintenance of moist soil conditions in riparian land cover types (e.g., cottonwood-willow); dredging activities to create backwaters or backwater connection with the main river channel; removal or control of undesirable vegetation such as saltcedar and *Arundo*; and other appropriate means to maintain existing desirable habitat.

5.4.3 Habitat Creation Concepts

This section describes design concepts for creating cottonwood-willow, honey mesquite, marsh, and backwater land cover types to provide habitat for covered species. Habitat creation involves the direct construction of habitat that results in new habitat at sites that do not presently support habitat (e.g., establishment of cottonwood-willow stands or marsh that provides habitat for covered species on existing agricultural lands). Covered species habitat that will be established with creation of each land cover type is presented in Table 5-4.

Table 5-4. Covered Species Habitat Provided by Creation of Cottonwood-Willow, Honey Mesquite III, Marsh, and Backwater Land Cover Types

	LCR MSCP-Created Land Cover Type			
Covered Species	Cottonwood-Willow	Honey Mesquite III	Marsh	Backwater
Threatened and Endangered Species				
Yuma clapper rail			X	
Southwestern willow flycatcher	X			
Bonytail				X
Razorback sucker				X
Other Covered Species				
Western red bat	X	X		
Western yellow bat	X	X		
Colorado River cotton rat			X	
Yuma hispid cotton rat	X			
Western least bittern			X	
California black rail			X	
Yellow-billed cuckoo	X			
Elf owl	X	X		
Gilded flicker	X			
Gila woodpecker	X			
Vermilion flycatcher	X	X		
Arizona Bell's vireo	X	X		
Sonoran yellow warbler	X			
Summer tanager	X			
Flannelmouth sucker				X
MacNeill's sootywing skipper		X		

Note: X = Habitat for covered species shown in the left column could be provided within portions of the created areas of the land cover types indicated. See Sections 5.3 and 5.4 for more detailed information on the relationship between covered species habitat and land cover types.

Habitat for covered species provided by created land cover types will serve to mitigate effects of covered activities and LCR MSCP implementation on covered species. The created habitats and intended ecological functions to be provided by created habitats will be protected under the LCR MSCP. In addition, LCR MSCP–created habitats will require implementation of long-term management measures to maintain or improve the intended ecological functions of the habitat and ensure covered species goals are achieved over the term of the LCR MSCP. Management measures are expected to include such activities as implementation of irrigation schedules, fuel load reduction, and monitoring and removal of invasive nonnative flora and fauna.

Table 5-5. Extent of Covered Species Habitat That Will Be Provided with Creation of Land Cover Types

Created Land Cover Type	Species Habitat Provided by the Created Land Cover Type
Create a total of 5,940 acres of cottonwood-willow	Southwestern willow flycatcher: ▪ 2,700 acres will be created as cottonwood-willow types I–III with moist surface soil conditions during the breeding season ▪ 1,350 acres will be created as cottonwood-willow types I–IV with moist surface soil conditions during the breeding season
	Western red bat: ▪ 175 acres will be created as cottonwood-willow types I and II to provide roosting habitat[a]
	Western yellow bat: ▪ 175 acres will be created as cottonwood-willow types I and II to provide roosting habitat[a]
	Yuma hispid cotton rat: ▪ 76 acres will be created in Reaches 6 and 7 that support a moist herbaceous understory, including openings in the canopy to allow for the establishment and growth of herbaceous vegetation
	Yellow-billed cuckoo: ▪ 2,700 acres will be created as cottonwood-willow types I–III with moist surface soil conditions during the breeding season ▪ 1,350 acres will be created as cottonwood-willow types I–III
	Elf owl: ▪ 600 acres will be created as cottonwood-willow types I and II in Reaches 3–5[b]
	Gilded flicker: ▪ 4,050 acres will be created as cottonwood-willow types I–III in Reaches 3–7
	Gila woodpecker: ▪ 1,702 acres will be created as cottonwood-willow types I–IV in Reaches 3–6
	Vermilion flycatcher: ▪ 4,008 acres will be created as cottonwood-willow types I–IV
	Arizona Bell's vireo: ▪ 1,783 acres will be created as cottonwood-willow types III and IV
	Sonoran yellow warbler: ▪ 4,050 acres will be created as cottonwood-willow types I–IV
	Summer tanager: ▪ 602 acres will be created as cottonwood-willow types I and II
Create a total of 1,320 acres of honey mesquite III	Western (desert) red bat: ▪ 590 acres will be created to provide roosting habitat[a]
	Western yellow bat: ▪ 590 acres will be created to provide roosting habitat[a]
	Elf owl: ▪ 1,184 acres will be created in Reaches 3–5[b]

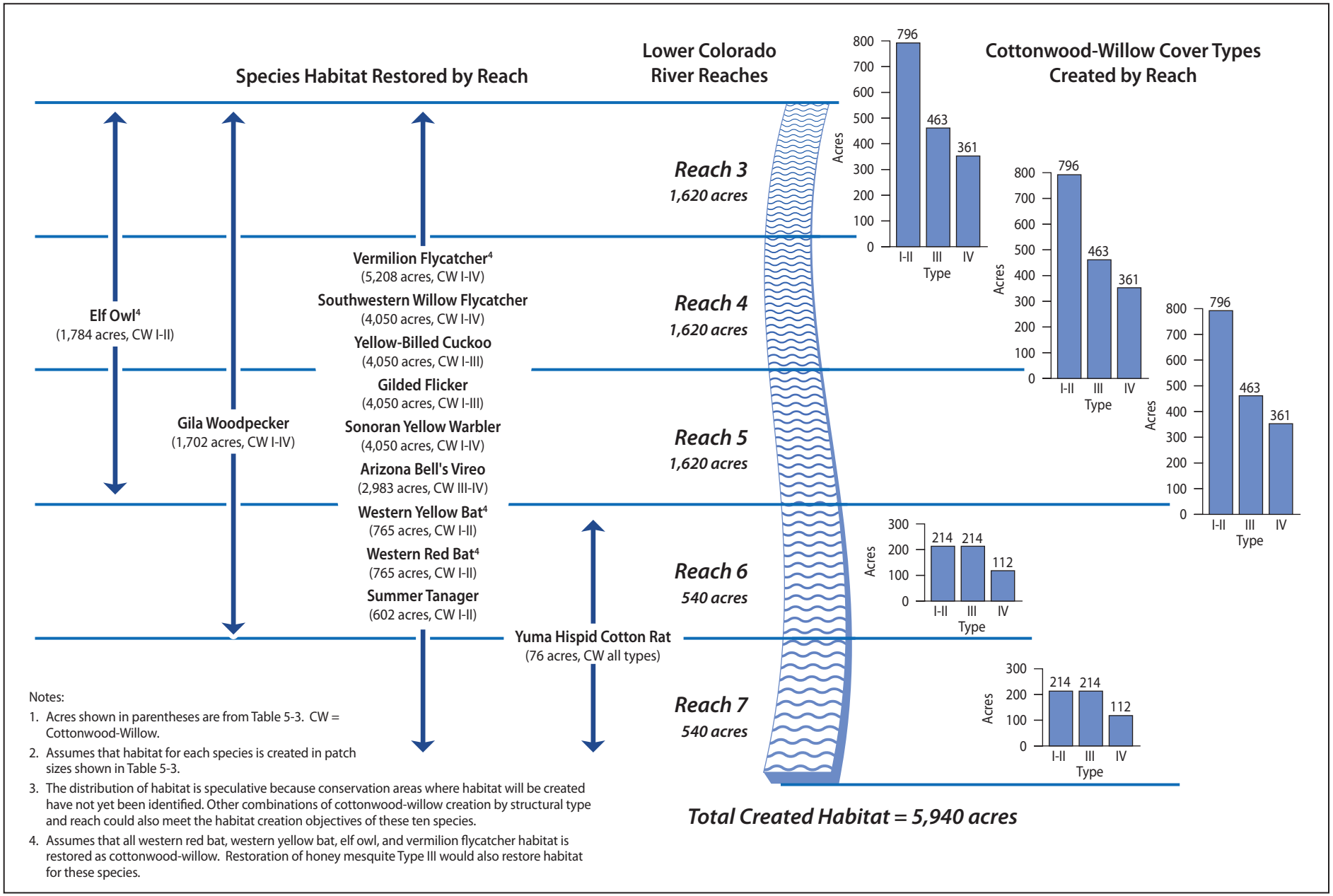
Table 5-5. Continued

Created Land Cover Type	Species Habitat Provided by the Created Land Cover Type
	Vermilion flycatcher: ▪ 1,200 acres will be created
	Arizona Bell's vireo: ▪ 1,200 acres will be created
	MacNeill's sootywing skipper: ▪ 222 acres will be created with quail bush to create the honey mesquite–quail bush edge required by this species near existing occupied habitat in Reaches 1–4
Create a total of 512 acres of marsh	Yuma clapper rail: ▪ 512 acres will be created with water depths no greater than 12 inches
	Colorado River cotton rat: ▪ 125 acres will be created in Reaches 3 and 4
	Western least bittern: ▪ 512 acres will be created with water depths no greater than 12 inches
	California black rail: ▪ 130 acres will be created with water depths no greater than 1 inch in Reaches 5 and 6
Create a total of 360 acres of backwater	Bonytail: ▪ 360 acres will be created in Reaches 3–6 that achieve a rating of *good* based on the Holden et al. (1986) habitat rating system
	Razorback sucker: ▪ 360 acres will be created in Reaches 3–6 that achieve a rating of *good* based on the Holden et al. (1986) habitat rating system
	Flannelmouth sucker: ▪ Up to 85 acres will be created in Reach 3 that achieve a rating of *good* based on the Holden et al. (1986) habitat rating system

Notes:

[a] Cottonwood-willow types I and II and honey-mesquite type III provide roosting habitat for this species. The LCR MSCP Conservation Plan will provide a total of 765 acres of habitat for this species by creating a combination of 765 acres of cottonwood-willow types I and II and honey mesquite type III. The quantity of each created land cover type presented in this table is for illustrative purposes only—the actual amount of each land cover type that will be created to provide habitat for this species will depend on a number of factors, including site availability and conditions for creating each of the land cover types. For example, the habitat creation objective of 765 acres for this species could also be achieved by creating 100 acres of cottonwood-willow types I and II and 665 acres of honey mesquite type III.

[b] Cottonwood-willow types I and II and honey-mesquite type III provide elf owl habitat. The LCR MSCP Conservation Plan will provide a total of 1,784 acres of habitat for this species by creating a combination of 1,784 acres cottonwood-willow types I and II and honey mesquite type III. The quantity of each created land cover type presented in this table is for illustrative purposes only—the actual amount of each land cover type that will be created to provide elf owl habitat will depend on a number of factors, including site availability and conditions for creating each of the land cover types. For example, the habitat creation objective of 1,784 acres for this species could also be achieved by creating 1000 acres of cottonwood-willow types I and II and 784 acres of honey mesquite type III.



Notes:

1. Acres shown in parentheses are from Table 5-3. CW = Cottonwood-Willow.
2. Assumes that habitat for each species is created in patch sizes shown in Table 5-3.
3. The distribution of habitat is speculative because conservation areas where habitat will be created have not yet been identified. Other combinations of cottonwood-willow creation by structural type and reach could also meet the habitat creation objectives of these ten species.
4. Assumes that all western red bat, western yellow bat, elf owl, and vermilion flycatcher habitat is restored as cottonwood-willow. Restoration of honey mesquite Type III would also restore habitat for these species.

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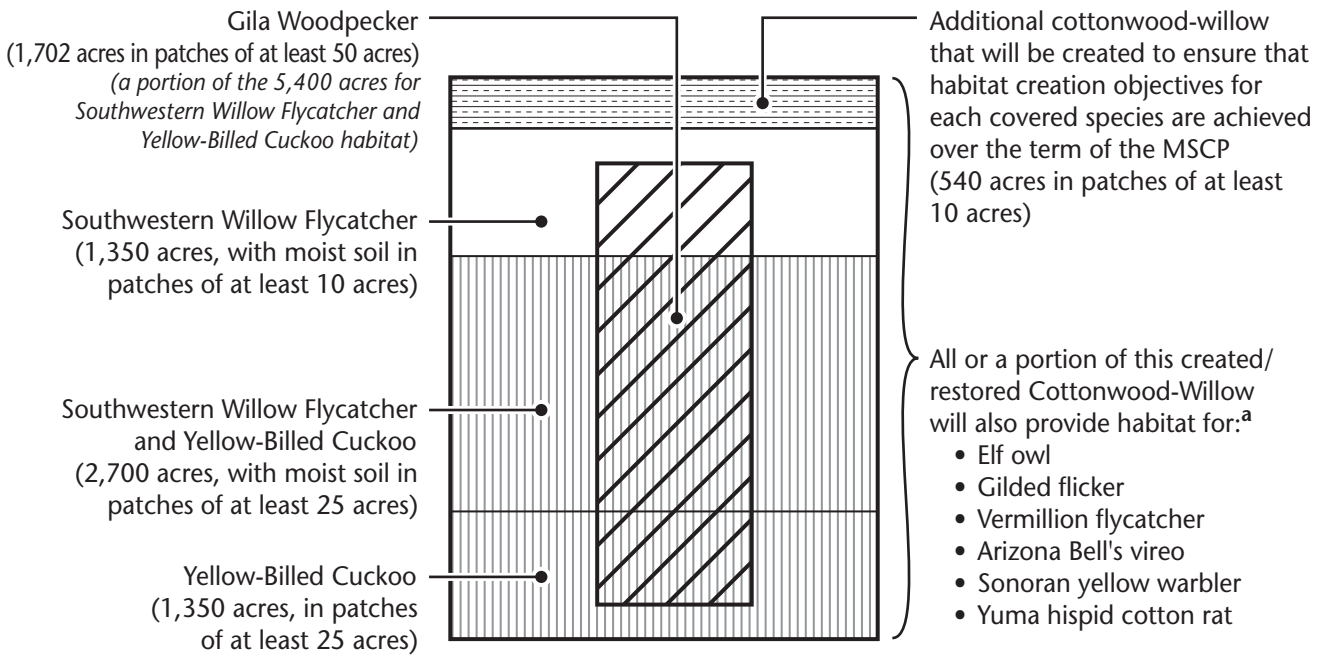
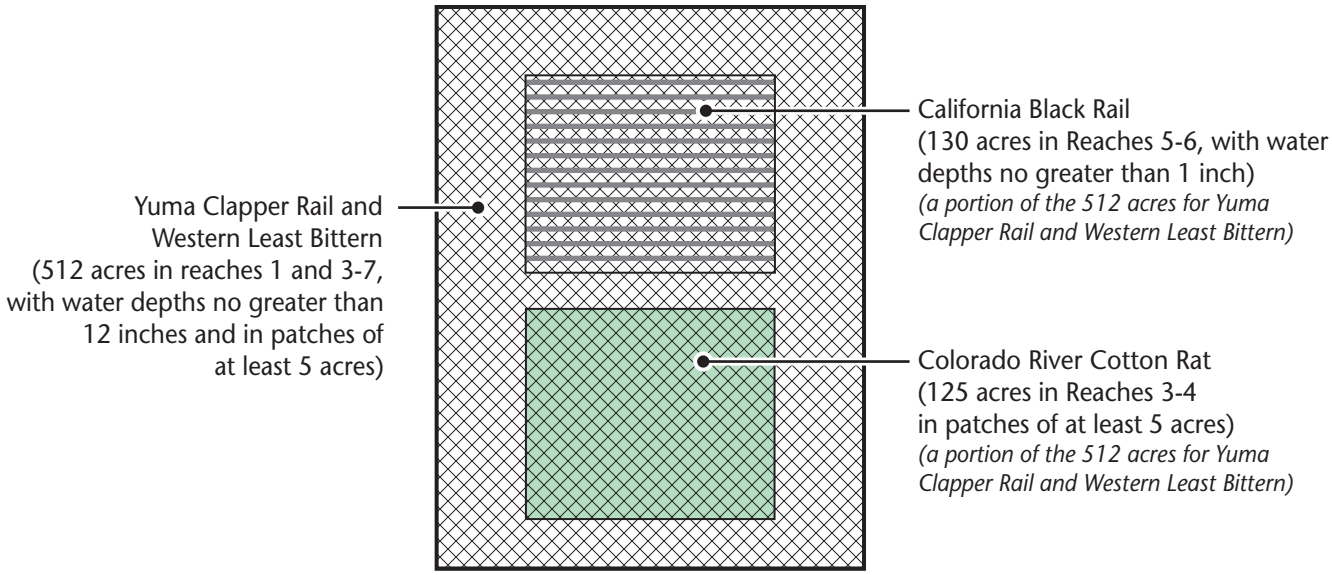
Figure 5-1
Hypothetical Distribution of Cottonwood-Willow Creation That Would Meet Habitat Requirements for All Covered Species Associated with Cottonwood-Willow



Cottonwood-Willow Creation (5,940 acres)

[a] The portion of created cottonwood-willow that will provide habitat for these species is dependent on the structure type of cottonwood-willow required by each species and the reaches in which the species occurs or is assumed to occur (Table 5-3).



Marsh Creation (512 acres)

00450.00-303

Figure 5-2
Proportion of Created Cottonwood-Willow and Marsh That Will Provide Habitat for Selected Covered Species

To the extent practicable based on site conditions, cottonwood-willow, honey mesquite, marsh, and backwaters will be created in proximity to each other to recreate integrated mosaics of habitat that approximate the relationship among aquatic and terrestrial communities historically present along the LCR floodplain.

The LCR MSCP will design and create the following amounts of each land cover type in a manner that will provide habitat for covered species that could be affected by covered activities and LCR MSCP implementation:

- 5,940 acres of cottonwood-willow,
- 1,320 acres of honey mesquite type III,
- 512 acres of marsh, and
- 360 acres of backwaters.

The extent of each created land cover type and the extent of created habitat the land cover types will provide for each covered species are summarized in Table 5-5. The minimum requirements for achieving habitat creation objectives for each species is presented in Table 5-3. Created land cover types will be designed to provide the elements of each covered species habitat in sufficient quantities to fully mitigate effects of covered activities and LCR MSCP implementation. Created land cover design and management requirements to provide habitat for each covered species are described in Section 5.7.

Patches of created land cover, in most instances, will be designed and managed to provide habitat for more than one covered species. Patches of land cover can support habitat for one or more covered species, although how each species may use the same patch of land cover may differ. For example, habitat for one species may be supported by the upper layers of canopy in a stand of riparian land cover, while habitat for another species may be supported by the understory vegetation. Therefore, affected habitat for more than one covered species can be replaced within the same footprint of created land cover, where the created land cover supports the habitat elements of each covered species. Species for which habitat can be created within the same area of land (if elements of each species habitat are present and accessible to the species) are shown in Table 5-4 and illustrated on Figures 5-1 and 5-2 for cottonwood-willow and marsh land cover, respectively.

LCR MSCP acquired lands on which land cover types are created to provide habitat for covered species will be located within designated LCR MSCP conservation areas under management of the Program Manager. The selection, design, and management of LCR MSCP conservation areas are described in Section 5.5.

The length of time that created habitats will be maintained under the LCR MSCP depends on the duration of the effects of the covered activities on covered species. The LCR MSCP HCP is unlike many HCPs submitted to the USFWS under section 10 of the ESA. HCPs generally address development or other “footprint” projects where the covered activities result in permanent, irreversible loss of habitat. In contrast, the LCR MSCP HCP includes both activities that would result in permanent loss of habitat and activities that would not. This latter type of activity includes changes in points of diversion that would result in a decrease in the water surface elevation. The decrease affects

groundwater levels and thereby affects habitat. These changes in points of diversion are largely based on leases of water with specific time limits on the lease. If the lease is not renewed, the water will revert to the original diversion point, restoring water elevations. This time limit would enable the habitat to recover once the lease was over. Some diversions, however, may extend beyond the term of the LCR MSCP, and any habitat determined to be lost as a result of these diversions would be mitigated beyond the term of the LCR MSCP, as appropriate relative to the term of effects on habitat.

The LCR MSCP commits to maintaining in perpetuity the habitat created to address permanent impacts of implementing the covered activities. This commitment will be accomplished through a variety of management options, including transfer of purchased mitigation land to a Federal, state, or appropriate private entity for permanent management for wildlife values or creating habitat on existing protected lands. Agreement by the managing entity to maintain the habitat will be acquired or, if necessary, endowments for the maintenance of the properties will be provided within the LCR MSCP budget.

5.4.3.1 Cottonwood-Willow

Cottonwood-willow land cover will be created to provide the habitat elements for the covered species described in Table 5-5. The LCR MSCP will replace 2,132 acres of cottonwood-willow that would be removed or could be degraded by non-flow-related and flow-related covered activities, respectively, with 5,940 acres of created and actively managed cottonwood-willow of higher quality than the affected land cover (Table 5-5). The vegetative composition of created cottonwood-willow land cover that provides habitat elements for the covered species will exceed the proportion of native plant species described in, and the vegetative structure will be consistent with, Anderson and Ohmart's (1976, 1984a) vegetation classification types. Cottonwood-willow land cover will be created in specific patches of land cover types, such as saltcedar and agricultural lands, that provide little or no habitat for cottonwood-willow-associated covered species (Table 3-9).

It is likely that the vast majority of existing cottonwood-willow land cover that could be affected by covered activities is of low habitat quality relative to the quality of cottonwood-willow land cover that will be created by the LCR MSCP to replace the affected cottonwood-willow. The vegetation mapping classification system used to assess impacts of the covered activities is based on Anderson and Ohmart (1976, 1984a). Under this system, as few as 10 percent of the trees in mapped patches of cottonwood-willow land cover could be cottonwood trees, with the remaining trees usually being saltcedar. Results of studies conducted by Anderson and Ohmart (1984a) along the LCR found that the diversity and abundance of wildlife tended to increase with increasing proportions of cottonwood and willow trees in riparian stands and to decrease as the proportion of saltcedar increased. Through the active management of conservation areas, the LCR MSCP will seek to achieve high densities of cottonwood willow trees and to minimize the density of saltcedar, thereby achieving higher habitat quality than most existing stands.

To the extent practicable, cottonwood-willow will be created in large patches in conjunction with honey mesquite, *Atriplex* spp., and other native riparian species and with marsh and backwater vegetation to meet the habitat requirements of the covered species and to create an integrated mosaic of functional habitats. In addition, creation of large patches of habitat will reduce the likelihood for cowbird nest parasitism on several covered bird species whose populations have declined and are now being affected by nest parasitism. Creation of cottonwood-willow in patches suitable for these species will also meet the habitat patch requirements for other covered riparian-associated species.

Depending on site-specific conditions, creation of cottonwood-willow stands may require creating canals and seasonally wet swales, creating some topographic diversity, and planting or seeding the site with cottonwoods, willows, honey mesquite, and other native riparian species, such as quail bush and saltbush. It is anticipated that most created cottonwood-willow land cover would be flood irrigated. After planting or seeding, removal of saltcedar and management of other invasive exotic species may be required. Created cottonwood-willow designed to provide southwestern willow flycatcher habitat will be specifically managed to ensure that moist surface soil, slow-moving water, or ponded water conditions are present during the breeding season to ensure the production of the flycatcher's flying insect prey base. Once established, each patch of created cottonwood-willow will be actively managed to maintain the patch attributes that are required habitat elements for the covered species (e.g., seral stages) for which the patch was intended to provide habitat.

This creation approach is designed to create cottonwood-willow stands that exceed the habitat value of existing cottonwood-willow stands, by supporting a substantially:

- greater density of cottonwood and willow trees than the 10 percent density of cottonwood and willow trees that can constitute cottonwood-willow land cover under the Anderson and Ohmart classification system (1984a),
- greater diversity of plant species than are typically associated with existing stands,
- greater abundance of insect prey production, and
- greater structural diversity associated with creation of multiple layers of vegetation and seral stages, compared to most of the potentially affected patches of cottonwood-willow land cover.

In addition, creation of patches of honey mesquite in and adjacent to patches of cottonwood-willow will:

- more closely approximate the distribution of riparian vegetation that was present along the historical gradient of the LCR floodplain and
- is expected to support an abundance and diversity of insects associated with more natural habitats, thus, contributing to the availability of prey for southwestern willow flycatchers, yellow-billed cuckoos, and other covered insectivorous species.

This approach to creating cottonwood-willow land cover will result in replacing affected existing cottonwood-willow land cover with land cover that, per unit area, will provide higher quality habitat for associated covered species than the affected cottonwood-willow. This approach is consistent with Anderson and Ohmart's (1984b) observations

that, on a per acre basis, restoring a mix of cottonwood-willow and honey mesquite habitat generally can provide substantially higher habitat values for birds and other wildlife than the value provided by dense stands of saltcedar on dry sites.

Major design elements for creating cottonwood-willow as habitat for the southwestern willow flycatcher, yellow-billed cuckoo, and other covered species include:

- creating large blocks of cottonwood-willow forest necessary to provide yellow-billed cuckoo habitat interspersed with bands of honey mesquite established at higher site elevations;
- excavating and supplying water to canals and shallow swales that dissect blocks of created forest to provide water and forest-edge conditions necessary to support southwestern willow flycatcher habitat, create the microrelief and soil moisture conditions necessary to support a diversity of understory plant species, and distribute irrigation water;
- actively managing created forest to maintain the seral stages required by covered species;
- irrigating to water and establish planted cottonwood-willow and mesquite seedlings (once stands have become established, ongoing maintenance of the native vegetation would include limiting establishment of saltcedar and other nonnative species to maintain habitat quality for associated covered species); and
- periodically irrigating, when necessary, to prevent the buildup of salts in the soil.

Successful creation of cottonwood-willow riparian forest requires that the physical processes that determine habitat structure and dynamics in riparian systems be mimicked as much as possible. In suitable locations, this component of the creation will include mimicking overbank flooding using flood irrigation, in particular in the spring and early summer, but also later in the season to maintain a shallow groundwater table. Maintaining a shallow groundwater table will help maintain herbaceous understory vegetation as well as woody riparian vegetation. Creation will also include seeding of cottonwoods and willows during the natural dispersal period or allowing for self-seeding. Following the establishment of vegetation, irrigation will continue as needed to maintain moist soil conditions during the breeding season in habitat created for southwestern willow flycatcher and to prevent the buildup of salts in the soil. In addition, stands will be managed to maintain the seral stages required by the covered species and the essential habitat parameters and minimum habitat area requirements for the southwestern willow flycatcher, yellow-billed cuckoo, and other riparian-associated covered species. Monitoring and research through the adaptive management process will guide cottonwood-willow habitat management. (Active management may include apical pruning, bole reduction, vegetative propagation via willow limb, and bole prostration in moist soil.)

5.4.3.2 Honey Mesquite

The LCR MSCP will replace 590 acres of honey mesquite land cover type III that provide habitat for the elf owl, vermilion flycatcher, and Arizona Bell's vireo that would

be removed by non-flow-related activities, with 1,320 acres of created and actively managed honey mesquite type III. The composition and structure of the created honey mesquite land cover will be consistent with Anderson and Ohmart's (1976, 1984a) vegetation classification type III. Honey mesquite will be created in conjunction with created cottonwood-willow and backwaters to form an integrated mosaic of habitats. Depending on site-specific conditions, honey mesquite may be created in small patches or as bands within created cottonwood-willow and adjacent to backwaters at suitable site elevations or as larger patches (e.g., greater than 50 acres) adjoining created or existing habitats. Created honey mesquite would be designed to:

- mimic the historical landscape patterns of plant communities along the LCR and to create an integrated mosaic of habitats;
- create high-quality habitat for the elf owl, vermilion flycatcher, Arizona Bell's vireo, and other neotropical migrants; and
- provide an abundance and diversity of insects used as food by the southwestern willow flycatcher, yellow-billed cuckoo, other covered bird species and neotropical migrants, and covered bat species by replacing existing vegetation dominated primarily by nearly monotypic stands of saltcedar.

Within the range of the MacNeill's sootywing skipper (Reaches 1–4), honey mesquite will also be planted with quail bush to create the honey mesquite–quail bush interface that provides habitat for this species.

It is anticipated that creation of large blocks of honey mesquite generally will require removing existing saltcedar-dominated stands of riparian vegetation, planting and irrigating honey mesquite seedlings, and seeding or planting native understory vegetation. Quail bush, saltbush, and other native riparian vegetation may also be planted along the perimeter of created honey mesquite where topography and soil conditions are suitable.

5.4.3.3 Marsh

The LCR MSCP will replace 243 acres of marsh that provide habitat for covered species and could be removed or degraded by non-flow-related and flow-related activities with 512 acres of marsh that provide habitat for affected covered species. Replacement marsh will be designed and managed to provide habitat for the Yuma clapper rail, California black rail, western least bittern, and Colorado River cotton rat (Table 5-5). Replacement marsh will be provided by creating new marsh in locations with suitable soils and water availability. Patches of new marsh will be created and designed and managed to provide an integrated mosaic of habitat for the Yuma clapper rail and California black rail. Creation of habitat for these species will also provide habitat for the western least bittern and Colorado River cotton rat. Habitat creation activities could include, but not be limited to:

- creating moist soil units vegetated with bulrush, with infrastructure that will allow water levels to be managed to depths required by the California black rail;
- dredging and planting emergent vegetation in newly created backwaters and marsh components of LCR MSCP conservation areas; and

- restoring hydrologic conditions in existing degraded, non-functional marsh to create marsh that functions as habitat for covered species.

Long-term management activities to maintain the created habitat could include burning, or applying other appropriate management measures, to remove dead mats of emergent vegetation to encourage growth of cattails and bulrush as the created marshes mature.

5.4.3.4 Backwater

The LCR MSCP will replace 399 acres of backwater and river channel that provide habitat for the bonytail, razorback sucker, and flannelmouth sucker that would be affected by flow-related activities, with 360 acres of created and actively managed connected and disconnected backwaters.

The backwater creation concept would create backwaters to provide habitat for the razorback sucker and bonytail and to provide surface and groundwater hydrology in support of existing or created habitat for southwestern willow flycatcher, yellow-billed cuckoo, clapper rail, elf owl, and other covered species. Disconnected backwaters isolated from nonnative fish communities in the river or reservoirs could provide habitat for a recruiting population of native fish, production facilities (grow-out or harvestable surplus of natural recruitment), and research facilities on habitat use and species interactions and would ultimately serve as refuges for these species. Backwaters that are disconnected from the LCR channel are of considerably higher value to bonytail and razorback sucker than connected backwaters in the LCR and are the preferred type of backwater to achieve LCR MSCP conservation goals for these species. (Fish reared under the LCR MSCP and stocked into these backwaters would count toward total augmentation numbers for bonytail [Section 5.7.4] and razorback sucker [Section 5.7.6].) Connected backwaters will be designed to provide the environmental conditions necessary to support adult or subadult razorback sucker, bonytail, and flannelmouth sucker. Vegetation, substrate, depth, water quality, and continuity with the adjacent river or reservoir are important habitat elements for these species.

Where possible, backwater creation will be combined with creation of riparian and marsh land cover types to provide a mosaic of land cover types. Backwaters will be designed to provide for the establishment of bulrush and cattail along the edges. Depending on the extent of marsh vegetation established at each site, breeding and/or dispersal habitat may be created for the Yuma clapper rail. Backwater creation within or adjacent to existing or created patches of riparian vegetation provides the two major components of southwestern willow flycatcher breeding habitat—structure for nest site placement and standing water and saturated soils for production of insect prey. Backwaters, integral to flycatcher breeding habitat, will be designed and managed to maintain standing water and moist soils during the southwestern willow flycatcher breeding season. Where backwaters are created in or adjacent to extensive stands of riparian forest, they will also contribute to maintaining the humid microclimate conditions required by nesting yellow-billed cuckoos.

5.4.4 Fish Augmentation Strategies

In addition to replacing covered fish species habitat affected by covered activities, the LCR MSCP will rear and stock fish to augment the existing population of razorback sucker and bonytail in the LCR. To offset any potential take of razorback sucker and bonytail, the LCR MSCP commits to providing the level of funding necessary to produce:

- up to 660,000 subadult razorback suckers (at least 300 millimeters [mm] in length) and
- up to 620,000 bonytail (at least 300 mm in length).

These augmentations will be structured as described in Sections 5.7.4.2 and 5.7.6.2. Funds not used for production of fish will be used for other management activities that will benefit the populations of both species.

Existing fish rearing capacity and aquacultural techniques may initially be insufficient to meet the augmentation objectives described above. Accordingly, in the initial years of LCR MSCP implementation, the LCR MSCP will:

- monitor the response of razorback suckers to previous augmentations and stock the numbers of razorback sucker that can be produced up to the amounts described above;
- assess the efficacy of existing or proposed bonytail production programs and facilities and develop the methods required to produce and rear the fish;
- increase rearing capacity, if necessary, in cooperation among AGFD, CDFG, NDOW, USFWS, and other LCR MSCP participants, or fish may be acquired from other sources; and
- construct, in the context of the integrated landscape mosaic, a “pilot project” for isolated backwaters that can be used for recruiting populations, grow-out facilities, or research within the LCR MSCP planning area.

The LCR MSCP will also monitor fish response to augmentations and conduct adaptive management experiments to collect information necessary to evaluate and adaptively manage implementation to better ensure species goals are achieved. Specific activities related to augmentation of the bonytail and razorback sucker are presented in Sections 5.7.4.2 and 5.7.6.2, respectively.

5.4.5 Other Conservation Strategies

5.4.5.1 Contribute to Ongoing Conservation Programs

The LCR MSCP will contribute up to $1.25 million to entities charged with ongoing programs to conserve LCR MSCP covered species within and outside of the LCR MSCP planning area. Funding will be provided only to implement species conservation

activities that have been identified to contribute to the conservation of the species and for which other funding is not available. Covered species for which the LCR MSCP will fund conservation measures through other ongoing programs include the relict leopard frog, humpback chub, flannelmouth sucker, sticky buckwheat, and threecorner milkvetch. Specific LCR MSCP funding levels for conservation of these species are described in Section 5.7, "Species-Specific Conservation Measures."

5.4.5.2 Covered Species Population Enhancement

Species-specific population enhancement conservation measures are designed to address species conservation needs that cannot be addressed through maintenance of existing habitat or creation of habitat. Examples of population enhancement measures include collecting wild fish spawn, raising brood and young fish at hatcheries and rearing ponds, and releasing them into the river and backwaters; controlling piscivorous fish and nonnative amphibians in advance of releases into created backwaters; placing nest boxes in created cottonwood-willow land cover to increase nesting success for cavity-nesting species; and controlling brown-headed cowbirds to reduce adverse effects of nest parasitism on covered species. Specific descriptions of population enhancement conservation measures are presented in Section 5.6.2, "Monitoring and Research Measures," and Section 5.7, "Species-Specific Conservation Measures."

5.4.5.3 Protection of Existing Habitat

As described in Section 5.4.3, the habitat conservation element of the LCR MSCP Conservation Plan is directed toward creating new covered species habitats to replace affected habitats and contribute to the recovery of covered species. Under specific circumstances, however, existing unprotected covered species habitats may be acquired, protected, and managed under the LCR MSCP to prevent their future loss or degradation. If existing habitat is protected under the LCR MSCP, the extent of the protected covered species habitat will be credited in lieu of an equal amount of the applicable covered species habitat to be created under the LCR MSCP Conservation Plan (e.g., if 100 acres of existing southwestern willow flycatcher habitat are acquired and protected, 100 fewer acres would be created than is identified in the LCR MSCP Conservation Plan). For existing unprotected habitat to be protected and managed under the LCR MSCP, the Program Manager will evaluate each identified property on a case-by-case basis in accordance to the following criteria and procedures:

1. The habitat area must be clearly in imminent danger of being permanently lost, or in danger of significant long-term degradation, as a result of on-the-ground development activities or other irreversible activities. The Program Manager will complete an analysis of threats to the habitat area and demonstrate why the habitat area is in imminent danger of being lost.
2. The habitat area should be on private or other lands under a status that provides no or limited protection for resource values.
3. At the time of consideration, the habitat area must provide habitat as defined in Table 5-3 of the LCR MSCP Conservation Plan for one or more covered species.

4. The value of the habitat will be documented as part of the evaluation of the property before acquisition is proposed. This evaluation will include an assessment of the habitat area relative to requirements for covered species habitats that will be created under the LCR MSCP Conservation Plan. Existing habitat areas must meet the same standards as described for covered species habitats to be created under the LCR MSCP Conservation Plan (Table 5-3). These standards include, but are not limited to, size of the habitat, vegetative structure, location within the planning area, need for buffer areas to protect the habitat from offsite disturbances, and certainty of water availability to support the habitat in the future.
5. The acquisition of the property must be economically justifiable within the budget of the LCR MSCP. Further, the costs of managing and maintaining the property as covered species habitat over the term of the LCR MSCP must also be within the budgeted range of such costs for LCR MSCP–created habitats.
6. The USFWS, Program Manager, and LCR MSCP Steering Committee must agree that the acquisition is appropriate to contribute to meeting the mitigation responsibilities of the LCR MSCP.
7. Once the identified property is acquired, the extent of habitat area credited as LCR MSCP habitat must be maintained to continue to provide at least that extent of habitat over time. If it is destroyed or degraded, for any reason, replacement of the habitat is required under the same conditions as for replacement of created habitats that are lost.

5.4.5.4 Avoidance and Minimization of Impacts

The LCR MSCP includes measures to avoid and minimize impacts of implementing covered activities and the LCR MSCP Conservation Plan on covered and evaluation species. Examples of such measures include avoiding declines in groundwater and surface water elevations by installing infrastructure to maintain water elevations and designing LCR MSCP–created habitats to avoid removal of cottonwood-willow land cover and southwestern willow flycatcher habitat. Specific descriptions of avoidance and minimization conservation measures are presented in Section 5.6.1, “Avoidance and Minimization Measures,” and Section 5.7, “Species-Specific Conservation Measures.”

5.5 Conservation Area Site Selection, Design, and Management

The selection, design, and management of a system of conservation areas are central elements of the LCR MSCP for creating habitat for covered species and achieving conservation goals for LCR MSCP species. Conservation areas are lands on which land cover types will be created to establish new habitat for covered species to mitigate impacts of covered activities and LCR MSCP implementation on existing habitat for covered species. Once established, conservation areas will be maintained and managed to ensure continued habitat persistence and function.

The Program Manager is responsible for initially evaluating and selecting conservation areas, developing conservation area designs, and developing conservation area management plans. Because conservation areas have not yet been identified, site-specific habitat creation design and management criteria (e.g., need for and configuration of buffers) will necessarily be developed and applied within the guidelines described in this section as each conservation area is identified. Technical subcommittees or workgroups established by the LCR MSCP Steering Committee may participate in the selection and design of and management planning for conservation areas and all conservation area designs and management plans will be reviewed by USFWS before they are implemented.

5.5.1 Conservation Area Site Selection

The LCR MSCP will create 8,132 acres of habitat for covered species. The LCR MSCP will select conservation areas in which to create habitat from:

- among 30 potentially suitable habitat creation sites that have been initially identified, surveyed, and evaluated by the LCR MSCP (Ogden Environmental and Energy Services 1999; CH2M Hill 1999; SWCA Environmental Consultants 2000; Inter-Agency Team 1999, 2000a, 2000b, 2000c; SAIC/Jones & Stokes 2001);
- available agricultural lands; and
- other undeveloped lands.

Approximately 37,500 acres are present in the 30 initially identified conservation areas (Table 5-6, Figure 5-3), and approximately 270,500 acres of agricultural lands are present in the LCR MSCP planning area (Table 5-7). Consequently, sufficient suitable sites would be available to the LCR MSCP to successfully create the 8,132 acres of habitat (representing approximately 3 percent of the lands identified in Tables 5-6 and 5-7) required to achieve goals for covered species.

Table 5-6 lists the initially identified conservation areas. These areas are not likely to be the only conservation areas. As additional information is gathered regarding other conservation areas, more sites may be added to the list of conservation areas, using the site-selection criteria described below.

The process for selecting conservation areas will involve application of site-selection criteria and will require collection of sufficient information to properly evaluate the potential for the successful creation of habitat before conservation areas are acquired. It is the intent of the LCR MSCP to create habitats in locations and patch sizes that will best meet the conservation needs of the covered species and to manage those habitats in a manner that will meet species seasonal habitat requirements, within the constraints associated with land availability. Conservation site-selection criteria will include:

- presence of and proximity to existing occupied covered species habitats,
- suitability of site conditions for creating habitat for specific species (e.g., appropriate soils, availability of water for irrigation),

Table 5-6. Summary of Initially Identified Conservation Areas

Potential Conservation Area	River Mile	Ownership Status[a]	Total Area[b] (acres)	Cottonwood-Willow	Honey Mesquite III	Riparian[c]	Marsh
Hualapai Wilderness Riparian Restoration	GC 243–260	T	60	0	0	60	0
Hualapai Lost Creek Riparian Improvement	GC 247	T	2	1	0	0	0
Lake Mead Riparian Restoration[d]	418–343	F	500	0	0	500	0
Lake Mohave Riparian Restoration[e]	326–278	F	200	ND	ND	ND	ND
Backwaters and Sloughs I	266–264	S	450	100	250	0	50
Cimarron Agricultural Conversion	254–253.3	T	97	97	0	0	0
Long Lake	254–252	T	570	0	0	562	0
Piute Wash Restoration	251.5	T	630	20	200	0	0
Twin Lakes	251–249	T	165	150	0	0	0
Section 33 Agricultural Conversion	250.5	T	150	150	0	0	0
Section 20 Riparian and Native Fish Restoration	243–244	T	1,326	0	0	1,226	0
Chemehuevi Rearing Pond Cove Enhancements	216–208.5	T	54	ND	ND	ND	ND
Chemehuevi Wilderness Riparian Restoration	212.5–208.5	T	124	124	0	0	0
Chemehuevi Agricultural Conversion	Chem Res	T	40	40	0	0	0
Chemehuevi Desert Wash Revegetation	Chem Res	T	100	ND	ND	ND	ND
'Ahakhav Tribal Preserve	175–169	T	1,010	280	530	0	0
Mohave and Deer Tail Backwaters	169–166	T	800	170	540	0	0
A7 Backwater	121–117	S	1,560	670	590	0	0
A10 Backwater	115–114	F	220	110	80	0	0
Swendt Slough	111–110	F	235	50	160	0	0
Cibola Valley Irrigation and Drainage District	110–107	P	1,030	515	515	0	0
BLM Agricultural Leases within PVID	107–102	F	2,200	2,110	60	0	0
Cibola Meander, Arizona Side	104.5–101.5	P	1,040	700	300	0	0
Palo Verde Oxbow Enhancement	102–100	P,F	1,560	620	20	0	0
Sempre Property Land Acquisition	113–96.5	P	17,000	ND	ND	ND	0
Cibola Restoration Concepts	96–88	R,F	230	70	110	0	0
Laguna Old Channel Restoration	49–43	S	1,425	770	420	0	0

Potential Conservation Area	River Mile	Ownership Status[a]	Total Area[b] (acres)	Cottonwood-Willow	Honey Mesquite III	Riparian[c]	Marsh
Yuma East Wetlands Pilot Project	34.2–30.8	S,T,F,P	1,305	580	0	0	0
Cocopah Tribal Enhancement Proposal	27–9	T	1,223	0	0	1,223	0
Limitrophe BLM Habitat Restoration	8–0	F	770	740	20	0	0
Total			**37,526**	**7,917**	**3,795**	**3,571**	**50**

Notes:

ND = no data available
GC = Grand Canyon
Chem Res = Chemehuevi Indian Reservation
BLM = Bureau of Land Management

[a] Ownership Status Symbols:

F = Federal (non refuge)
R = national wildlife refuge
S = state
T = tribal
P = private

[b] The total extent of potential conservation areas may include land cover types (e.g., developed lands and desert scrub) that are not suitable for creation of covered species habitat. Consequently, the total extent of created habitat may be less than the total extent of the conservation area.

[c] The design for the specific composition of this created riparian land cover has not yet been developed. Land cover types could include cottonwood-willow, honey mesquite, arrowweed, atriplex, and other riparian land cover types.

[d] Habitat created in this potential conservation area would be in addition to the Federal covered activities described in the LCR MSCP BA that will also restore habitat at Lake Mead.

[e] Habitat created in this potential conservation area would be in addition to the Federal covered activities described in the LCR MSCP BA that will also restore habitat at Lake Mohave.

Table 5-7. Agricultural Land by River Reach and Landowner Category

River Reach[a]	Owner Category	Agricultural Land (acres)
Reach 3	Federal/state refuge	222
	Tribal	11,510
	Private	5,789
	Not identified[b]	0
	Total	19,159
Reach 4	Federal/state refuge	1,551
	Other Federal/state	8,874
	Tribal	78,061
	Private	81,118
	Not identified[b]	0
	Total	169,604
Reach 5	Federal/state refuge	256
	Other Federal/state	4
	Total	260
Reach 6	Federal/state refuge	65
	Other Federal/state	3,314
	Tribal	7,292
	Private	25,207
	Not identified[b]	908
	Total	36,786
Reach 7	Other Federal/state	1,847
	Tribal	883
	Private	41,943
	Not identified[b]	32
	Total	44,705
All Reaches	Federal/state refuge	2,096
	Other Federal/state	15,677
	Tribal	97,745
	Private	154,057
	Not identified[b]	940
	Grand total	270,514

Note: Land cover type areas in this table do not match exactly with areas in Table 3-9 because when the land ownership database was combined with the land cover type databases, small sliver polygons were created that could not be assigned to any land cover type.

[a] No Lower Colorado River Accounting System agricultural landowner data are available for Reaches 1 and 2.

[b] No landowner data is available; however landowners could include any of the other landowner categories.

Sources: Bureau of Reclamation 1997 (supplemented in 2002), 2001a.

N

10 0 10 20 30

Miles

Figure 5-3
Lower Colorado River MSCP
Initially Identified Conservation Areas

00450.00-303

- available requisite infrastructure (e.g., access roads, irrigation-related infrastructure),
- relative suitability for achieving multiple creation objectives through an integrated mosaic of habitat types,
- likelihood for mosquitoes produced on a site to become a vector control or nuisance problem based on proximity to urban areas and mosquito production potential,
- cost of land acquisition (e.g., fee title, conservation easement, lease),
- timing of land availability relative to the need for implementing habitat creation measures,
- consideration of zoning and general plan designations,
- relative cost of implementing and maintaining created habitat, and
- availability and cost of water to meet creation and maintenance requirements.

5.5.2 Conservation Area Design Concepts

Once the location of conservation areas is determined based on the site-selection criteria, a conservation area design plan will be developed specific to the conservation area to meet covered species' needs. The conservation area design plans will incorporate created habitat, existing habitat if present, and, if necessary, buffer areas to protect conservation area habitats from activities on adjacent lands that could degrade LCR MSCP habitats. Important conservation area design concepts that will guide implementation of the habitat creation element of the LCR MSCP are described below.

1. Habitat will be created in patches equal to or greater than the patch sizes required to support sustainable occupancy of the target-covered species.
2. LCR MSCP conservation areas will be designed to create an integrated mosaic of vegetation to approximate the historical juxtaposition of communities along the LCR. Examples of how this may be accomplished include:
    a. approximating the historical floodplain community by establishing an integrated mosaic of patches of cottonwood-willow, honey mesquite, *Atriplex* spp., other native riparian species, and backwater and emergent vegetation and
    b. creating habitat in locations where, in combination with existing adjacent habitat, habitat mosaics are created or enhanced.
3. Created habitat for species with limited distribution along the LCR and with limited ability to move among habitat patches along the LCR will be located near known populations to facilitate future occupancy of created habitats.
4. To create large patches of habitat that will be more likely to support high numbers of associated covered species, priority will be given to creating habitat near existing habitats.
5. To the extent consistent with the conservation area site-selection criteria, preference will be accorded to locating created habitat on Federal, state, and tribal lands. If suitable public lands are not available, private land will be considered on the

principle of willing seller or lessor. Preference will also be given to the acquisition of large tracts to facilitate the creation of large patches of habitat.

6. Management of conservation areas includes a commitment to:

   a. reduce the risk of the loss of created habitat to wildfire by providing resources to suppress wildfires (e.g., contributing to and integrating with local, state, and Federal agency fire management plans),

   b. design conservation areas to contain wildfire and facilitate rapid response to suppress fires (e.g., fire management plans will be an element of each conservation area management plan), and

   c. implement land management and habitat creation measures in conservation areas to support the reestablishment of native vegetation that is lost to wildfire.

7. Conservation areas will, as needed, incorporate buffer areas to minimize the potential effects of wildfire, existing land uses, and other activities that may be associated with adjacent lands that could adversely affect the ecological functions associated with created habitats. Conservation areas will be designed to minimize the need for buffers by locating, juxtaposing, and managing created habitats in a manner that will minimize the effect of activities/events that may occur on adjacent lands. The need for buffer lands will be determined based on the site-specific needs identified for each conservation area. Lands acquired and designated as buffers for conservation areas will not be lands that are created as covered species habitat. To avoid potential impacts to aircraft from increases in bird populations, the conservation measures would be implemented consistent with Federal Aviation Administration (FAA) Guidelines.

8. Conservation areas will be located and designed to incorporate, to the greatest extent practicable, existing infrastructure and to minimize the need for construction of new infrastructure required for establishment and management of habitats. The extent of land required for new infrastructure to manage conservation areas will be based on site-specific needs identified for each conservation area, and lands required for new infrastructure will be in addition to lands used to create covered species habitat.

9. Design and management of conservation areas will be coordinated with appropriate local health officials to incorporate, to the extent practicable, design and management concepts to help reduce the likelihood that conservation areas could produce mosquitoes in numbers that could cause public health or nuisance concerns. Access to conservation areas will be provided to mosquito abatement district officials to monitor mosquito populations.

5.5.3 Conservation Area Management

A management plan will be developed and implemented for each conservation area. Major elements addressed by the management plans should include:

- habitat objectives for the conservation area,
- monitoring requirements,
- fire management,

- predator/competitor management,
- vegetation management,
- infrastructure maintenance,
- permitted uses, and
- water management.

It is anticipated that conservation area management plans will need to be periodically revised to reflect new information that is collected through monitoring and research (Section 5.11).

5.5.4 Conservation Area Mainstream Water Use and Management

The purpose of this section is to identify and briefly describe the anticipated mainstream water uses associated with implementation of LCR MSCP habitat conservation and creation activities. These potential water uses are a critical element of the proposed conservation measures. As has been discussed previously, the specific habitat creation and conservation sites have not yet been identified. However, there are approximately 36,500 acres within sites that have been preliminarily identified, surveyed, and evaluated and are potentially suitable for habitat creation (Section 5.5.1) under the LCR MSCP.

It is generally anticipated that most, if not all, of the sites will require permanent or periodic applications of mainstream water to enhance and maintain the desired habitat conditions and promote species conservation benefits. Most sites will require water during the habitat creation project construction and development periods. Once the habitat has been established, mainstream water use on the site would generally be determined by annual irrigation needs for trees and ground covers, seasonal moist-soil creation, maintenance of open water and marsh areas, and other management needs as identified. Generally, mainstream water will be required over the 50-year term of the LCR MSCP.

This section of the LCR MSCP is not intended to distinguish the legal or entitlement aspects related to the proposed types of mainstream water use associated with the habitat creation, maintenance, and species conservation activities contemplated with implementation of the LCR MSCP conservation measures. Sources of water supply other than the Colorado River may become available during the 50-year implementation period of the LCR MSCP. Any water source that would be required to implement the conservation measures would be analyzed during the LCR MSCP site selection process. This section only purports to identify the various types of mainstream water uses that may be required in conjunction with specific habitat creation, habitat maintenance, and other types of species conservation activities. Generally, these activities include:

- establishment and maintenance of native riparian vegetation,
- establishment and maintenance of marsh land cover,
- establishment and maintenance of backwaters, and

- establishment and operation of native fish hatchery and rearing facilities.

Additionally, permutations associated with each of these activities are briefly described in the following sections.

5.5.4.1 Establishment and Maintenance of Cottonwood-Willow and Honey Mesquite Land Cover Types

This type of proposed habitat creation and maintenance activity involves the establishment, or reestablishment, of native riparian vegetation on specific tracts of land within the LCR MSCP planning area, largely from Davis Dam to the SIB with Mexico, to create habitat for associated covered species. The target land cover types in this category are cottonwood-willow and honey mesquite, as well as the associated understory communities of native plants (e.g., shrubs, forbs, grasses). The LCR MSCP proposes to create and maintain 5,940 acres of cottonwood-willow and 1,320 acres of honey mesquite land cover types within the LCR MSCP planning area to provide habitat for associated covered species.

The habitat creation concepts proposed for these land cover types involve the replacement of existing poor-quality patches of riparian vegetation (e.g., monotypic stands of saltcedar) with an integrated mosaic of native riparian vegetation, including cottonwood-willow (near water or in areas of acceptable groundwater depths) with an understory of varying amounts of shrubs (e.g., *Atriplex* spp., wolfberry) and other forbs and grasses, and mesquite bosques established in the drier or more upland sites (e.g., second-terrace floodplain). A second habitat creation concept involves the establishment of cottonwood-willow and honey mesquite land cover on existing agricultural land. Potential mainstream water use attributes associated with these concepts involve a number of different activities that are described below.

Mainstream Water Use Attributes Associated with Creation of Cottonwood-Willow and Honey Mesquite Land Cover

The potential water use attributes associated with creation of cottonwood-willow and honey mesquite land cover may include site preparation, establishment irrigation, maintenance irrigation, and managed flooding. Each of these attributes is described below.

- Site preparation—After clearing and root-ripping to remove the exotic vegetation, soil conditioning or leaching of salts may be necessary. This work may require several applications of mainstream water to create appropriate soil conditions prior to revegetation with the desired native riparian plant species. Water use needs for site preparation are probably not necessary, or are very limited, on sites involving the conversion of lands in agricultural crop production to support stands of cottonwood-willow and honey mesquite. Depending on the existing conditions of the soil column

at the proposed habitat creation site, site preparation water use may be necessary for only one growing season.

- Establishment irrigation—Water use for establishment irrigation is necessary to ensure that the recently planted native plant species are maintained and to promote vigorous growth. Typically, on sites with undulating or uneven topography, this irrigation will involve the application of mainstream water via sprinkler or drip irrigation systems (recognizing that most of the selected sites should be favorable for flood irrigation practices or would be graded and leveled during site preparation, but that sprinklers could be used under special or local conditions). On lands converted from agricultural crop production, the land may be level enough to facilitate flood irrigation using the existing water conveyance infrastructure. Generally, it is expected that establishment irrigation will be required at specific sites for 1–3 years following revegetation until the young tree root systems are able to reach the water table.

- Maintenance irrigation—Water use for maintenance irrigation may be necessary to maintain overall plant health and vigor in sites where depth to water is beyond the ability of the plant's root system to access. This ability to access water may be more of an issue for the cottonwood-willow and associated shrub and forb understory communities than for mesquite species (i.e., mesquite has been shown to exhibit rooting depths in excess of 50 feet) (Stromberg et al. 1992). At some sites, it may be desirable or feasible to lower the grade in order to ensure adequate depths to water for mature riparian plant species, thus limiting maintenance irrigation requirements. Depending on specific site characteristics, maintenance irrigation may be required one or more times annually during the 50-year term of the LCR MSCP, particularly for the created patches of cottonwood-willow land cover.

- Managed flooding—Water use for managed flooding is intended to simulate predevelopment hydrologic conditions along the LCR. The concept involves flooding or irrigating the established patch of riparian vegetation from late February to late March or early April, during the seed germination period for cottonwood-willow. Obviously, this technique requires the presence of a number of mature cottonwood and willow seed source trees in proximity to the habitat creation site. This managed flooding promotes recruitment of juvenile cohorts of cottonwood and willow species and maintains adequate soil conditions. Managed flooding may be desirable at some sites on an annual basis, but at other sites it may be necessary only every 2–3 years. Because of the current paucity of seed trees within the planning area, this technique may be somewhat limited during the first decade of LCR MSCP implementation until more mature trees are present in areas suitable for habitat creation.

Managed flooding may also be required to maintain adequate or suitable soil-moisture content at specific habitat creation sites. Adequate soil moisture promotes healthy macrobiotic and microbiotic conditions and the production of flying insects important to many of the LCR MSCP–covered species (e.g., southwestern willow flycatcher, bats). This aspect of managed flooding could be accomplished, in some cases, with the February–April flooding requirements for seed germination but may also be required one or more times during the heat of the summer if the soil conditions warrant.

Finally, a third type of managed flooding involves maintaining saturated soils or standing water in and adjacent to created stands of cottonwood-willow associated with occupied southwestern willow flycatcher habitat from May 1 to August 30. This habitat characteristic is highly desirable to promote successful breeding and recruitment of neotropical migrant bird species. Consequently, at sites currently occupied by southwestern willow flycatcher or sites that over time become flycatcher territories and nesting sites, it may be necessary to include this water use as well. It may be possible to use adjacent marsh or backwater land cover types to meet this requirement as well.

Based on the proposed creation of 5,940 acres of cottonwood-willow and 1,320 acres of honey mesquite land cover types, a preliminary analysis indicates that approximately 34,480 afy of mainstream water would be required per year to meet the CU of the created habitat. This amount is based on an average evapotranspiration (ET) rate of 4.74 afy per acre for cottonwood-willow land cover and 4.79 afy per acre for mesquite land cover.[1] Additionally, it has been estimated that an additional 8,600 afy may be required for the periodic managed flooding events. This water is particularly important for the created and maintained stands of cottonwood-willow because these stands must maintain certain specific macrosite and microsite characteristics to function as habitat for covered species.

5.5.4.2 Creation and Maintenance of Marsh Land Cover

Creation and maintenance of native marsh vegetation along the LCR are considered critical elements in ensuring adequate conservation for LCR MSCP covered species, including Yuma clapper rail, California black rail, and western least bittern. Implementation of the LCR MSCP conservation measures would result in the creation and maintenance of 512 acres of marsh land cover as habitat for associated covered species within the LCR MSCP planning area.

Typically, the appropriate LCR marsh land cover type comprises a mosaic of marsh vegetation, including tule, cattail, and common reed, as well as trees, grasses, open water, and mudflats. Generally, the marsh vegetation component ranges from 25 to 100 percent of the total land cover.

Marsh creation activities could be included in the design of backwater creation projects. Additionally, marsh vegetation could be developed in conjunction with large-scale establishment of native riparian vegetation, where there would be open water areas with associated marshes created as part of the integrated mosaic concept.

Existing backwaters could be resculpted with shallow benches at the land/water interface to allow for establishment of additional patches of marsh vegetation (e.g., cattail, bulrush habitat). California black rail requires marsh with moist soils and surface water areas up to 1 inch deep, while the water depth for Yuma clapper rails should not exceed 12 inches.

[1] The average ET rate was calculated using data reported in Reclamation's calendar year (CY)–1999 LCRAS Annual Report and was based on ET rates reported for three reaches of the mainstream (i.e., Davis Dam to Parker Dam, Parker Dam to Imperial Dam, and Imperial Dam to the SIB) (Bureau of Reclamation 2000b).

Mainstream Water Use Attributes Associated with Creation of Marsh Land Cover Creation

The potential water use attributes associated with creation of native marsh may include the following: existing backwater enhancement and/or enlargement and new backwater and marsh creation. Each of these attributes is described below.

- Existing backwater enhancement/enlargement—To create functional marshes, it may be feasible and desirable to restructure existing backwater features within the LCR MSCP planning area. This restructuring may involve the use of amphibious excavators to enlarge and reshape the interface between the backwater and the floodplain. Benches and shelves could be sculpted to create the shallow water conditions necessary to promote establishment and maintenance of marsh vegetation for both the Yuma clapper rail and California black rail. The potential mainstream water use is associated with increased open water surface area and evaporation, as well as additional CU related to the ET by the marsh vegetation.
- New backwater and marsh creation—In conjunction with the creation of large patches of native riparian vegetation or isolated native fish refugia in the floodplain, it may be feasible and desirable to create functioning patches of marsh at the interface between the backwater and riparian vegetation. The potential mainstream water use is related to open water evaporation and the ET of the marsh vegetation.

The proposed creation and maintenance of 512 acres of marsh land cover would require an estimated 3,000 af of mainstream water per year. This amount is based on an average ET rate of 5.77 af per acre per year. Again, this average ET rate was calculated from data reported in Reclamation's calendar year (CY)–1999 LCRAS annual report for the three mainstream reaches of the Colorado River below Davis Dam.

5.5.4.3 Establishment and Maintenance of Backwaters

The proposed backwater creation and maintenance concept would create and enhance backwaters to provide habitat and conditions for bonytail, razorback sucker, and flannelmouth sucker. Additionally, the created and maintained backwaters will provide surface and groundwater hydrologic conditions in support of the habitat creation and maintenance activities for southwestern willow flycatcher, yellow-billed cuckoo, Yuma clapper rail, California black rail, and other covered species. Created and maintained backwaters within the LCR MSCP are considered a critical component of the integrated mosaic concept. The proposed LCR MSCP conservation measures would lead to the creation and maintenance of 360 acres of actively managed connected and disconnected backwaters within the LCR MSCP planning area. Potential mainstream water use attributes associated with these habitat creation activities are described in the following section.

5.5.4.4 Mainstream Water Use Attributes Associated with Creation of Backwater

The potential water use attributes associated with creation of the actively managed connected or disconnected backwaters may include the following: enhancement and/or enlargement of existing connected or disconnected backwaters and new backwater and marsh creation. Each of these attributes is described below.

- Enhancement and/or enlargement of existing connected or disconnected backwaters—This habitat creation concept, like marsh habitat creation, involves enhancement or enlargement of existing backwaters and the creation of new backwaters adjacent to the mainstream or in the floodplain. Existing backwaters could be modified to provide improved water flow and water quality through the backwater (e.g., culverts, gate structures, percolation dike structures, openings directly to the mainstream). Backwaters could be divided into zones to better facilitate management of native fish and desired aquatic characteristics. The potential mainstream water use associated with enhanced or modified backwater creation activities is related to evaporation and bank storage.
- New backwater and marsh creation—In conjunction with the creation of large patches of cottonwood-willow, honey mesquite, and marsh land cover types, it may be desirable to construct isolated native fish refugia in the floodplain. These refugia could involve reestablishment of a hydrologic connection in a relict channel feature, remnant backwater, swale, or slough. Typically, this reestablishment involves lowering the grade of the land surface in the relict channel feature or diversion (e.g., via direct diversion from the mainstream and conveyance or supplied by groundwater pumping from wells in the floodplain) and conveyance of a water supply to the feature.

In the integrated mosaic concept, it is likely that functioning patches of marsh would be established around the fringe of the new backwater. The potential mainstream water use is related to open water evaporation, bank storage, and the ET of the associated marsh vegetation.

The proposed creation and maintenance of 360 acres of backwater would require an estimated 1,900 af of mainstream water per year. This amount is based on an average ET and evaporation rate of 5.17 af per acre per year. Again, this average evaporation and ET rate was calculated from data reported in Reclamation's CY-1999 LCRAS annual report for the three mainstream reaches of the Colorado River below Davis Dam.

5.5.4.5 Establishment and Operation of Native Fish Hatchery and Rearing Facilities

To produce sufficient numbers of native endangered fishes for reintroduction into suitable LCR mainstream habitats, it is likely that additional native fish production facilities will be required. Some of these hatchery facilities may be constructed off-stream, which is outside of the LCR MSCP planning area. No mainstream water use would be associated with these off-stream facilities. At suitable sites within the planning

area, it may make economic sense to construct the facility in the adjacent floodplain, thus reducing transport costs and the transit time associated with moving the fish from the facility to the reintroduction site.

Hatchery facilities would involve the construction and maintenance of raceways and grow-out ponds. Mainstream water, either directly pumped from the river or from wells in the floodplain, would provide the water supply for these activities. The potential mainstream water use attributes are generally associated with open water evaporation and bank storage in unlined earthen ponds and/or evaporation from lined ponds or raceways. The amount of water that could be required for hatchery and rearing facilities would be based on the CU through evaporation.

5.5.4.6 Summary of Conservation Area Mainstream Water Use and Management Needs

As has been described, the potential requirements for the use of mainstream Colorado River water include the following types of activities:

- conservation area site preparation;
- establishment and maintenance of riparian, marsh/wetland, and aquatic and backwater land cover to provide habitat for covered species, as well as native fish rearing facilities; and
- periodic managed flooding to maintain overall plant growth and vigor and promote the development of moist soil conditions and flying insect production.

These potential uses of mainstream water are anticipated to occur over the life of the 50-year LCR MSCP.

Generally, the expected mainstream water uses associated with establishment and maintenance of conservation areas could include the use of the annual amounts shown in Table 5-8.

Table 5-8. Expected Mainstream Water Uses Associated with Establishment and Maintenance of Conservation Areas

Land Cover Types	Acres	Estimated Consumptive Use (acre-feet)
Cottonwood-willow	5,940	28,156
Mesquite	1,320	6,323
Marsh	512	2,954
Aquatic	360	1,861
Total	**8,132**	**39,294**

To meet the estimated CU requirement associated with all of the conservation areas, it is assumed that 6.0 afy per acre would be necessary. Consequently, to satisfy the CU requirement of 39,294 afy, approximately 48,800 afy would need to be applied to the conservation areas.

Finally, as was described above, the periodic managed flooding requirement to maintain overall plant growth and vigor and promote the development of moist soil conditions and flying insect production is estimated to be approximately 8,600 afy of additional mainstream water. This water is assumed to be an additional 25 percent of the annual CU of that required to meet the conservation area site total CU needs for cottonwood-willow and mesquite land cover types.

In summary, the total estimated conservation area CU needs, including the managed flooding requirements, is approximately 39,300 afy. This total results in an estimated requirement of approximately 57,400 afy to establish and maintain the 8,132 acres of LCR MSCP conservation areas.

5.6 General Species Conservation Measures

General species conservation measures include impact AMMs and monitoring and research measures (MRMs) that apply to more than one covered or evaluation species. These general measures are not repeated in the species-specific conservation measures described in Section 5.7, “Species-Specific Conservation Measures.”

5.6.1 Avoidance and Minimization Measures

This section describes the LCR MSCP conservation measures that will be implemented to avoid and minimize the effects of implementing covered activities and the LCR MSCP on covered species. Each avoidance and minimization conservation measure is provided with a unique four-character alphanumeric code that will assist with monitoring of LCR MSCP Conservation Plan implementation. The three-letter portion of the code designates the conservation measure as an avoidance and minimization measure, and the numeral in the code designates the conservation measure number. In addition to these conservation measures, the BMPs of the state in which a covered activity is implemented will be used to control sedimentation in the vicinity of water bodies during ground-disturbing activities.

AMM1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats. To the extent practicable, establishment and management of LCR MSCP–created habitats will avoid removal of existing cottonwood-willow stands, honey mesquite bosques, marsh, and backwaters to avoid and minimize impacts on habitat they provide for covered species. Temporary disturbance of covered species habitats, however, may be associated with habitat creation and subsequent maintenance activities (e.g., controlled burning in marshes and removal of trees to maintain succession objectives). LCR MSCP conservation measures that could result in such temporary disturbances will, to the extent practicable, be designed

and implemented to avoid or minimize the potential for disturbance. In addition to implementing AMM3 and AMM4 below, these measures could include conducting pre-construction surveys to determine if covered species are present and, if present, implementing habitat establishment and management activities during periods when the species would be least sensitive to those activities; or redesigning the activities to avoid the need to disturb sensitive habitat use areas; staging construction activities away from sensitive habitat use areas; and implementing BMPs to control erosion when implementing ground disturbing activities.

AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh. Impacts on groundwater levels that support covered species habitat at Topock Marsh will be avoided by maintaining water deliveries for maintenance of water levels and existing conditions. At times, flow-related activities could lower river elevations to levels that could disrupt diversion of water from the river to the marsh. Improvements to intake structures that allow water to continue to be diverted or other measures to maintain the water surface elevation will avoid effects on groundwater elevation. Avoidance of effects could be accomplished with the purchase, installation, and operation of two electric pumps sized to the current inflow at the Topock Marsh diversion inlet. The pumps would most likely need to be operated during summer to make up for the lower flow periods.

Implementation of this conservation measure would maintain existing habitat at Topock Marsh for the Yuma clapper rail, southwestern willow flycatcher, Colorado River cotton rat, western least bittern, California black rail, yellow-billed cuckoo, gilded flicker, vermilion flycatcher, Arizona Bell's vireo, and Sonoran yellow warbler. The extent of covered species habitat impacts that will be avoided by maintaining water deliveries to Topock Marsh are presented in Table 4-2. Maintaining water deliveries to Topock Marsh will also maintain razorback sucker and bonytail habitat associated with disconnected backwaters managed for these species.

AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season. To the extent practicable, to avoid and minimize potential impacts on covered bird species, vegetation management activities (e.g., periodic removal of emergent vegetation to maintain canals and drains) associated with implementation of covered activities and the LCR MSCP that could result in disturbance to covered bird species will not be implemented during the breeding season to prevent injury or mortality of eggs and young birds unable to avoid these activities. Table 5-9 describes the breeding period for each of the covered species during which, to the extent practicable, vegetation management activities in each species' habitat will be avoided.

Table 5-9. Covered Bird Species Breeding Periods in the LCR MSCP Planning Area

Covered Species	Breeding Season in the LCR MSCP Planning Area
Yuma clapper rail	March 15 to August 1[1]
Southwestern willow flycatcher	May 10 to August 25[2]
Western least bittern	April 1 to August 1[3]
California black rail	March 15 to August 1[1, 4]
Yellow-billed cuckoo	June 1 to August 15[3]
Elf owl	May 1 to July 20[6]
Gilded flicker	April 1 to August 1[7]
Gila woodpecker	April 1 to September 1[3, 8]
Vermilion flycatcher	March 15 to July 15[3, 9]
Arizona Bell's vireo	April 1 to August 1[3, 10]
Sonoran yellow warbler	April 15 to August 1[3]
Summer tanager	May 15 to September 1[3, 11]

Sources:
[1] Eddleman and Conway 1998.
[2] Sogge et al. 1997b.
[3] Rosenberg et al. 1991.
[4] Eddleman et al. 1994.
[5] Haug et al. 1993.
[6] Henry and Gehlbach 1999.
[7] Gilman 1915.
[8] Edwards and Schnell 2000.
[9] Wolf and Jones 2000.
[10] Brown 1993.
[11] Robinson 1996.

AMM4—Minimize contaminant loads in runoff and return irrigation flows from LCR MSCP–created habitats to the LCR. LCR MSCP–created habitats that require irrigation to establish and maintain vegetation to provide habitat will be designed and managed to minimize contaminant loads that could return to the LCR as runoff or return-flow. Measures will include vegetation establishment methods that minimize the need for application of herbicides, pesticides, and fertilizers and designing irrigation methods and new irrigation infrastructure to reduce runoff and return-flows to the extent practicable. Use of pesticides is not a covered activity. Pesticides used to establish and maintain LCR MSCP habitats, however, will be applied in accordance with EPA restrictions and, as needed, authorization for their use will be sought under separate permits.

AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area. To the extent practicable, before implementing activities associated with OM&R of hydroelectric generation and transmission facilities, measures will be identified and implemented that are necessary to avoid take of covered species where such activities could otherwise result in take. These measures could include conducting surveys to determine if covered species are present and, if so, deferring the implementation of activities to avoid disturbance during the breeding season; redesigning the activities to avoid the need to disturb covered species habitat use areas; staging of equipment outside of covered species habitats; delineating the limits of vegetation control

activities to ensure that only the vegetation that needs to be removed to maintain infrastructure is removed; stockpiling and disposing of removed vegetation in a manner that minimizes the risk of fire; and implementing BMPs to control erosion when implementing ground disturbing activities.

AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities, and other river management activities. To the extent practicable, before initiating activities involved with river maintenance projects, measures will be identified and implemented that avoid or minimize take of covered species where such activities could otherwise result in take. Such measures could include alternative methods to achieve project goals, timing of activities, pre-activity surveys, and minimizing the area of effect, including offsite direct and indirect effects (e.g., avoiding or minimizing the need to place dredge spoil and discharge lines in covered species habitats; placing dredge spoils in a manner that will not affect covered species habitats).

5.6.2 Monitoring and Research Measures

This section describes the LCR MSCP MRMs that will be implemented to help guide the design and management of created habitats over the term of the LCR MSCP. These MRMs are designed to provide information necessary to adaptively manage implementation of the LCR MSCP Conservation Plan (see Sections 5.11, "Monitoring and Research"). Each monitoring and research conservation measure is provided with a unique four-character alpha-numeric code that will assist with monitoring of LCR MSCP Conservation Plan implementation. The three-letter portion of the code designates the conservation measure as a monitoring and research measure, and the numeral in the code designates the conservation measure number.

MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements. Conduct surveys and research, as appropriate, to collect information necessary to better define the species habitat requirements and to design and manage fully functioning created covered and evaluation species habitats. This conservation measure applies to those species for which comparable measures are not subsumed under species-specific conservation measures (Section 5.7). They are not applicable to species for which habitat would not be created under the LCR MSCP Conservation Plan, such as the desert tortoise, relict leopard frog, humpback chub, and threecorner milkvetch.

This conservation measure applies to the following species:

Yuma clapper rail	California black rail	Arizona Bell's vireo
Southwestern willow flycatcher	Yellow-billed cuckoo	Sonoran yellow warbler
Western red bat	Elf owl	Summer tanager
Western yellow bat	Gilded flicker	California leaf-nosed bat
Desert pocket mouse	Gila woodpecker	Pale Townsend's big-eared bat
Western least bittern	Vermilion flycatcher	

MRM2—Monitor and adaptively manage created covered and evaluation species habitats. Created species habitats will be managed to maintain their functions as species habitat over the term of the LCR MSCP. Created habitat will be monitored and adaptively managed over time to determine the types and frequency of management activities that may be required to maintain created cottonwood-willow, honey mesquite, marsh, and backwater land cover as habitat for covered species. This conservation measure applies to those species for which comparable measures are not subsumed under species-specific conservation measures (Section 5.7). They are not applicable to species for which habitat would not be created under the LCR MSCP Conservation Plan, such as the desert tortoise, relict leopard frog, humpback chub, and threecorner milkvetch.

This conservation measure applies to the following species:

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

MRM3—Conduct research to determine and address the effects of nest site competition with European starlings on reproduction of covered species. Research will be undertaken to determine whether nest site competition with European starlings is a substantial factor limiting the reproductive success of the elf owl, gilded flicker, and Gila woodpecker. If so, experimental programs may be implemented to determine the effectiveness and practicality of controlling starlings.

MRM4—Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species. Research will be undertaken to determine whether brown-headed cowbird nest parasitism is a substantial factor limiting the reproductive success of the southwestern willow flycatcher, vermilion flycatcher, Arizona Bell's vireo, Sonoran yellow warbler, and summer tanager in the LCR MSCP planning area. If so, studies will be implemented to identify effective and practical methods for controlling brown-headed cowbirds. If cowbirds are adversely affecting breeding success and effective control measures are developed, a program will be implemented to monitor the effects of cowbirds on nesting success in LCR MSCP–created habitats to determine the need for cowbird control and to implement cowbird control measures in locations where cowbird control is needed to improve reproductive success.

MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities. Conduct monitoring of selenium levels in sediment, water, and/or biota present in LCR MSCP created backwater and marsh land cover types. If monitoring results indicate that management of the LCR MSCP conservation areas increases levels of selenium in

created backwaters and marshes or in covered species that use them, the LCR MSCP will undertake research to develop feasible methods to manage the conservation areas in a manner that will eliminate or compensate for the effects of increased selenium levels. If feasible management methods are identified, they will be implemented. This conservation measure will include monitoring the effects of dredging and dredge spoil disposal associated with creating and maintaining backwaters and marshes. If monitoring results indicate that current or future dredging and dredge spoil disposal methods increase selenium levels, the LCR MSCP will only implement methods that will have the least effect on selenium levels. A study will also be conducted to look at the effects of potential releases of selenium from dredging in general.

5.6.3 Conservation Area Management Measures

This section describes the LCR MSCP conservation area management measures (CMMs) that will be implemented to maintain the intended functions and values of created covered species habitats over the term of the LCR MSCP. Each CMM is provided with a unique four-character alphanumeric code that will assist with monitoring of LCR MSCP Conservation Plan implementation. The three-letter portion of the code designates the conservation measure as a conservation area management measure, and the numeral in the code designates the conservation measure number.

CMM1—Reduce risk of loss of created habitat to wildfire. Management of LCR MSCP conservation areas will include contributing to and integrating with local, state, and Federal agency fire management plans. Conservation areas will be designed to contain wildfire and facilitate rapid response to suppress fires (e.g., fire management plans will be an element of each conservation area management plan).

CMM2—Replace created habitat affected by wildfire. In the event of created-habitat degradation or loss as a result of wildfire, land management and habitat creation measures to support the reestablishment of native vegetation will be identified and implemented.

5.7 Species-Specific Conservation Measures

This section describes the species-specific LCR MSCP conservation measures, in addition to the general conservation measures described in Section 5.6, “General Species Conservation Measures,” that will be implemented to avoid, minimize, and fully mitigate the effects of implementing covered activities and contribute to the recovery of listed covered species/reduce the likelihood of future listing of nonlisted covered species. Each species conservation measure is provided with a unique five-character alpha-numeric code that will assist with monitoring of LCR MSCP Conservation Plan implementation. The four-letter portion of the code designates the covered species, and the numeral in the code designates the conservation measure number for the species.

Detailed information on the ecology and status of each covered species used to support this plan is provided in Appendix I. Table 5-10 presents a summary of impacts of

implementing covered activities and the LCR MSCP, the estimated levels of take, conservation measures, and expected outcomes for each covered species. Impacts of implementing covered activities and the LCR MSCP on the extent of covered species habitats and the extent of habitat that will be created under the LCR MSCP are presented in Table 5-11.

5.7.1 Yuma Clapper Rail

5.7.1.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 173 acres of Yuma clapper rail habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 70 acres of habitat. Some additional limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.1.2 Conservation Measures

CLRA1—Create 512 acres of Yuma clapper rail habitat. Create and manage 512 acres of marsh to provide Yuma clapper rail habitat (Figure 5-2). This created habitat will also provide habitat for the western least bittern and the California black rail (see conservation measures LEBI1 and BLRA1). Habitat will be created in patches as large as possible but will not be created in patches smaller than 5 acres. Smaller patches are likely to support isolated nesting pairs and be within the range of habitat patch sizes used by the species for foraging and dispersal. Larger patches would be expected to support multiple nesting pairs. Additional Yuma clapper rail habitat may be provided by marsh vegetation that becomes established along margins of the 360 acres of backwaters that will be created in Reaches 3–6. These small patches of habitat would provide cover for dispersing rails, thereby facilitating linkages between existing breeding populations and the colonization of created habitats.

Yuma clapper rail habitat will be created and maintained as described in Section 5.4.3.3. Marshes created to provide Yuma clapper rail habitat will be designed and managed to provide an integrated mosaic of wetland vegetation types, water depths, and open water areas. Within this mosaic of marsh conditions, Yuma clapper rail habitat will generally be provided by patches of bulrush and cattails interspersed with small patches of open water with water levels maintained at depths appropriate for this species (no more than 12 inches).

CLRA2—Maintain existing important Yuma clapper rail habitat areas. The Applicants, under agreements with cooperating land management agencies, will provide funding to those agencies to maintain a portion of existing Yuma clapper rail habitat within the LCR MSCP planning area (Section 5.4.2). Maintaining important existing habitat areas is necessary to ensure the continued existence of Yuma clapper rails in the

Table 5-10. Summary of Impacts and Conservation Measures to Avoid, Minimize, and Compensate Impacts of Implementing Covered Activities and the LCR MSCP Conservation Plan

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
Threatened and Endangered Species			
Yuma clapper rail	▪ Loss of up to 133 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 70 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains ▪ Potential for disturbance of up to 512 acres of existing degraded or former marsh that may provide low habitat value associated with converting it to fully functioning marsh that provides high value habitat ▪ Potential for removal of some limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan[b] ▪ Harassment of individuals associated with operation of equipment and other activities	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities CLRA1—Create 512 acres of Yuma clapper rail habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire CLRA2—Maintain existing important Yuma clapper rail habitat areas	Implementation of the conservation measures achieves the LCR MSCP goals to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Yuma clapper rail, and to contribute to its recovery. Implementation of these measures will contribute to recovery by increasing the amount of new nesting habitat by 269 acres over the number of impacted acres.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP		
Southwestern willow flycatcher	▪ Loss of up to 1,784 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 59 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM4—Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species WIFL1—Create 4,050 acres of Southwestern willow flycatcher habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire WIFL2—Maintain existing important habitat areas	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the southwestern willow flycatcher, and contribute to its recovery. Implementation of these measures will contribute to recovery by increasing the amount of new breeding habitat by 2,197 acres in addition to replacing the extent of impacted habitat. The conservation measures will also contribute to the objectives of the Southwestern Willow Flycatcher Recovery Plan (U.S. Fish and Wildlife Service 2002b).

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
Desert tortoise (Mojave population)	▪ Loss of up to 192 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for direct mortality of individuals associated with operation of vehicles and other equipment with implementation of non-flow-related covered activities and implementation of the LCR MSCP Conservation Plan over the term of the LCR MSCP	AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area DETO1—Acquire and protect 230 acres of existing unprotected occupied habitat DETO2—Avoid impacts on individuals and their burrows	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Mohave population of desert tortoises.
Bonytail	▪ Loss of up to 399 acres of habitat associated with implementation of flow-related covered activities ▪ Potential temporary disturbance of habitat associated with the creation of habitat and habitat management activities. ▪ Potential for entrainment of individuals at diversions over the term of the LCR MSCP ▪ Potential for direct mortality of individuals as a result of stranding over the term of the LCR MSCP	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM4—Minimize contaminant loads in runoff and return irrigation flows from LCR MSCP created habitats to the LCR AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities BONY1—Coordinate bonytail conservation efforts with the USFWS and recovery programs for endangered fish species in the Lower Basin BONY2—Create 360 acres of bonytail habitat BONY3—Augment bonytail populations BONY4—Evaluate and develop, if necessary, additional bonytail rearing capacity BONY5—Conduct monitoring and research, and adaptively manage bonytail augmentations and created habitat	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the bonytail, and contribute to its recovery. Implementation of these measures will contribute to attainment of the recovery goals established for the species (U.S. Fish and Wildlife Service 2002c).

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
Humpback chub	▪ Periodic loss of up to 62 miles of transitory Colorado River channel habitat that may be present in Lake Mead when the reservoir is below full pool elevation and lost when reservoir elevations are raised	HUCH1—Provide funding to support existing humpback chub conservation programs	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the humpback chub, and contribute to its recovery.
Razorback sucker	▪ Loss of up to 399 acres of habitat associated with implementation of flow-related covered activities ▪ Potential for periodic loss of razorback sucker spawning habitat in Lake Mead (Reach 1) with implementation of flow-related covered activities ▪ Potential temporary disturbance of habitat associated with the creation of habitat and habitat management activities. ▪ Potential for entrainment of individuals at diversions over the term of the LCR MSCP ▪ Potential for direct mortality of individuals as a result of stranding over the term of the LCR MSCP	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM4—Minimize contaminant loads in runoff and return irrigation flows from LCR MSCP created habitats to the LCR AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities RASU1—Coordinate razorback sucker conservation efforts with USFWS and recovery programs for endangered fish species in the Lower Basin Implementation Program RASU2—Create 360 acres of razorback sucker habitat RASU3—Augment razorback populations RASU4—Develop additional razorback sucker rearing capacity RASU5—Support ongoing razorback conservation efforts at Lake Mohave RASU6—Conduct monitoring and research, and adaptively manage	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the razorback sucker, and contribute to its recovery. Implementation of these measures will contribute to attainment of the recovery goals established for the species (U.S. Fish and Wildlife Service 2002e).

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
		razorback sucker augmentations and created habitat RASU7—Provide funding and support for continuation of the Reclamation/SNWA ongoing Lake Mead razorback sucker studies RASU8—Continue razorback conservation measures identified in the ISC/SIA BO	
Other Covered Species			
Western red bat (roosting habitat)	▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 604 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of covered activities	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats WRBA1—Conduct surveys to determine species distribution of the western red bat WRBA2— Create 765 acres of western red bat roosting habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western red bat.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
Western yellow bat (roosting habitat)	▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 604 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of covered activities	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats WYBA1—Conduct surveys to determine species distribution of the western yellow bat WYBA2—Avoid removal of western yellow bat roosts trees WYBA3— Create 765 acres of western yellow bat roosting habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western yellow bat.
Desert pocket mouse	▪ Potential temporary or permanent disturbance or loss of habitat associated with the restoration of habitat and habitat management activities ▪ Potential temporary disturbance of habitat associated with the creation of LCR MSCP habitats and habitat management activities[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP	AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area DPMO1—Conduct surveys to locate desert pocket mouse habitat	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the desert pocket mouse.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP		
Colorado River cotton rat	▪ Loss of up to 59 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 3 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 5 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, restoration of habitat and habitat management activities ▪ Potential for disturbance of up to 125 acres of existing degraded or former marsh that may provide low habitat value associated with converting it to fully functioning marsh that provides high value habitat ▪ Potential for removal of some limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities CRCR1—Conduct research to better define Colorado River cotton rat habitat requirements CRCR2—Create 125 acres of Colorado River cotton rat habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Colorado River cotton rat.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
Yuma hispid cotton rat	▪ Loss of up to 71 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 5 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM2—Monitor and adaptively manage created covered and evaluation species habitats YHCR1—Conduct research to better define Yuma hispid cotton rat habitat requirements YHCR2—Create 76 acres of Yuma hispid cotton rat habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Yuma hispid cotton rat.
Western least bittern	▪ Loss of up to 133 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 70 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western least bittern, and reduce the likelihood of future federal listing of the species. Implementation of these measures will benefit

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	restoration and habitat management activities ▪ Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains ▪ Potential for disturbance of up to 512 acres of existing degraded or former marsh that may provide low habitat value associated with converting it to fully functioning marsh that provides high value habitat ▪ Potential for removal of some limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities LEBI1—Create 512 acres of western least bittern habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	the western least bittern by increasing the amount of new habitat in the LCR MSCP planning area by 269 acres in addition to replacing the extent of impacted habitat.
California black rail	▪ Loss of up to 37 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 31 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 5 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the California black rail, and reduce the likelihood of future federal listing of the

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	▪ Potential periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains ▪ Potential for disturbance of up to 130 acres of existing degraded or former marsh that may provide low habitat value associated with converting it to fully functioning marsh that provides high value habitat ▪ Potential for removal of some limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) as a result of creating covered species habitats with implementation of the LCR MSCP Conservation Plan[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities BLRA1—Create 130 acres of California black rail habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire BLRA2—Maintain existing important California black rail habitat areas	species. Implementation of these measures will benefit the California black rail by increasing the amount of new habitat in the LCR MSCP planning area by 27 acres in addition to replacing the extent of impacted habitat.
Yellow-billed cuckoo	▪ Loss of up to 1,425 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 99 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the yellow-billed cuckoo, and reduce the likelihood of future federal listing of the species. Implementation of these measures will benefit

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats YBCU1—Create 4,050 acres of yellow-billed cuckoo habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire YBCU2—Maintain existing important yellow-billed cuckoo habitat areas	the yellow-billed cuckoo by increasing the amount of new habitat in the LCR MSCP planning area by 2,516 acres in addition to replacing the extent of impacted habitat.
Elf owl	▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 590 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM3—Conduct research to determine and address the effects of nest site competition with European starlings on reproduction of covered species	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the elf owl, and reduce the likelihood of future federal listing of the species. Implementation of these measures will benefit the elf owl by increasing the amount of new habitat in the LCR MSCP planning area by 1,033 acres in addition to replacing the extent of impacted habitat.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	implementation of non-flow-related covered activities over the term of the LCR MSCP	ELOW1—Create 1,784 acres of elf owl habitat ELOW2—Install elf owl nest boxes CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	
Gilded flicker	▪ Loss of up to 1,425 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 99 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM3—Conduct research to determine and address the effects of nest site competition with European starlings on reproduction of covered species GIFL1—Create 4,050 acres of gilded flicker habitat GIFL2—Install artificial snags to provide gilded flicker nest sites CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the gilded flicker, and reduce the likelihood of future federal listing of the species. Implementation of these measures will benefit the gilded flicker by increasing the amount of new habitat in the LCR MSCP planning area by 2,516 acres in addition to replacing the extent of impacted habitat.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
Gila woodpecker	▪ Loss of up to 819 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 26 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM3—Conduct research to determine and address the effects of nest site competition with European starlings on reproduction of covered species GIWO1—Create 1,702 acres of Gila woodpecker habitat GIWO2—Install artificial snags to provide Gila woodpecker nest sites CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Gila woodpecker, and reduce the likelihood of future federal listing of the species. Implementation of these measures will benefit the gilded flicker by increasing the amount of new habitat in the LCR MSCP planning area by 847 acres in addition to replacing the extent of impacted habitat.
Vermilion flycatcher	▪ Loss of up to 1,890 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 714 acres of habitat associated with implementation of federal non-flow-	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the vermilion flycatcher, and reduce the likelihood of

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM4—Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species VEFL1—Create 5,208 acres of vermilion flycatcher habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	future federal listing of the species. Implementation of these measures will benefit the vermilion flycatcher by increasing the amount of new habitat in the LCR MSCP planning area by 2,594 acres in addition to replacing the extent of impacted habitat.
Arizona Bell's vireo	▪ Loss of up to 1,654 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 1,309 acres of habitat associated with implementation of federal non-flow-related covered activities[a,c] ▪ Potential for loss of up to 20 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Arizona Bell's vireo.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM4—Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species BEVI1—Create 2,983 acres of Arizona Bell's vireo habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	
Sonoran yellow warbler	▪ Loss of up to 2,929 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 183 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for loss of up to 10 acres of degraded, low-value habitat associated with non-Federal, non-flow-related, habitat restoration and habitat management activities ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b]	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM2—Avoid impacts of flow-related covered activities on covered species habitats at Topock Marsh AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM4—Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Sonoran yellow warbler, and reduce the likelihood of future federal listing of the species. Implementation of these measures will benefit the Sonoran yellow warbler by increasing the amount of new habitat in the LCR MSCP planning area by 928 acres in addition to replacing the extent of impacted habitat.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	YWAR1—Create 4,050 acres of Sonoran yellow warbler habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	
Summer tanager	▪ Loss of up to 161 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic establishment and loss of habitat within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevation ▪ Loss of up to 14 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Potential for incidental take of individuals from activities that create covered species habitats in land cover types not considered to be habitat for the species, but where some transitory or minor use of the land cover type does occur[b] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of a small number of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM3—To the extent practicable, avoid and minimize disturbance of covered bird species during the breeding season AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM4—Conduct research to determine and address the effects of brown-headed cowbird nest parasitism on reproduction of covered species SUTA1—Create 602 acres of summer tanager habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the summer tanager, and reduce the likelihood of future federal listing of the species. Implementation of these measures will benefit the summer tanager by increasing the amount of new habitat in the LCR MSCP planning area by 427 acres in addition to replacing the extent of impacted habitat.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
Flat-tailed horned lizard	▪ Loss of up to 128 acres of habitat associated with implementation of federal non-flow-related covered activities[a] ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities and the LCR MSCP over the term of the LCR MSCP	AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area FTHL1—Acquire and protect 230 acres of existing unprotected occupied flat-tailed horned lizard habitat FTHL2—Implement conservation measures to avoid or minimize take of flat-tailed horned lizard	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the flat-tailed horned lizard.
Relict leopard frog	▪ Potential temporary disturbance of habitat associated with the creation of habitat and habitat management activities. ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	RLFR1—Provide funding to support existing relict leopard frog conservation programs	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the relict leopard frog, and reduce the likelihood of future federal listing of the species.
Flannelmouth sucker	▪ Loss of up to 85 acres of habitat associated with implementation of flow-related covered activities ▪ Periodic loss of transitory Colorado River and Virgin River channel habitat that may be present in Lake Mead when the reservoir is below full pool elevation and lost when reservoir elevations are raised ▪ Potential temporary disturbance of habitat associated with the creation of habitat and habitat management activities.	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM4—Minimize contaminant loads in runoff and return irrigation flows from LCR MSCP created habitats to the LCR AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area AMM6—Avoid or minimize impacts on covered species habitats during dredging, bank stabilization activities and other river management activities	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the flannelmouth sucker, and reduce the likelihood of future federal listing of the species.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
	▪ Potential for entrainment of individuals at diversions over the term of the LCR MSCP ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	MRM2—Monitor and adaptively manage created covered and evaluation species habitats MRM5—Monitor selenium levels in created backwater and marsh land cover types, and study the effect of selenium released as a result of dredging activities FLSU1—Create 85 acres of flannelmouth sucker habitat FLSU2—Provide funding to support existing flannelmouth sucker conservation programs FLSU3—Assess flannelmouth sucker management needs and develop management strategies	
MacNeill's sootywing skipper	▪ Loss of up to 172 acres of habitat associated with implementation of flow-related covered activities ▪ Loss of up to 50 acres of habitat associated with implementation of Federal non-flow-related covered activities[a] ▪ Potential disturbance of or loss of a small, unquantifiable amount of habitat associated with the creation of habitat and habitat management activities. ▪ Harassment of individuals associated with operation of equipment and other activities related to implementing non-flow-related covered activities and the LCR MSCP Conservation Plan ▪ Potential for direct mortality of individuals associated with implementation of non-flow-related covered activities over the term of the LCR MSCP	AMM 1—To the extent practicable, avoid and minimize impacts of implementing the LCR MSCP on existing covered species habitats AMM5—Avoid impacts of operation, maintenance, and replacement of hydroelectric generation and transmission facilities on covered species in the LCR MSCP planning area MRM2—Monitor and adaptively manage created covered and evaluation species habitats MNSW1—Conduct surveys and research to locate MacNeill's sootywing skipper habitat and to better define its habitat requirements MNSW2—Create at least 222 acres of MacNeill's sootywing skipper habitat CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the MacNeill's sootywing skipper.
Sticky buckwheat	▪ Potential for direct mortality of individuals associated with implementation of flow-related covered activities over the term of the LCR MSCP	STBU1—Provide funding to support existing sticky buckwheat conservation programs	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
			effects of covered activities and LCR MSCP implementation on the sticky buckwheat, and reduce the likelihood of future federal listing of the species.
Threecorner milkvetch	▪ Potential for direct mortality of individuals associated with implementation of flow-related covered activities over the term of the LCR MSCP	THMI1—Provide funding to support existing threecorner milkvetch conservation programs	Implementation of the conservation measures achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the threecorner milkvetch, and reduce the likelihood of future federal listing of the species.
Evaluation Species			
California leaf-nosed bat (roosting habitat)	▪ Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of flow-related activities	MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats CLNB1—Conduct surveys to locate California leaf-nosed bat roost sites CLNB2—Create covered species habitat near California leaf-nosed bat roost sites CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures will fully mitigate flow-related impacts, if any, on the diversity and production of insects. In addition, implementation of survey and research conservation measures will provide important information for use in developing future conservation efforts for this species.

Species	Impacts and Estimated Level of Take	Conservation Measures to Avoid, Minimize, and Mitigate Impacts	Summary of Expected Outcomes
Pale Townsend's big-eared bat (roosting habitat)	▪ Potential for likely small, unmeasurable, effects on the production and abundance of insect prey associated with implementation of flow-related activities	MRM1—Conduct surveys and research to better identify covered and evaluation species habitat requirements MRM2—Monitor and adaptively manage created covered and evaluation species habitats PTBB1—Conduct surveys to locate pale Townsend's big-eared bat roost sites PTBB2— Create covered species habitat near pale Townsend's big-eared bat roost sites CMM1—Reduce risk of loss of created habitat to wildfire CMM2—Replace created habitat affected by wildfire	Implementation of the conservation measures will fully mitigate flow-related impacts, if any, on the diversity and production of insects. In addition, implementation of survey and research conservation measures will provide important information for use in developing future conservation efforts for this species.
Colorado River toad	▪ No impacts expected	CRTO1—Conduct research to better define the distribution, habitat requirements, and factors that are limiting the distribution of the Colorado River toad CRTO2—Protect existing unprotected occupied Colorado River toad habitat CRTO3—Conduct research to determine feasibility of establishing the Colorado River toad in unoccupied habitat	Implementation of the conservation measures will provide information necessary for successful management to maintain and increase the abundance of the Colorado River toad throughout its range.
Lowland leopard frog	▪ No impacts expected	LLFR1— Conduct research to better define the distribution, habitat requirements, and factors that are limiting the distribution of the lowland leopard frog LLFR2—Protect existing unprotected occupied lowland leopard frog habitat LLFR3— Conduct research to determine feasibility of establishing the lowland leopard frog in unoccupied habitat	Implementation of the conservation measures would provide information necessary for successful management to maintain and increase the abundance of lowland leopard frogs throughout its range.

Note:

[a] The estimated effects on covered species habitats that will result from implementation of the federal non-flow-related covered activities addressed in the LCR MSCP BA. The amount of land cover types to be created to provide covered species habitats described in Chapter 5 "Conservation Plan" includes the creation of sufficient land cover to provide covered species habitat to mitigate both the impacts of implementing the LCR MSCP HCP and the federal non-flow-related activities on covered species habitats.

[b] The LCR MSCP currently estimates that about two-thirds of LCR MSCP created habitat would be created on agricultural lands (5,045 acres), including associated infrastructure (estimated to be 1 percent of all habitat created, or 81 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.

The LCR MSCP impact assessment also assumes that up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Up to 360 acres of existing degraded or former backwaters could also be converted to create fully functioning backwaters that provides high-value habitat for the bonytail, razorback sucker, and flannelmouth sucker. Conversion of existing degraded or former marsh and backwaters to create habitat for these species, however, will not result in a loss of existing habitat.

The remainder of LCR MSCP habitat (currently estimated to be 2,377 acres) would be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered to be habitat. These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. Implementation of the avoidance and minimization measures described in Section 5.6.1, "Avoidance and Minimization Measures," however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

[c] Includes 610 acres of honey mesquite IV that provides Arizona Bell's vireo habitat that could be converted to agricultural uses and that are covered under the LCR MSCP. Up to an additional 3,832 acres of honey mesquite IV that provides habitat could be removed by Federal non-flow-related activities, however, these activities and resultant impacts are not covered under the LCR MSCP.

Table 5-11. Comparison of Species-Specific Habitat Impacts to Created LCR MSCP Habitat

Covered Species	Impacts of Federal and Non-Federal Flow-Related Covered Activities[a]	Impacts of Federal and Non-Federal Non-Flow-Related Covered Activities[a,b]	Total Impacts	LCR MSCP Created Habitat
Threatened and Endangered Species				
Yuma clapper rail	133	110	243	512
Southwestern willow flycatcher	1,784	69	1,853	4,050
Desert tortoise (Mojave population)	0	192	192	0[c]
Bonytail	399	0	399	360[d]
Humpback chub	ND[e]	0	ND[e]	ND[e]
Razorback sucker	399	0	399	360[d]
Other Covered Species				
Western red bat (roosting habitat)	161	604	765	765
Western yellow bat (roosting habitat)	161	604	765	765
Desert pocket mouse	0	0	0	0
Colorado River cotton rat	59	8	67	125
Yuma hispid cotton rat	0	76	76	76
Western least bittern	133	110	243	512
California black rail	37	66	103	130
Yellow-billed cuckoo	1,425	109	1,534	4,050
Elf owl	161	590	751	1,784
Gilded flicker	1,425	109	1,534	4,050
Gila woodpecker	819	36	855	1,702
Vermilion flycatcher	1,890	724	2,614	5,208
Arizona Bell's vireo	1,654	1,329[f]	2,983[f]	2,983
Sonoran yellow warbler	2,929	193	3,122	4,050
Summer tanager	161	14	175	602
Flat-tailed horned lizard	0	128	128	0[g]
Relict leopard frog	0[h]	0[h]	0[h]	0
Flannelmouth sucker	85	0	85	85
MacNeill's sootywing skipper	172	50	222	222
Sticky buckwheat	ND[i]	0	ND[i]	ND[i]
Threecorner milkvetch	ND[i]	0	ND[i]	ND[i]
Evaluation Species				
California leaf-nosed bat (roosting habitat)	0	0	0	0
Pale Townsend's big-eared bat (roosting habitat)	0	0	0	0
Colorado River toad	0	0	0	0
Lowland leopard frog	0	0	0	0

Note: LCR MSCP conservation measures to create habitat for covered species will avoid removal of cottonwood-willow, honey mesquite, marsh, and backwater land cover types that provide habitat for covered species, and, therefore, impacts of implementing the LCR MSCP conservation measures are not shown in this table. The LCR MSCP currently estimates that about two-thirds of LCR MSCP created habitat would be created on agricultural lands (5,045 acres), including associated infrastructure (estimated to be 1percent of all habitat created, or 81 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.

The LCR MSCP impact assessment also assumes that up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Up to 360 acres of existing degraded or former backwaters could also be converted to create fully functioning backwaters that provides high-value habitat for the bonytail, razorback sucker, and flannelmouth sucker. Conversion of existing degraded or former marsh and backwaters to create habitat for these species, however, will not result in a loss of existing habitat.

The remainder of LCR MSCP habitat (currently estimated to be 2,377 acres) would be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered to be habitat . These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. Implementation of the avoidance and minimization measures described in Section 5.6.1, "Avoidance and Minimization Measures," however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

[a] Impacts of non-Federal non-flow-related covered activities are derived from Table 4-5.

[b] The estimated effects on covered species habitats that will result from implementation of the Federal non-flow-related covered activities are addressed in the LCR MSCP BA. The amount of land cover types to be created or protected to provide covered species habitats described in Table 5-5 includes the creation or protection of sufficient land cover to provide covered species habitat to mitigate both the impacts of implementing the LCR MSCP HCP and the Federal non-flow-related activities on covered species habitats.

[c] Net loss in habitat is fully mitigated by protecting 230 acres of desert tortoise habitat in accordance with mitigation requirements in the document entitled "Compensation for Desert Tortoise" (Desert Tortoise Compensation Team 1991).

[d] The effects of the loss of 399 acres of backwater on this species is fully mitigated by both creating 360 acres of backwater that will be managed to provide greater habitat values for this species and by stocking juvenile fish to substantially augment the existing population over the term of the LCR MSCP (Section 5.7.4, "Bonytail," and Section 5.7.6, "Razorback Sucker").

[e] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in reservoir elevations associated with implementation of flow-related covered activities, however, could result in the establishment of up to 62 miles of transitory Colorado River channel when the reservoir pool is maintained at lower elevations that could be occupied by humpback chub and subsequently lost when reservoir elevations rise.

[f] Includes 610 acres of honey mesquite IV that provides Arizona Bell's vireo habitat that could be converted to agricultural uses and that are covered under the LCR MSCP. Up to an additional 3,832 acres of honey mesquite IV that provides habitat could be removed by Federal non-flow-related activities, however, these activities and resultant impacts are not covered under the LCR MSCP.

[g] Net loss in habitat is fully mitigated by protecting 230 acres of flat-tailed horned lizard habitat in accordance with mitigation requirements in the Flat-Tailed Horned Lizard Rangewide Management Strategy (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003).

[h] Implementation of covered activities will not result in removal of this species' habitat but could result in temporary disturbance of habitat or affect movement of individuals.

[i] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities, however, would result in periodic loss of habitat that is exposed along the Lake Mead shoreline when reservoir elevations are low and then is subsequently inundated when reservoir elevations rise.

LCR MSCP planning area, provide for the production of individuals that could disperse to and nest in LCR MSCP–created habitat, and support future recovery of the species. Habitat maintenance would likely be undertaken in conjunction with the maintenance of existing California black rail habitat.

5.7.1.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including maintenance of existing important habitat areas and creation of 512 acres of habitat, achieves the LCR MSCP goals to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Yuma clapper rail, and to contribute to its recovery. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. Implementation of the conservation measures will also contribute to recovery by increasing the amount of new breeding habitat by 269 acres, in addition to replacing the extent of affected habitat.

5.7.2 Southwestern Willow Flycatcher

5.7.2.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 1,794 acres of southwestern willow flycatcher habitat and harassment of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 59 acres of habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.2.2 Conservation Measures

WIFL1—Create 4,050 acres of southwestern willow flycatcher habitat. Of the 5,940 acres of created cottonwood-willow, at least 4,050 acres will be designed and created to provide habitat for this species. Created cottonwood-willow will be designed and managed to support cottonwood-willow types I–IV that provide breeding habitat for this species. The created cottonwood-willow would also function as migration habitat for birds that migrate along the LCR. A total of 2,700 acres of created habitat will be designed and managed to provide habitat for both the southwestern willow flycatcher and yellow-billed cuckoo. To provide habitat for both species, created habitat will need to be composed of cottonwood-willow types I–IV, include moist soils for flying insect production, and be in large habitat blocks (at least 25 acres but preferably up to 200 or more acres). The remaining 1,350 acres of the 4,050 acres of created habitat will also be

composed of cottonwood-willow types I–IV and will include moist soils, but patches of this habitat may be smaller if site constraints limit the construction of larger habitat patches.

Of the 1,350 acres of habitat to be created specifically for the yellow-billed cuckoo (Section 5.7.14), patches that provide surface water or moist surface soil conditions during the breeding season will also support habitat for the southwestern willow flycatcher.

In addition to the spatial replacement of affected habitat, the quality of created habitat will be substantially greater than the affected habitat. Affected southwestern willow flycatcher habitat is dominated by dense stands of saltcedar that support little vegetative diversity relative to the cottonwood-willow land cover that will be created and managed as flycatcher breeding habitat. Cottonwood-willow land cover created to provide southwestern willow flycatcher habitat will be designed and managed to be dominated by native riparian trees (i.e., cottonwood and willow trees), support flying insect production used as food by the flycatcher, support a diversity of plant species, provide a dense multilayered canopy, support multiple seral stages, and provide substantial areas of edge habitat. Created habitat, thus, will be similar to the condition of the species' native habitat that was historically present along the LCR.

The relative suitability and carrying capacity of saltcedar and cottonwood-willow habitats for nesting southwestern willow flycatchers are difficult to measure under current conditions because saltcedar now dominates most riparian areas along the LCR. Based on historical accounts, however, cottonwood-willow forests of the LCR once supported a high diversity and density of nesting birds, including willow flycatchers (Grinnell 1914; Garrett and Dunn 1981; Rosenberg et al. 1991). Thus, it is reasonable to assume that the successful replacement of the current saltcedar-dominated habitats by the species' historical, native habitat would provide highly favorable conditions for long-term maintenance and enhancement of southwestern willow flycatcher populations on the LCR.

To ensure that high quality and fully functioning southwestern willow flycatcher breeding habitat is created, the following design and management criteria, subject to adjustment through the LCR MSCP adaptive management process, will be applied to created cottonwood-willow land cover dedicated as replacement southwestern willow flycatcher habitat:

- Southwestern willow flycatcher habitat will be created in patches of at least 10 acres, with an objective of creating larger patches of habitat.
- Created-habitat patches will be close to each other or existing tracts of riparian forest that provide southwestern willow flycatcher habitat in a manner that will maximize continuity with other riparian habitats.
- Designs of created habitats will emphasize creation of nesting habitat within 200 feet of standing or slow-moving water or moist surface soils (suitable insect-productive foraging habitats) and will include creation of suitable habitat edges that are preferred by this species.

- Created habitat will include provisions for supporting moist surface soils and standing or slow-moving water required by the species within their territories during the breeding season (may extend from late April to August along the LCR). Maintaining these conditions could involve creation of canals and shallow swales that permanently or seasonally maintain surface water or moist surface soil conditions. Because the actual period that moist soils or ponded or slow-moving water conditions must be present to support successful reproduction is not well understood, watering of created habitat will be managed adaptively to determine periods when water must be present to support flycatcher reproduction.
- Canals and shallow swales may need to be created to dissect blocks of created cottonwood-willow that will be wide enough (estimated to be at least 25 feet) to create interior forest-edge conditions necessary to support southwestern willow flycatcher habitat, create the microrelief and soil moisture conditions necessary to support a diversity of understory plant species, and supply irrigation water.
- Created habitat will be designed and actively managed to support a vigorous plant community that will support multiple layers, seral stages, and age cohorts of trees.
- Mounds and depressions, to the extent necessary, will be created in habitat created on conservation areas to establish some topographic diversity that will also provide habitat diversity by increasing plant and insect prey species diversity.

WIFL2—Maintain existing important habitat areas. The Applicants, under agreements with cooperating land management agencies, will provide funding to those agencies to maintain a portion of existing southwestern willow flycatcher habitat within the LCR MSCP planning area (Section 5.4.2). Maintaining important existing habitat areas is necessary to ensure the continued existence of the southwestern willow flycatcher in the LCR MSCP planning area, provide for the production of individuals that could disperse to and nest in LCR MSCP–created habitats, and support future recovery of the species.

5.7.2.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including maintenance of existing important habitat areas and creation of 4,050 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the southwestern willow flycatcher, and contribute to its recovery. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. Implementation of the conservation measures will also contribute to recovery by increasing the amount of new breeding habitat by 2,233 acres, in addition to replacing the extent of affected habitat.

The LCR MSCP conservation measures will contribute to the objectives of the Southwestern Willow Flycatcher Recovery Plan (U.S. Fish and Wildlife Service 2002b). The southwestern willow flycatcher Lower Colorado Recovery Unit currently supports approximately 146 occupied nesting territories and a target of 525 occupied nesting

territories in the unit for removal from the ESA endangered and threatened species list. Implementation of the LCR MSCP will maintain existing occupied habitats in a condition that will continue to function over time and, assuming a mean nesting territory size of 10 acres, the LCR MSCP would create sufficient habitat to support 405 nesting territories that would be available for occupancy by nesting pairs.

5.7.3 Desert Tortoise

5.7.3.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures may result in take of individuals (i.e., mortality of individuals associated with operation of vehicles and equipment in habitat). Small amounts of desert tortoise habitat could be removed if new infrastructure (e.g., access roads) necessary to develop and maintain LCR MSCP conservation areas is constructed in habitat. The level of habitat removal, however, is expected to be minimal and is not expected to result in harm (i.e., injury or mortality of individuals). Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of 192 acres of desert tortoise habitat.

5.7.3.2 Conservation Measures

DETO1—Acquire and protect 230 acres of existing unprotected occupied habitat. Consistent with the mitigation measures identified in the document "Compensation for Desert Tortoise" (Desert Tortoise Conservation Team 1991), the LCR MSCP will acquire and protect 230 acres of unprotected occupied desert tortoise habitat. The acquired habitat will be transferred to an appropriate management agency for permanent protection of species' habitat. Although creation of replacement habitat is not considered feasible, protecting existing occupied habitat will ensure that implementation of covered activities and LCR MSCP conservation measures do not adversely affect the existing distribution, abundance, or population viability of the desert tortoise within the LCR MSCP planning area.

DETO2—Avoid impacts on individuals and their burrows. To avoid and minimize impacts on desert tortoise, the following measures, which are derived from USFWS's *Field Survey Protocol for Any Federal Action That May Occur within the Range of the Desert Tortoise* (U.S. Fish and Wildlife Service 1992) and the Desert Tortoise Council's *Guidelines for Handling Desert Tortoises during Construction Projects* (Desert Tortoise Council 1994), will be implemented.

1. Before implementing non-flow-related covered activities and LCR MSCP conservation measures in desert tortoise habitat, presence or absence surveys will be conducted using approved USFWS survey protocols to locate desert tortoises and their burrows (U.S. Fish and Wildlife Service 1992). The number and location of all tortoises or tortoise sign (e.g., shells, bones, scutes, limbs, scats, burrows, pellets, tracks, egg shell fragments, courtship rings, drinking sites, and mineral licks) that occur within the project area and its zone of influence and whether any tortoises

occur outside of the project area whose home ranges may overlap the project area or its zone of influence should be identified. The project area is defined as any area that will be cleared or partially cleared; have vehicles on or adjacent to it; be temporarily or permanently used for equipment or materials storage, loading, or unloading; or will have its soil or vegetation damaged, fragmented, or disturbed. Desert tortoise presence or absence surveys should be conducted during the typical period of activity for the tortoise (i.e., March 25 to May 31). Surveys should be conducted during daylight hours. The USFWS considers the results of a presence or absence survey, including the zone of influence, to be valid for no more than 1 year, though the time period may be significantly reduced, depending on project size, location, or proximity to other land disturbance.

2. If desert tortoises are present, the covered activity or LCR MSCP activity will be modified to avoid take of individuals and their burrows. However, if impacts cannot be avoided, clearance surveys will be conducted to locate desert tortoises that will be removed and relocated to other habitat areas. Clearance surveys should be conducted to locate all desert tortoises above and below ground within the project area that would be temporarily relocated or salvaged using the USFWS clearance survey protocol (U.S. Fish and Wildlife Service 1992). Clearance surveys should be conducted immediately prior to surface disturbance at each site within the project area. Surveys should be conducted during daylight hours.

3. If impacts cannot be avoided, desert tortoises should be removed and relocated to other habitat areas, if appropriate. The Desert Tortoise Council guidelines for determining whether tortoises should be moved, mapping tortoise burrows, determining whether burrows should be excavated, finding tortoises in burrows, excavating burrows, constructing artificial burrows, handling tortoise eggs, handling tortoises, processing tortoises, translocating tortoises, and releasing tortoises should be followed (Desert Tortoise Council 1994).

5.7.3.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to protect 230 acres of unprotected occupied desert tortoise habitat achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Mohave population of desert tortoises. Implementation of this measure will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully mitigating the loss of habitat.

5.7.4 Bonytail

5.7.4.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 399 acres of bonytail habitat, stranding, and desiccation losses in the river and connected backwaters, and entrainment of individuals at diversions.

5.7.4.2 Conservation Measures

BONY1—Coordinate bonytail conservation efforts with the USFWS and recovery programs for endangered fish species in the Lower Basin. The LCR MSCP is not a recovery implementation program for the bonytail in the Lower Basin. However, because the planning area overlies bonytail habitats that may be significant components of recovery, and the conservation measures included in the plan can provide resources to a separately organized recovery program, the LCR MSCP will be a contributor to recovery efforts. In that role, the LCR MSCP will interact with the USFWS or any formal recovery program developed in the future for the Lower Basin to ensure that conservation measures included in the conservation plan will be implemented in support of recovery efforts to meet recovery goals for the bonytail in the Lower Basin. This will allow coordination of stocking, research, monitoring, and the funding of other types of conservation efforts inside and outside the LCR MSCP planning area. The LCR MSCP may also use funding programmed for bonytail augmentation (BONY3) and other bonytail conservation measures to implement other recovery activities identified by the USFWS or a future formal recovery program if it is determined through the adaptive management process (Section 5.12) and with concurrence of the USFWS that providing such funding would more effectively contribute to recovery of the bonytail. The LCR MSCP conservation measures are designed to be flexible and adaptable to allow for changing needs and priorities in bonytail recovery efforts over the term of the permit. The LCR MSCP recognized that this flexibility would be extremely valuable as interim benchmarks to meeting the 2002 recovery goals and changes to recovery needs identified from research and monitoring were developed over time. In order to define the amount of conservation the LCR MSCP would contribute for the bonytail, some assumptions on how funds would be spent were made for the purposes of costing out the program. The adaptive management program, relying on research, monitoring, and other information, will guide the implementation of the conservation measures to mitigate incidental take and contribute to recovery.

BONY2—Create 360 acres of bonytail habitat. Create 360 acres of backwater with depth, vegetation, and substrate characteristics that provide the elements of bonytail habitat. This created backwater will also provide habitat for the razorback sucker. Created backwaters will be designed and managed as described in Section 5.4.3.4. At a minimum, created backwaters will contain the physical, chemical, and biological conditions suitable for the establishment and maintenance of healthy fish populations in the LCR.

BONY3—Bonytail augmentation program. The LCR MSCP will provide a level of funding to support implementation of a stocking/augmentation program for the bonytail providing for the stocking of up to 620,000 subadult bonytail (at least 300 mm in length) into the designated critical habitat for the species in Reaches 2–3, and in Reaches 4 and 5 of the LCR. The figure of 620,000 fish is not a target number for the LCR but represents an assumption (see BONY1) used to define the extent of funding that would be available, with the understanding that the adaptive management process (see Section 5.12.2.2) would guide the actual stocking program. The elements of the augmentation program divide the conservation effort into the three reaches with numbers of fish per year per reach:

1. Annually augment 4,000–6,000 subadult fish for 40 years in Lake Mohave to maintain the population (LCR MSCP stocking would follow completion of USFWS's augmentation commitment; estimate 10,000 subadult fish augmented per year for 10 years; consequently, the LCR MSCP commitment is estimated at a mean annual average of 5,000 subadult fish per year for 40 years, for a total of 200,000 fish augmented).
2. Annually augment 4,000 subadult fish for 50 years in Lake Havasu to maintain the population (200,000 total augmentation).
3. When technology permits, implement an experimental augmentation of 8,000 subadult fish annually in the Parker-Imperial river reach (Reaches 4 and 5) for 5 consecutive years within the 50-year program (40,000 total augmentation) and conduct intensive follow-up monitoring.
4. Annually augment 4,000 subadult fish to establish and maintain populations in the Parker-Imperial river reach (Reaches 4 and 5) for 45 years (180,000 total augmentation).

The number of fish that would be stocked in each reach would be based on the results of monitoring and research. Factors to be evaluated include the survival of stocked fish (including examination of rearing methods, stocking methods, and size of fish stocked), habitat usage, quality and availability, and other information. Stocking of bonytail in any reach would cease, even if the numbers described herein had not been stocked, if monitoring and research demonstrate: (1) no need for additional stockings to provide adults for genetic refuge or for evaluation of management activities related to creating a self-sustaining population (i.e., species recovery goals have been achieved); (2) results of monitoring and research indicate that management activities other than stocking would be more effective in contributing to recovery of the species; (3) there are factors in the reach that are not conducive to the survival of stocked fish to become adults or to be managed toward a self-sustaining population; or (4) that other biological or other factors warrant cessation of stocking. Funds not expended for growing and stocking subadult bonytail would continue to be available to fund other management measures that would minimize and mitigate incidental take and contribute to recovery. Other such management measures would be identified and implemented through the adaptive management process (Section 5.12.1), which requires that any proposed changes in the conservation measures be approved by the USFWS prior to adoption and implementation. As described in conservation measure BONY1, the number of bonytail stocked could also be reduced if funding provided for stocking bonytail is reallocated to support implementation of other conservation measures.

The proposed augmentation program assumes that the USFWS will complete its obligation to stock 125,000 subadult fish in Lake Mohave (an estimated 100,000 subadult fish remain to be stocked) and that the LCR MSCP will incorporate annual augmentations to maintain the Lake Mohave population that becomes established as a result of USFWS's augmentations. All fish stocked under the LCR MSCP augmentation program would meet applicable disease and parasite control protocols established for fish health.

BONY4—Evaluate and develop, if necessary, additional bonytail rearing capacity. Additional rearing capacity, if needed, would be developed through cooperation between

AGFD, CDFG, NDOW, USFWS, and other LCR MSCP participants, or fish may be acquired from other sources. During the initial years of implementation, the LCR MSCP will evaluate the efficacy of existing or proposed bonytail production programs and facilities and develop the methods required to produce and rear the fish. Given the minimal information on the biology and ecology of the species, the success of large-scale production is uncertain. Also, the target size for subadults is 300 mm total length. Existing information indicates that hatchery and pond rearing of bonytail to 300 mm is difficult, requiring specific nutritional and spatial conditions. Opportunities to increase bonytail production could include defining feeding regimes, raceway and pond densities, and other factors that affect growth and testing the efficacy of raising fish in disconnected backwaters that are predator free. In the context of the integrated landscape mosaic (e.g., use of created disconnected backwaters), a "pilot project" grow-out facility will be developed for bonytail within the LCR MSCP planning area.

Until rearing capacity and aquaculture techniques can be increased sufficiently to produce the numbers of fish required for the augmentation strategy described in conservation measures BONY3, the LCR MSCP will stock the numbers of fish that can be produced up to the amounts described above. Annual augmentation targets for the first years of the program, therefore, may need to be shifted to later in the program, when increased rearing capacity is at full capacity. The LCR MSCP augmentation strategy assumes that fish production technology can be developed sufficiently to produce the numbers of subadult fish required for augmentation. If production of sufficient numbers of fish for the augmentation program is not possible, however, in addition to augmenting the numbers of fish that can be produced, the LCR MSCP will focus the expenditure of remaining augmentation funds on other types of management activities that will benefit the species (e.g., additional research, habitat improvements).

BONY5—Conduct monitoring and research, and adaptively manage bonytail augmentations and created habitat. Monitoring and research will be conducted to gather information necessary to adaptively manage bonytail conservation, including aggressive monitoring of fish response following augmentations to gather information regarding habitat use and fish movement, to increase the success of subsequent management of the species.

The LCR MSCP will implement an adaptive management process to reevaluate the augmentation strategy for bonytail, based on the results of monitoring and research. Monitoring and focused research will be a component of the adaptive management process. For example, the stocking of 8,000 subadult fish for 5 consecutive years below Parker Dam (conservation measure BONY3, submeasure 3) will be conducted as an adaptive management experiment, elements of which will include focusing augmentations in locations that currently support the species, followed by intensive monitoring and research for an estimated 7–8 years. Release of fish into the LCR will target a mix of riverine and lacustrine habitat types in Reaches 2 and 3. Augmented bonytail released will be marked with an appropriate batch-marking methodology and a statistically valid subset of released fish may also be PIT tagged or identified with other appropriate technology providing a similar level of individual fish identification. Monitoring will focus on determining key environmental correlates affecting survival, growth, movement, and reproduction (e.g., key habitat [e.g., depth, velocity, channel form, cover, substrate], continuity, water temperature, food, predation).

Following the 7–8-year intensive monitoring and research period, the information and insights gained will focus expenditure of the remaining funds on those management activities potentially contributing the most to achieving the recovery goals for bonytail. As appropriate, the management activities may include changes to the LCR MSCP participant's proposed augmentation approach, rates, and targeted areas. The monitoring and research information will also guide maintenance, enhancement, and creation of bonytail habitat (e.g., backwaters).

5.7.4.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 360 acres of habitat and stocking of up to 620,000 subadult bonytail, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the bonytail, and contribute to its recovery. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of replacing affected habitat and stocking subadult fish and will contribute to attainment of the recovery goals established for the species (U.S. Fish and Wildlife Service 2002c).

The bonytail recovery goals in the amendment and supplement to the Bonytail Recovery Plan include the following requirements for downlisting the species relative to the Lower Basin Recovery Unit: a genetic refuge is maintained in a suitable location (e.g., Lake Mohave, Lake Havasu) and two genetically and demographically viable, self-sustaining populations are maintained (U.S. Fish and Wildlife Service 2002c).

Although it is not the Applicants' obligation to achieve the recovery goals, the activities proposed by the Applicants conform with and contribute to the recovery goals, including:

- reestablish populations through augmentation and reintroductions,
- maintain historical genetic variability as reflected in existing populations of bonytail and maintain a genetic refuge in a suitable location in the Lower Basin, and
- investigate habitat requirements and management options for all life stages.

Maintaining bonytail populations in the LCR MSCP planning area currently depends on augmenting adult assemblages with hatchery-produced subadults. Augmentation proposed under the LCR MSCP will contribute to maintaining or increasing adult abundance. Augmentation may also contribute to maintaining a genetic refuge in a suitable location (e.g., Lake Mohave, Lake Havasu), one of the recovery criteria for downlisting and delisting of the species. The criteria for downlisting and delisting also requires maintenance of genetically and demographically viable, self-sustaining populations of bonytail in the Lower Basin Recovery Unit (U.S. Fish and Wildlife Service 2002c).

Although management tasks needed to establish a self-sustaining population have not been specifically identified, augmentation will help maintain adult assemblages. The maintenance of adult assemblages provides the opportunity for successful cohort

production, assuming that currently unknown changes in environmental circumstances were to support successful spawning and survival through the larval and juvenile life stages. Augmentation also contributes to an adult abundance that will support research and monitoring that may be necessary to identify and develop specific management activities to minimize or remove existing constraints to establishing self-sustaining populations of bonytail.

5.7.5 Humpback Chub

5.7.5.1 Summary of Effects

Transitory humpback chub habitat that forms within the high pool elevation of Lake Mead when Lake Mead reservoir elevations are low could be lost when reservoir elevations rise, thus inundating the transitory habitat. Up to an estimated 62 miles of transitory river channel of the Colorado River that could form within the full-pool elevation of Lake Mead when reservoir elevations are lowered to 950 feet msl could be affected when reservoir levels subsequently rise.

5.7.5.2 Conservation Measures

HUCH1—Provide funding to support existing humpback chub conservation programs. The LCR MSCP will provide $10,000 per year for 50 years ($500,000 total) to the Glen Canyon Dam Adaptive Management Program or other entity approved by the USFWS to support implementation of planned, but unfunded, species conservation measures and, as appropriate, to fund species conservation measures in the lower Grand Canyon of the Colorado River upstream of Lake Mead NRA. The purpose and use of this funding would be reevaluated if the species was recovered and delisted during the term of the LCR MSCP.

5.7.5.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to fund planned, but unfunded, conservation measures to be undertaken by the Glen Canyon Dam Adaptive Management Workgroup achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the humpback chub, and contribute to its recovery. Implementation of these measures will help ensure that the existing abundance of the species in the Lower Basin of the Colorado River is maintained or increased.

5.7.6 Razorback Sucker

5.7.6.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 399 acres of razorback sucker habitat, stranding and desiccation losses in the river and connected backwaters, and entrainment of individuals at diversions.

5.7.6.2 Conservation Measures

RASU1—Coordinate razorback sucker conservation efforts with the USFWS and recovery programs for endangered fish species in the Lower Basin. The LCR MSCP is not a recovery implementation program for the razorback sucker in the Lower Basin. However, because the planning area overlies razorback habitats that may be significant components of recovery, and the conservation measures included in the plan can provide resources to a separately organized recovery program, the LCR MSCP will be a contributor to recovery efforts. In that role, the LCR MSCP will interact with USFWS or any formal recovery program developed in the future for the Lower Basin to ensure that conservation measures included in the conservation plan will be implemented in support of recovery efforts to meet recovery goals for the razorback sucker in the Lower Basin. This will allow coordination of stocking, research, monitoring, and the funding of other types of conservation efforts inside and outside the LCR MSCP planning area. The LCR MSCP may also use funding programmed for razorback sucker augmentation (RASU3) and other razorback sucker conservation measures to implement other recovery activities identified by the USFWS or a future formal recovery program if it is determined through the adaptive management process (Section 5.12) and with concurrence of the USFWS that providing such funding would more effectively contribute to recovery of the razorback sucker.

The LCR MSCP conservation measures are designed to be flexible and adaptable to allow for changing needs and priorities in razorback sucker recovery efforts over the term of the permit. The LCR MSCP recognized that this flexibility would be extremely valuable as interim benchmarks to meeting the 2002 recovery goals and changes to recovery needs identified from research and monitoring were developed over time. In order to define the amount of conservation the LCR MSCP would contribute for the razorback sucker, some assumptions on how funds would be spent were made for the purposes of costing out the program. The adaptive management program, relying on research, monitoring, and other information will guide the implementation of the conservation measures to mitigate incidental take and contribute to recovery.

RASU2—Create 360 acres of razorback sucker habitat. Create 360 acres of backwater with water depth, vegetation, and substrate characteristics that provide the elements of razorback sucker habitat. This created backwater will also provide habitat for the bonytail. Created backwaters will be designed and managed as described in Section 5.4.3.4. At a minimum, created backwaters will contain the physical, chemical, and biological conditions suitable for the establishment and maintenance of healthy fish populations in the LCR.

RASU3—Razorback sucker augmentation program. The LCR MSCP will provide a level of funding to support implementation of a stocking/augmentation program for the razorback sucker, providing for the stocking of up to 660,000 subadult razorback suckers (at least 300 mm in length) into the designated critical habitat for the species in Reach 3, and in Reaches 4 and 5 of the LCR. The figure of 660,000 fish is not a target number for the LCR but represents an assumption (see RASU1) used to define the extent of funding that would be available, with the understanding that the adaptive management process (see Section 5.12.2.2) would guide the actual stocking program.

The elements of the augmentation program divide the conservation effort into the three reaches with numbers of fish per year per reach:

1. Implement an experimental augmentation, at a site(s) to be selected in cooperation with USFWS and state game and fish agencies, of 24,000 subadult razorback suckers each year for 5 years (120,000 total augmentation), and conduct intensive follow-up monitoring. When razorback sucker production capacity allows, razorback sucker production will be ramped up, with a target production of 120,000 300-mm subadult fish over a 5-year period (i.e., about 24,000 subadult fish per year). Of the 120,000 subadult fish, 6,000 300-mm fish will be stocked annually above Parker Dam and 6,000 300-mm fish below Parker Dam to facilitate maintenance of current juvenile and adult abundance. The augmentation program will also support maintenance and protection of the genetic diversity of existing populations in Lake Mohave (conservation measure RASU4).
2. Annually augment the existing population by stocking up to 6,000 subadult razorback sucker for 45 years in Lake Havasu (270,000 total augmentation).
3. Annually augment the existing population by stocking up to 6,000 subadult razorback sucker for 45 years below Parker Dam (270,000 total augmentation).

The number of fish that would be stocked in each reach would be based on the results of monitoring and research. Factors to be evaluated include the survival of stocked fish (including examination of rearing methods, stocking methods, and size of fish stocked), habitat usage, quality and availability, and other information. Stocking of razorback sucker in any reach would cease, even if the numbers described herein had not been stocked, if monitoring and research demonstrate: (1) no need for additional stockings to provide adults for genetic refuge or for evaluation of management activities related to creating a self-sustaining population (i.e., species recovery goals have been achieved); (2) results of monitoring and research indicate that management activities other than stocking would be more effective in contributing to recovery of the species; (3) there are factors in the reach that are not conducive to the survival of stocked fish to become adults or to be managed toward a self-sustaining population; or (4) that other biological or other factors warrant cessation of stocking. Funds not expended for growing and stocking subadult razorback sucker would continue to be available to fund other management measures that would minimize and mitigate incidental take and contribute to recovery. Other such management measures would be identified and implemented through the adaptive management process (Section 5.12.1), which requires that any proposed changes in the conservation measures be approved by the USFWS prior to adoption and implementation. As described in conservation measure RASU1, the number of razorback sucker stocked could also be reduced if funding provided for stocking razorback sucker is reallocated to support implementation of other conservation measures.

RASU4—Develop additional razorback sucker rearing capacity. The LCR MSCP, in cooperation with AGFD, CDFG, NDOW, USFWS, and other LCR MSCP participants, will develop additional razorback sucker rearing capacity or will acquire the necessary numbers of fish from other sources. Methods to increase rearing capacity to accommodate fish augmentations will include testing the efficacy of raising fish or creating recruiting populations in disconnected backwaters that are predator free. In the context of the integrated landscape mosaic that will provide a variety of habitats and management opportunities (e.g., use of created disconnected backwaters), grow-out facilities will be developed for razorback sucker in the LCR MSCP planning area.

Until rearing capacity can be increased sufficiently to produce the numbers of fish required for the augmentation strategy described in conservation measure RASU3, the LCR MSCP will monitor species' response to previous augmentations and will stock the numbers of fish that can be produced up to the amounts described in RASU3. Annual augmentation targets for the first years of the program, therefore, may need to be shifted until later in the program, when increased rearing capacity is at full capacity.

RASU5—Support ongoing razorback conservation efforts at Lake Mohave. Provide support to maintain the current Lake Mohave Program (Native Fish Work Group) goal of maintaining a population of 50,000 adult razorback sucker in Lake Mohave as a genetic refuge.

RASU6—Conduct monitoring and research, and adaptively manage razorback sucker augmentations and created habitat. Monitoring and research will be conducted to gather information necessary to adaptively manage razorback sucker conservation, including continued monitoring of fish response to previous augmentations, aggressive monitoring of fish response following LCR MSCP augmentations to gather information regarding habitat use, and fish movement, to increase the success of subsequent management of the species.

The LCR MSCP will implement an adaptive management process to reevaluate the augmentation strategy for razorback sucker based on the results of monitoring and research. Monitoring and focused research will be a component of the adaptive management process. In particular, the stocking of 24,000 subadult fish for 5 consecutive years (conservation measure RASU3, submeasure 1) will be conducted as an adaptive management experiment, elements of which will include focusing augmentations in locations that currently support large numbers of fish, followed by intensive monitoring and research for an estimated 7–8 years. Release of fish into the LCR will target a mix of riverine and lacustrine habitat types in Reaches 3–5. Razorback sucker released into Reaches 2–5 will be marked with wire-coded tags and a statistically valid subset of released fish may also be PIT tagged or identified with other appropriate technology, providing a similar level of individual fish identification. Monitoring and research will focus on determining key environmental correlates affecting survival, growth, movement, and reproduction (e.g., key habitat [e.g., depth, velocity, channel form, cover, substrate], continuity, water temperature, food, predation).

Following the 7–8-year intensive monitoring and research period, the information and insights gained will focus expenditure of the remaining LCR MSCP funds allocated for razorback sucker augmentations on those management activities potentially contributing the most to achieving the recovery goals for razorback sucker. As appropriate, the

management activities may include changes to the Applicants' proposed augmentation approach, rates, and augmentation sites. The monitoring and research information will also guide maintenance, enhancement, and creation of razorback sucker habitat (e.g., backwaters).

RASU7—Provide funding and support for continuation of the Reclamation/SNWA ongoing Lake Mead razorback sucker studies. The LCR MSCP will continue to fund and support the ongoing studies of razorback suckers in Lake Mead that were implemented under the ISC/SIA BO. The studies are anticipated to be completed within 5–10 years. The focus of the studies will be to resolve any remaining questions about the location of populations of razorback suckers in Lake Mead from the lower Grand Canyon (Separation Canyon) area downstream to Hoover Dam, documenting use and availability of spawning areas at various water elevations, clarifying substrate requirements, monitoring potential nursery areas, continuing ageing studies, and confirming recruitment events that may be tied to physical conditions in the lake. The LCR MSCP and USFWS will agree to the term and further define the scope of the studies. These studies may be followed by further research and monitoring within the adaptive management program of the LCR MSCP.

RASU8—Continue razorback conservation measures identified in the ISC/SIA BO. Reclamation will continue to implement, as part of the LCR MSCP, the following conservation measures identified in the ISC/SIA BO:

1. Reclamation will continue existing operations on Lake Mohave that benefit native fish during the term of the LCR MSCP and will explore additional ways to provide benefits to native fish.
2. Reclamation will, to the maximum extent practicable, provide rising spring (February–April) water surface elevations of 5–10 feet on Lake Mead, to the extent hydrologic conditions allow. This operation plan will be pursued through Beach Habitat Building Flows (BHBF) and/or equalization and achieved through the Adaptive Management and Annual Operating Plan processes, as determined for spawning razorback suckers.
3. Reclamation will monitor water levels of Lake Mead from February to April of each year during the term of the LCR MSCP. The LCR MSCP will evaluate the impacts to razorback spawning at water levels below an elevation of 1,160 feet msl. The ISC/SIA BO includes a conservation measure to collect and rear larval razorbacks in Lake Mead if the lake elevation falls below this level, based on an assumption that razorback spawning would be reduced or eliminated at water elevations below that level. It should be noted, however, that the spawning population of razorback sucker found in Echo Bay moved to a lower elevation in 2002 and spawned because the spawning location they had previously used was dry. This change indicates that razorback sucker can successfully move their spawning location into progressively lower elevations as the lake recedes. Given this new information, the LCR MSCP and USFWS will evaluate the data developed in conservation measure RASU6 and determine whether larva collection is appropriate and, if so, at what water elevation it should be implemented.

5.7.6.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 360 acres of habitat and stocking of up to 660,000 subadult razorback suckers over the term of the LCR MSCP, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the razorback sucker, and contribute to its recovery. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of replacing affected habitat and stocking subadult fish and will contribute to attainment of the recovery goals established for the species (U.S. Fish and Wildlife Service 2002e).

Although it is not the Applicants' obligation to achieve the recovery goals, the activities proposed by the Applicants conform with and contribute to three of the recovery goals:

- reestablish populations through augmentation and reintroductions,
- maintain historical genetic variability as reflected in existing populations of razorback sucker in Lake Mohave, and
- investigate habitat requirements and management options for all life stages.

Maintaining razorback sucker populations in the LCR MSCP planning area is currently dependent on augmenting adult assemblages with hatchery-produced subadults. Augmentation proposed under the LCR MSCP Conservation Plan will contribute to maintaining or increasing adult abundance, assisting in achievement of abundance goals identified by the Native Fish Work Group for Lake Mohave, Lake Havasu, and the river between Parker and Imperial Dams. Augmentation may also contribute to maintaining a genetic refuge in Lake Mohave, one of the recovery criteria for downlisting and delisting of the species. The criteria for downlisting and delisting also requires maintenance of genetically and demographically viable, self-sustaining populations of razorback sucker in the Lower Basin Recovery Unit (U.S. Fish and Wildlife Service 2002e).

Although management tasks needed to establish a self-sustaining population have not been specifically identified, augmentation will help maintain adult assemblages. The maintenance of adult assemblages provides the opportunity for successful cohort production, assuming that currently unknown changes in environmental circumstances were to support successful spawning and survival through the larval and juvenile life stages. Augmentation also contributes to an adult abundance that will support research and monitoring that may be necessary to identify and develop specific management activities to minimize or remove existing constraints to establishing self-sustaining populations of razorback sucker.

5.7.7 Western Red Bat

5.7.7.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in removal of 161 acres of roosting habitat, disturbance to roosting western red bats, and, potentially, a reduction in the diversity and abundance of insects that are food for the western red bat. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 604 acres of roosting habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.7.2 Conservation Measures

WRBA1—Conduct surveys to determine the distribution of the western red bat. Conduct investigations to identify the distribution of the western red bat in Reaches 3–5.

WRBA2— Create 765 acres of western red bat roosting habitat. Of the 7,260 acres of cottonwood-willow and honey mesquite to be created as covered species habitat, at least 765 acres will be designed and created to provide western red bat roosting habitat. Created roosting habitat will be designed and managed to support cottonwood-willow types I and II and honey mesquite type III. The LCR MSCP process for selecting sites to establish cottonwood-willow and honey mesquite as habitat for other covered species habitat will, based on the information collected under conservation measure WRBA1, give priority, when consistent with achieving LCR MSCP goals for other covered species, to selecting sites that are occupied by the western red bat in Reaches 3–5. As described in Section 5.4.3, created cottonwood-willow and honey mesquite land cover will be designed to establish stands that will support a substantially greater density and diversity of plant species that will provide roost trees and that are likely to support a greater abundance of insect prey species than is currently produced in the affected land cover types.

5.7.7.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures that will maintain or increase the production of flying insect food items and establish replacement roost trees achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western red bat. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of creating land cover types that will provide roost trees and facilitate the production of an abundance of insects used as food by the western red bat.

5.7.8 Western Yellow Bat

5.7.8.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in removal of 161 acres of roosting habitat, disturbance to roosting western yellow bats, and, potentially, a reduction in the diversity and abundance of insects that are food for the western yellow bat. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 604 acres of roosting habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.8.2 Conservation Measures

WYBA1—Conduct surveys to determine the distribution of the western yellow bat. Conduct investigations to identify the distribution of the western yellow bat in Reaches 3–5.

WYBA2—Avoid removal of western yellow bat roost trees. To the extent practicable, avoid removal of palm trees that could serve as roosts for the western yellow bat when creating covered species habitats.

WYBA3—Create 765 acres of western yellow bat roosting habitat. Of the 7,260 acres of cottonwood-willow and honey mesquite to be created as covered species habitat, at least 765 acres will be designed and created to provide western yellow bat roosting habitat. Created roosting habitat will be designed and managed to support cottonwood-willow types I and II and honey mesquite type III. The LCR MSCP process for selecting sites to establish cottonwood-willow and honey mesquite as habitat for other covered species habitat will, based on the information collected under conservation measure WYBA1, give priority, when consistent with achieving LCR MSCP goals for other covered species, to selecting sites that are occupied by the western yellow bat in Reaches 3–5. As described in Section 5.4.3, created cottonwood-willow and honey mesquite land cover will be designed to establish stands that will support a substantially greater density and diversity of plant species that will provide roost trees and that are likely to support a greater abundance of insect prey species than is currently produced in the affected land cover types.

5.7.8.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures that will maintain or increase the production of flying insect food items and establish replacement roost trees achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western yellow bat. Implementation of

these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of creating land cover types that will provide roost trees and facilitate the production of an abundance of insects used as food by the western yellow bat.

5.7.9 Desert Pocket Mouse

5.7.9.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in take of individuals and the temporary disturbance to or removal of desert pocket mouse habitat if habitat creation projects are implemented in occupied habitat.

5.7.9.2 Conservation Measures

DPMO1—Conduct surveys to locate desert pocket mouse habitat. Conduct surveys to locate desert pocket mouse habitat that could be affected by LCR MSCP habitat creation–related activities to determine whether the habitat is occupied. If the habitat is occupied, design habitat creation–related activities to avoid the habitat. If the habitat cannot be avoided, to the extent practicable, restore the disturbed habitat area onsite following completion of the activities and protect and incorporate the habitat into the conservation area. If the habitat cannot be restored onsite, create amount of habitat at least equal to the extent of disturbed habitat elsewhere in the conservation area. Restoring disturbed habitat will ensure that covered activities do not adversely affect the existing or potential future enhanced distribution, abundance, or population viability of the desert pocket mouse in the LCR MSCP planning area.

5.7.9.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to avoid impacts on or restore disturbed desert pocket mouse habitat achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the desert pocket mouse. Implementation of this measure will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully mitigating impacts.

5.7.10 Colorado River Cotton Rat

5.7.10.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in take of individuals, temporary disturbance of Colorado River cotton rat habitat

associated with habitat creation activities, and the loss of up to 64 acres of habitat. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 3 acres of habitat. Some additional limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.10.2 Conservation Measures

CRCR1—Conduct research to better define Colorado River cotton rat habitat requirements. Conduct research, if needed, to better define the elements of Colorado River cotton rat habitat and provide information necessary to design and manage created habitat.

CRCR2—Create 125 acres of Colorado River cotton rat habitat. Of the 512 acres of marsh to be created to create Yuma clapper rail habitat (Section 5.7.1), at least 125 acres will be designed to also provide Colorado River cotton rat habitat in Reaches 3 and 4 near occupied habitat (Figure 5-2). Additional habitat may be provided by marsh vegetation that establishes along margins of the 360 acres created backwaters (Section 5.4.3.4).

5.7.10.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to create 125 acres of habitat achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Colorado River cotton rat. Implementation of this measure will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully mitigating impacts.

5.7.11 Yuma Hispid Cotton Rat

5.7.11.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 5 acres of habitat, take of individuals, and temporary disturbance of Yuma hispid cotton rat habitat associated with habitat creation activities. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of 71 acres of species habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.11.2 Conservation Measures

YHCR1—Conduct research to better define Yuma hispid cotton rat habitat requirements. Conduct research, if needed, to better define the elements of Yuma hispid cotton rat habitat and provide information necessary to design and manage created habitat.

YHCR2—Create 76 acres of Yuma hispid cotton rat habitat. Of the 5,940 acres of cottonwood-willow to be created as habitat for covered species, at least 76 acres will be designed to provide habitat for the Yuma hispid cotton rat in Reaches 6 and 7 near occupied habitat. Created Yuma hispid cotton rat habitat will be designed and managed to support a moist herbaceous understory, an element of the species' habitat.

5.7.11.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to create 76 acres of habitat achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Yuma hispid cotton rat. Implementation of this measure will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully mitigating impacts.

5.7.12 Western Least Bittern

5.7.12.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 173 acres of western least bittern habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 70 acres of habitat. Some additional limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.12.2 Conservation Measures

LEBI1—Create 512 acres of western least bittern habitat. Create and manage 512 acres of marsh to provide western least bittern habitat (Figure 5-2). This created habitat will also be habitat for the Yuma clapper rail (conservation measure CLRA1). Habitat will be created in patches as large as possible. Smaller patches are likely within the range of habitat patch sizes used by the species for foraging and dispersal, and larger patches may be used for breeding. Western least bittern habitat will be created and

maintained as described in Section 5.4.3.3. Marshes created to provide western least bittern habitat will be designed and managed to provide an integrated mosaic of wetland vegetation types, water depths, and open water areas. Priority will be given, when consistent with achieving LCR MSCP goals for other covered species, to establishing habitat near occupied habitat. The largest numbers of western least bitterns in the LCR MSCP planning area are located at Topock Marsh and marshes near Imperial Dam, but they are present in suitable marshes throughout the LCR MSCP planning area. Within this mosaic of marsh conditions, western least bittern habitat will generally be provided by patches of bulrush and cattails interspersed with small patches of open water that maintain water depths no greater than 12 inches.

5.7.12.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 512 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the western least bittern, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. In addition, implementation of the conservation measures will benefit the western least bittern by increasing the amount of new habitat in the LCR MSCP planning area by 269 acres, in addition to replacing the extent of affected habitat.

5.7.13 California Black Rail

5.7.13.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 72 acres of California black rail habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the additional loss of 31 acres of habitat. Some additional limited and low value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.13.2 Conservation Measures

BLRA1—Create 130 acres of California black rail habitat. Of the 512 acres of LCR MSCP–created marsh, 130 acres will be created and managed to provide California black rail habitat near occupied habitat in Reaches 5 and 6 (Figure 5-2). This habitat will be provided by designing and managing at least 130 acres of the 512 acres of created Yuma clapper rail habitat to provide habitat for both species. Habitat will be created in patches

as large as possible but will not be created in patches smaller than 5 acres. Additional California black rail habitat may be provided by marsh vegetation that becomes established along margins of the 360 acres of backwaters that will be created in Reaches 5 and 6. These small patches of habitat provide cover for dispersing rails, thereby facilitating linkages between existing breeding populations and the colonization of created habitats.

Design of created habitat will be directed toward establishing moist-soil marshes that support a predominance of three-square bulrush with suitable water depths to replicate conditions present at Mittry Lake and Bill Williams Delta that support the species. Habitat will be designed and managed to provide an integrated mosaic of patches of cattail, bulrush, and mudflat, interspersed with small patches of open water with varying water depths.

BLRA2—Maintain existing important California black rail habitat areas. The Applicants, under agreements with cooperating land management agencies, will provide funding to those agencies to maintain a portion of existing California black rail habitat in the LCR MSCP planning area (Section 5.4.2). Maintaining important existing habitat areas is necessary to ensure the continued existence of California black rails in the LCR MSCP planning area, provide for the production of individuals that could disperse to and nest in LCR MSCP–created habitats, and support future recovery of the species. Habitat maintenance would likely be undertaken in conjunction with the maintenance of existing Yuma clapper rail habitat.

5.7.13.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including maintenance of existing important habitat areas and creation of 130 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the California black rail, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. In addition, implementation of the conservation measures will benefit the California black rail by increasing the amount of new habitat in the LCR MSCP planning area by 27 acres, in addition to replacing the extent of affected habitat.

5.7.14 Yellow-Billed Cuckoo

5.7.14.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 1,435 acres of yellow-billed cuckoo habitat and harassment of individuals. Implementation of Federal non-flow-related covered activities addressed in

the LCR MSCP BA could result in the loss of an additional 99 acres of species habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.14.2 Conservation Measures

YBCU1—Create 4,050 acres of yellow-billed cuckoo habitat. Of the 5,940 acres of created cottonwood-willow, at least 4,050 acres will be designed and created to provide habitat for this species. Created habitat will be designed and managed to support cottonwood-willow types I–III that provide breeding habitat for this species. The created cottonwood-willow would also function as migration habitat for birds that migrate along the LCR. A total of 2,700 acres of created habitat will be designed and managed to provide both yellow-billed cuckoo and southwestern willow flycatcher habitat, and 1,350 acres will be designed and managed to specifically provide habitat for the yellow-billed cuckoo.

The created habitat will be established in patches as large as possible but will not be created in patches smaller than 25 acres to achieve, based on the best available information, the minimum habitat patch size requirements of the species. Of the 1,350 acres of habitat to be created specifically for the southwestern willow flycatcher (Section 5.7.2), patches that support cottonwood-willow types I–III of at least 25 acres will also support habitat for the yellow-billed cuckoo.

In addition to the spatial replacement of affected habitats, the quality of created habitats will be substantially greater than affected habitats that are currently dominated by saltcedar. Cottonwood-willow land cover created to provide yellow-billed cuckoo habitat will be designed and managed to provide high habitat values for this species. Created habitat will be dominated by native riparian trees (i.e., cottonwood and willow trees), support a tree structure corresponding to structural types I–III (i.e., the greatest proportion of trees are at least in the 10–20-foot height class), support a diversity of plant species, and be created to the greatest extent practicable in patch sizes optimal for supporting the species. Created habitat, thus, will approximate the condition of the native habitat of the species that was historically present along the LCR.

To ensure that high-quality and fully functioning yellow-billed cuckoo habitat is created, the following design and management criteria, subject to adjustment through the LCR MSCP adaptive management process (Section 5.12.1), will be applied to created cottonwood-willow land cover dedicated as replacement yellow-billed cuckoo habitat.

- Habitat will be created in patches of at least 25 acres, which, at a minimum, is expected to provide suitable nesting habitat for 1–2 pairs. Creation of larger patches are expected to provide sufficient habitat to support multiple nesting pairs.
- Based on studies conducted by Gaines (1974), priority will be given to creating habitat in patches of at least 330 feet in width. Created-habitat patches will be located close to each other or to existing tracts of riparian forest and situated in a manner that will maximize continuity with other riparian land cover types.

- Created habitat will be managed to maintain cottonwood and willow stands with trees in structural types I–III.
- The vegetation and seral structure and edge characteristics described for created southwestern willow flycatcher habitat (Section 5.7.2) will be maintained in created cottonwood-willow land cover that is designed and managed to provide both yellow-billed cuckoo and southwestern willow flycatcher habitat.
- Mounds and depressions will be created in habitat created on conservation areas to establish some topographic diversity that will also provide habitat diversity by increasing plant and insect prey species diversity.

YBCU2—Maintain existing important yellow-billed cuckoo habitat areas. The Applicants, under agreements with cooperating land management agencies, will provide funding to those agencies to maintain a portion of existing yellow-billed cuckoo habitat within the LCR MSCP planning area (Section 5.4.2). Maintaining important existing habitat areas is necessary to ensure the continued existence of the yellow-billed cuckoo in the LCR MSCP planning area, provide for the production of individuals that could disperse to and nest in LCR MSCP–created habitats, and reduce the likelihood of future Federal listing of the species.

5.7.14.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including maintenance of existing important habitat areas and creation of 4,050 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the yellow-billed cuckoo, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. In addition, implementation of the conservation measures will benefit the yellow-billed cuckoo by increasing the amount of new habitat in the LCR MSCP planning area by 2,516 acres, in addition to replacing the extent of affected habitat.

5.7.15 Elf Owl

5.7.15.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 161 acres of elf owl habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 590 acres of habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.15.2 Conservation Measures

ELOW1—Create 1,784 acres of elf owl habitat. Of the 7,260 acres of created cottonwood-willow and honey mesquite land cover, at least 1,784 acres will be designed and created to provide elf owl habitat. Patches of created habitat will be designed and managed to support cottonwood-willow types I and II and honey mesquite type III that provide habitat for this species. The created habitat will be established in patches as large as possible. At a minimum, however, isolated patches of honey mesquite type III will be created in patches of at least 50 acres, and, of the 5,940 acres of LCR MSCP–created cottonwood-willow, 1,702 acres will be created in patches of at least 50 acres, 2,348 acres will be created in patches of at least 25 acres, and 1,890 acres will be created in patches of at least 10 acres. In addition to the spatial replacement of affected habitat, the quality of created habitat will be substantially greater than affected habitats. Patches of existing cottonwood-willow in the LCR MSCP planning area typically include dense stands of saltcedar that support little vegetative diversity relative to the cottonwood-willow land cover that will be created as habitat. Created habitat will be dominated by native riparian trees (i.e., cottonwood and willow trees), support a tree structure corresponding to structural types I and II, support a diversity of plant species, and be created to the greatest extent practicable in patch sizes optimal for supporting the species. The created elf owl habitat will also provide habitat for gilded flickers and Gila woodpeckers that create tree cavities that are used by elf owls for nesting. The design and management criteria described in the conservation measures for the yellow-billed cuckoo (Section 5.7.14) will ensure that created cottonwood-willow stands in structural types I and II will also provide other habitat requirements for this species (e.g., habitat patch size, food requirements). Created habitat, thus, will approximate the condition of the native habitat of the species that was historically present along the LCR. In addition, larger patches of created southwestern willow flycatcher habitat (i.e., greater than 10 acres) that supports cottonwood-willow types I and II could also provide habitat for this species.

ELOW2—Install elf owl nest boxes. Until vegetation has matured sufficiently to attract woodpeckers that are needed to create nesting cavities for the elf owl, structural characteristics of nesting habitat (i.e., snags) will be artificially established. Installation of 2–5 nest boxes on poles or sufficiently tall trees per 250 acres of created habitat will be conducted to replicate the average breeding density of established populations in southwestern United States (Henry and Gehlbach 1999).

5.7.15.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 1,784 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the elf owl, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. In addition, implementation of the conservation measures will

benefit the elf owl by increasing the amount of new habitat in the LCR MSCP planning area by 1,033 acres, in addition to replacing the extent of affected habitat.

5.7.16 Gilded Flicker

5.7.16.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 1,435 acres of gilded flicker habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 99 acres of habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.16.2 Conservation Measures

GIFL1—Create 4,050 acres of gilded flicker habitat. Of the 5,940 acres of created cottonwood-willow, at least 4,050 acres will be designed and created to provide habitat for this species. The 4,050 acres of habitat created for the yellow-billed cuckoo will also provide habitat for the gilded flicker. The created habitat will be established in patches as large as possible but will not be created in patches smaller than 25 acres. In addition to the spatial replacement of affected habitat, the quality of created habitat will be substantially greater than affected habitats. Patches of existing cottonwood-willow in the LCR MSCP planning area typically include dense stands of saltcedar that support little vegetative diversity relative to the cottonwood-willow land cover that will be created as habitat. Created habitat will be dominated by native riparian trees (i.e., cottonwood and willow trees), support a tree structure corresponding to structural types I–III, support a diversity of plant species, and be created to the greatest extent practicable in patch sizes optimal for supporting the species. The design and management criteria described in the conservation measures for the yellow-billed cuckoo (Section 5.7.14) will ensure that created cottonwood-willow stands in structural types I–III will also provide other habitat requirements for this species (e.g., habitat patch size, food requirements). Created habitat, thus, will approximate the condition of the native habitat of the species that was historically present along the LCR. In addition, created southwestern willow flycatcher habitat that supports cottonwood-willow types I–III could also provide habitat for this species.

GIFL2—Install artificial snags to provide gilded flicker nest sites. Until vegetation in created patches of gilded flicker habitat has matured sufficiently to support structural characteristics of nesting habitat (i.e., snags), install artificial snags that can be used by gilded flickers to excavate nesting cavities.

5.7.16.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 4,050 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the gilded flicker, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. In addition, implementation of the conservation measures will benefit the gilded flicker by increasing the amount of new habitat in the LCR MSCP planning area by 2,516 acres, in addition to replacing the extent of affected habitat.

5.7.17 Gila Woodpecker

5.7.17.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 829 acres of Gila woodpecker habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 26 acres of habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.17.2 Conservation Measures

GIWO1—Create 1,702 acres of Gila woodpecker habitat. Of the 5,940 acres of created cottonwood-willow, at least 1,702 acres will be designed and created to provide habitat for this species in Reaches 3–6. Patches of created habitat will be designed and managed to support cottonwood-willow types I–IV in patches as large as possible but will not be created in patches smaller than 50 acres to achieve, based on the best available information, the minimum habitat patch size requirements of the species. In addition to the spatial replacement of affected habitat, the quality of created habitat will be substantially greater than affected habitats. Patches of existing cottonwood-willow in the LCR MSCP planning area typically include dense stands of saltcedar that support little vegetative diversity relative to the cottonwood-willow land cover that will be created as habitat. Created habitat will be dominated by native riparian trees (i.e., cottonwood and willow trees), support a tree structure corresponding to structural types I–IV, support a diversity of plant species, and be created to the greatest extent practicable in patch sizes optimal for supporting the species. The design and management criteria described in the conservation measures for the southwestern willow flycatcher (Section 5.7.2) and yellow-billed cuckoo (Section 5.7.14) will ensure that created cottonwood-willow stands in

structural types I–IV will also provide other habitat requirements for this species (e.g., habitat patch size, food requirements). Created habitat, thus, will approximate the condition of native habitat of the species that was historically present along the LCR.

GIWO2—Install artificial snags to provide Gila woodpecker nest sites. Until vegetation in created patches of Gila woodpecker habitat has matured sufficiently to support structural characteristics of nesting habitat (i.e., snags), install artificial snags that can be used by Gila woodpeckers to excavate nesting cavities.

5.7.17.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 1,702 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Gila woodpecker, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. In addition, implementation of the conservation measures will benefit the Gila woodpecker by increasing the amount of new habitat in the LCR MSCP planning area by 847 acres, in addition to replacing the extent of affected habitat.

5.7.18 Vermilion Flycatcher

5.7.18.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 1,900 acres of vermilion flycatcher habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 714 acres of habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.18.2 Conservation Measures

VEFL1—Create 5,208 acres of vermilion flycatcher habitat. Of the 7,260 acres of created cottonwood-willow and honey mesquite, at least 5,208 acres will be designed and created to provide habitat for this species. Patches of created habitat will be designed and managed to support cottonwood-willow types I–IV and honey mesquite type III that provide habitat for this species. The created habitat will be established in patches as large as possible. At a minimum, however, isolated patches of honey mesquite will be created

in patches of at least 50 acres, and, of the 5,940 acres of LCR MSCP–created cottonwood-willow, 1,702 acres will be created in patches of at least 50 acres, 2,348 acres will be created in patches of at least 25 acres, and 1,890 acres will be created in patches of at least 10 acres. In addition to the spatial replacement of affected habitat, the quality of created habitat will be substantially greater than affected habitats. Patches of existing cottonwood-willow in the LCR MSCP planning area typically include dense stands of saltcedar that support little vegetative diversity relative to the cottonwood-willow land cover that will be created as habitat. Created habitat will be dominated by native riparian trees (i.e., cottonwood and willow trees), support a tree structure corresponding to structural types I–IV, support a diversity of plant species, and be created to the greatest extent practicable in patch sizes optimal for supporting the species. Created habitat, thus, will approximate the condition of the native habitat of the species that was historically present along the LCR. The design and management criteria described in the conservation measures for the southwestern willow flycatcher (Section 5.7.2) and yellow-billed cuckoo (Section 5.7.14) will ensure that created cottonwood-willow stands in structural types I–IV will also provide other habitat requirements for this species (e.g., habitat patch size, food requirements).

5.7.18.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 5,208 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the vermilion flycatcher, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. In addition, implementation of the conservation measures will benefit the vermilion flycatcher by increasing the amount of new habitat in the LCR MSCP planning area by 2,594 acres, in addition to replacing the extent of affected habitat.

5.7.19 Arizona Bell's Vireo

5.7.19.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 1,674 acres of Arizona Bell's vireo habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 1,309 acres of habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.19.2 Conservation Measures

BEVI1—Create 2,983 acres of Arizona Bell's vireo habitat. Of the 7,260 acres of created cottonwood-willow and honey mesquite, at least 2,983 acres will be designed and created to provide habitat for this species. Patches of created habitat will be designed and managed to support cottonwood-willow types III and IV and honey mesquite type III that provide habitat for this species. The created habitat will be established in patches as large as possible. In addition to the spatial replacement of affected habitat, the quality of created habitat will be substantially greater than affected habitats. Patches of existing cottonwood-willow in the LCR MSCP planning area typically include dense stands of saltcedar that support little vegetative diversity relative to the cottonwood-willow land cover that will be created as habitat. Created habitat will be dominated by native riparian trees (i.e., cottonwood and willow trees), support a tree structure corresponding to structural types III–IV, support a diversity of plant species, and will be created to the greatest extent practicable in patch sizes optimal for supporting the species. The design and management criteria described in the conservation measures for the southwestern willow flycatcher (Section 5.7.2) and yellow-billed cuckoo (Section 5.7.14) will ensure that created cottonwood-willow stands in structural types III and IV will also provide other habitat requirements for this species (e.g., habitat patch size, food requirements). In particular, the management of moist surface soil, slow-moving water, or ponded water conditions and greater diversity of seral stages of cottonwood-willow described in the conservation measures for the southwestern willow flycatcher habitat will also provide these habitat requirements for this species. Created habitat, thus, will approximate the condition of the native habitat of the species that was historically present along the LCR.

5.7.19.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 2,983 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Arizona Bell's vireo. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat.

5.7.20 Sonoran Yellow Warbler

5.7.20.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 2,939 acres of Sonoran yellow warbler habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 183 acres of habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however,

the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.20.2 Conservation Measures

YWAR1—Create 4,050 acres of Sonoran yellow warbler habitat. Of the 5,940 acres of created cottonwood-willow, at least 4,050 acres will be designed and created to provide habitat for this species. Patches of created habitat will be designed and managed to support cottonwood-willow types I–IV. The created habitat will be established in patches as large as possible. At a minimum, however, all of the habitat will be created in patches of at least 10 acres, thus, based on the best available information, will meet the minimum habitat patch size requirements of the species. Created riparian forests will support breeding and migration habitats for yellow warblers that migrate along the LCR. In addition, the per-acre quality of created habitat for this species will be substantially greater than that of the affected habitat. Along the LCR, this species formerly nested in cottonwood-willow habitat ranging from gallery forests to early successional stage scrublands.

In addition to the spatial replacement of affected habitat, the quality of created habitat will be substantially greater than affected habitats. Patches of existing cottonwood-willow in the LCR MSCP planning area typically include dense stands of saltcedar that support little vegetative diversity relative to the cottonwood-willow land cover that will be created as habitat. Created habitat will be dominated by native riparian trees (i.e., cottonwood and willow trees), support a tree structure corresponding to structural types I–IV, support a diversity of plant species, and be created to the greatest extent practicable in patch sizes optimal for supporting the species. Created habitat, thus, will approximate the condition of the native habitat of the species that was historically present along the LCR. The design and management criteria described in the conservation measures for the southwestern willow flycatcher (Section 5.7.2) and yellow-billed cuckoo (Section 5.7.14) will ensure that created cottonwood-willow stands in structural types I–IV will also provide other habitat requirements for this species (e.g., habitat patch size, food requirements).

5.7.20.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 4,050 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the Sonoran yellow warbler, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat. In addition, implementation of the conservation measures will benefit the Sonoran yellow warbler by increasing the amount of new habitat in the LCR MSCP planning area by 928 acres, in addition to replacing the extent of affected habitat.

5.7.21 Summer Tanager

5.7.21.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 161 acres of summer tanager habitat and take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of an additional 14 acres of habitat. Some additional limited and low value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be affected by habitat creation and maintenance activities; however, the level of take is assumed to be low because of the limited value of the potentially affected habitat.

5.7.21.2 Conservation Measures

SUTA1—Create 602 acres of summer tanager habitat. Of the 5,940 acres of created cottonwood-willow, at least 602 acres will be designed and created to provide habitat for the species. Patches of created habitat will be designed and managed to support cottonwood-willow types I and II. The created habitat will be established in patches as large as possible. At a minimum, however, 4,050 acres of cottonwood-willow will be created in patches of at least 25 acres, and 1,890 acres will be created in patches of at least 10 acres.

In addition to the spatial replacement of affected habitat, the quality of created habitat will be substantially greater than affected habitats. Patches of existing cottonwood-willow in the LCR MSCP planning area typically include dense stands of saltcedar that support little vegetative diversity relative to the cottonwood-willow land cover that will be created as habitat. Created habitat will be dominated by native riparian trees (i.e., cottonwood and willow trees), support a tree structure corresponding to structural types I and II (i.e., over 50 percent of the trees are taller than 15 feet), support a diversity of plant species, and will be created to the greatest extent practicable in patch sizes optimal for supporting the species. Created habitat, thus, will approximate the condition of the native habitat of the species that was historically present along the LCR. The design and management criteria described in the conservation measures for the yellow-billed cuckoo (Section 5.7.14) will ensure that created cottonwood-willow stands in structural types I and II will also provide other habitat requirements for this species (e.g., habitat patch size, food requirements). In addition, created southwestern willow flycatcher habitat that supports cottonwood-willow types I and II could also provide habitat for this species.

5.7.21.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 602 acres of habitat, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the summer tanager, and reduce the likelihood of future Federal listing of the species.

Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully replacing affected habitat and maintaining existing habitat that otherwise could decline in function or be lost without management intervention. In addition, implementation of the conservation measures will benefit the summer tanager by increasing the amount of new habitat in the LCR MSCP planning area by 427 acres, in addition to replacing the extent of affected habitat.

5.7.22 Flat-Tailed Horned Lizard

5.7.22.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures are not expected to affect flat-tailed horned lizard habitat or result in take of individuals. Implementation of Federal non-flow-related covered activities addressed in the LCR MSCP BA could result in the loss of 128 acres of species habitat and direct mortality of lizards.

5.7.22.2 Conservation Measures

FTHL1—Acquire and protect 230 acres of existing unprotected occupied flat-tailed horned lizard habitat. Consistent with the mitigation measures identified in the Flat-Tailed Horned Lizard Rangewide Management Strategy (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003), the LCR MSCP will acquire and protect 230 acres of unprotected occupied flat-tailed horned lizard habitat. The acquired habitat will be transferred to an appropriate management agency for permanent protection of habitat for the species.

FTHL2—Implement conservation measures to avoid or minimize take of flat-tailed horned lizard. Reclamation will continue to implement measures to avoid or minimize take of flat-tailed horned lizard. These measures would include worker education programs and other procedures as described in the 1997 BO (U.S. Fish and Wildlife Service 1997) and are in accordance with the 2003 Flat-tailed Horned Lizard Interagency Coordinating Committee recommendations for the species.

5.7.22.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to protect 230 acres unprotected occupied flat-tailed horned lizard habitat achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the flat-tailed horned lizard. Implementation of this measure will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained.

5.7.23 Relict Leopard Frog

5.7.23.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures to create and maintain wetland areas may result in take of the relict leopard frog, restriction of gene flow, and temporary disturbance of habitat.

5.7.23.2 Conservation Measures

RLFR1—Provide funding to support existing relict leopard frog conservation programs. LCR MSCP program activities will assist and contribute to existing relict leopard frog research and conservation programs where appropriate. In particular, the LCR MSCP will contribute $10,000 per year for 10 years to support implementation of planned, but unfunded, conservation measures for the relict leopard frog. To the extent consistent with the LCR MSCP Conservation Plan goals and objectives, implementation of this conservation measure will be coordinated with the Relict Leopard Frog Conservation Team.

5.7.23.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to fund planned, but unfunded, research and conservation measures to be undertaken through existing programs, as appropriate, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the relict leopard frog, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in and adjacent to the LCR MSCP planning area is maintained or increased.

5.7.24 Flannelmouth Sucker

5.7.24.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 85 acres of flannelmouth sucker habitat, stranding and desiccation losses in the river and backwaters, and entrainment of individuals at diversions.

5.7.24.2 Conservation Measures

FLSU1—Create 85 acres of flannelmouth sucker habitat. Of the 360 acres of LCR MSCP–created backwaters, at least 85 acres will be created in Reach 3 with water depth,

vegetation, and substrate characteristics that provide the elements of flannelmouth sucker habitat. Additional habitat could also be provided depending on the extent of connected backwaters that are created for the razorback sucker and bonytail in Reach 3. Created backwaters will be designed and managed as described in Section 5.4.3.4. At a minimum, created backwaters will contain the physical, chemical, and biological conditions suitable for the establishment and maintenance of healthy fish populations in the LCR.

FLSU2—Provide funding to support existing flannelmouth sucker conservation programs. The LCR MSCP will provide $80,000 per year for 5 years ($400,000 total) to support flannelmouth sucker research efforts in Reach 3 below Davis Dam to determine habitat use, habitat preferences, and recruitment and to support decisions on habitat management activities for river channel and backwater habitats in Reach 3.

FLSU3—Assess flannelmouth sucker management needs and develop management strategies. The LCR MSCP will use results of research conducted by the LCR MSCP (see conservation measure FLSU2) and others, through the adaptive management process, to assess main channel and backwater management needs and develop management strategies to benefit the flannelmouth sucker.

5.7.24.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures, including creation of 85 acres of habitat and funding research to determine the management needs of the flannelmouth sucker in the LCR, achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the flannelmouth sucker, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of replacing affected habitat and identifying future management activities that could be undertaken by the LCR MSCP or others that will benefit the species.

5.7.25 MacNeill's Sootywing Skipper

5.7.25.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures could result in the loss of up to 222 acres of MacNeill's sootywing skipper habitat and take of individuals.

5.7.25.2 Conservation Measures

MNSW1—Conduct surveys and research to locate MacNeill's sootywing skipper habitat and to better define its habitat requirements. Conduct research to locate

MacNeill's sootywing skipper populations that could be affected by covered activities and determine the macrohabitat and microhabitat requirements and ecology of the species. Based on research results, implement adaptive management experiments to develop habitat establishment and management methods.

MNSW2—Create at least 222 acres of MacNeill's sootywing skipper habitat. Based on results of research conducted under conservation measure MNSW1, at least 222 acres of MacNeill's sootywing skipper habitat will be created in Reaches 1–4 near occupied habitat. Patches of created habitat will be designed and managed to support a mix of honey mesquite type III and quail bush to provide food plants for caterpillars and adults and to maintain the microhabitat conditions required by the species. A substantial amount of the 1,320 acres of honey mesquite type III that would be created is expected to be created in reaches occupied by this species and will be established in conjunction with quail bush, the species' larval host plant. Consequently, it is anticipated substantially more than 222 acres of habitat could be created under the LCR MSCP.

5.7.25.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to create 222 acres of MacNeill's sootywing skipper habitat achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the MacNeill's sootywing skipper. Implementation of this measure will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained as a result of fully mitigating the loss of habitat.

5.7.26 Sticky Buckwheat

5.7.26.1 Summary of Effects

Changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities could result in some low, unquantifiable, level of take of sticky buckwheat plants that have established below the full-pool elevation, when reservoir elevations rise to elevations that inundate plants.

5.7.26.2 Conservation Measures

STBU1—Provide funding to support existing sticky buckwheat conservation programs. The LCR MSCP will provide $10,000 per year until 2030 to the Clark County Multi-Species Habitat Conservation Plan (MSHCP) Rare Plant Workgroup to support implementation of conservation measures for the sticky buckwheat and threecorner milkvetch that are beyond the permit requirements of the Clark County MSHCP.

5.7.26.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to fund planned, but unfunded, conservation measures to be undertaken by the Clark County MSHCP Rare Plant Workgroup achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the sticky buckwheat, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in and adjacent to the LCR MSCP planning area is maintained or increased.

5.7.27 Threecorner Milkvetch

5.7.27.1 Summary of Effects

Changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities could result in some low, unquantifiable, level of take of threecorner milkvetch plants that have established below the full-pool elevation, when reservoir elevations rise to elevations that inundate plants.

5.7.27.2 Conservation Measures

THMI1—Provide funding to support existing threecorner milkvetch conservation programs. The LCR MSCP will provide $10,000 per year until 2030 to the Clark County MSHCP Rare Plant Workgroup to support implementation of conservation measures for the threecorner milkvetch and sticky buckwheat that are beyond the permit requirements of the Clark County MSHCP.

5.7.27.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measure to fund planned, but unfunded, conservation measures to be undertaken by the Clark County MSHCP Rare Plant Workgroup achieves the LCR MSCP goal to avoid, minimize, and fully mitigate adverse effects of covered activities and LCR MSCP implementation on the threecorner milkvetch, and reduce the likelihood of future Federal listing of the species. Implementation of these measures will help ensure that the existing abundance of the species in and adjacent to the LCR MSCP planning area is maintained or increased.

5.8 Evaluation Species Conservation Measures

5.8.1 California Leaf-Nosed Bat

5.8.1.1 Summary of Effects

Implementation of flow-related covered activities could potentially reduce the diversity and abundance of insects that are food for the California leaf-nosed bat.

5.8.1.2 Conservation Measures

CLNB1—Conduct surveys to locate California leaf-nosed bat roost sites. Conduct investigations to identify locations of California leaf-nosed bat roost sites within 5 miles of the LCR MSCP planning area in Reaches 3–5.

CLNB2—Create covered species habitat near California leaf-nosed bat roost sites. The LCR MSCP process for selecting sites to establish cottonwood-willow and honey mesquite as habitat for other covered species will, based on the information collected under conservation measure CLNB1, give priority, when consistent with achieving LCR MSCP goals for other covered species, to selecting sites that are within 5 miles of California leaf-nosed bat roosts in Reaches 3–5. As described in Section 5.4.3, created cottonwood-willow and honey mesquite land cover will be designed to establish stands that will support a substantially greater density and diversity of plant species that are likely to support a greater abundance of insect prey species than is currently produced in the affected land cover types.

5.8.1.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures that will maintain or increase the production of insect food items will fully mitigate flow-related impacts, if any, on the diversity and production of insects. In addition, implementation of survey and research conservation measures will provide important information for use in developing future conservation efforts for this species.

5.8.2 Pale Townsend's Big-Eared Bat

5.8.2.1 Summary of Effects

Implementation of flow-related covered activities could potentially reduce the diversity and abundance of insects that are food for the pale Townsend's big-eared bat.

5.8.2.2 Conservation Measures

PTBB1—Conduct surveys to locate pale Townsend's big-eared bat roost sites. Conduct investigations to identify locations of pale Townsend's big-eared bat roost sites within 10 miles of the LCR MSCP planning area in Reaches 3–5.

PTBB2—Create covered species habitat near pale Townsend's big-eared bat roost sites. The LCR MSCP process for selecting sites to establish cottonwood-willow and honey mesquite as habitat for other covered species will, based on the information collected under conservation measure PTBB1, give priority, when consistent with achieving LCR MSCP goals for other covered species, to selecting sites that are within 10 miles of pale Townsend's big-eared bat roosts in Reaches 3–5. As described in Section 5.4.3, created cottonwood-willow and honey mesquite land cover will be designed to establish stands that will support a substantially greater density and diversity of plant species that are likely to support a greater abundance of insect prey species than is currently produced in the affected land cover types.

5.8.2.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures that will maintain or increase the production of insect food items will fully mitigate flow-related impacts, if any, on the diversity and production of insects. In addition, implementation of survey and research conservation measures will provide important information for use in developing future conservation efforts for this species.

5.8.3 Colorado River Toad

5.8.3.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures will not result in take of the Colorado River toad because it is not known to currently inhabit the LCR MSCP planning area.

5.8.3.2 Conservation Measures

CRTO1—Conduct research to better define the distribution, habitat requirements, and factors that are limiting the distribution of the Colorado River toad. Develop and implement a multiyear integrated research program to determine the range, status, habitat requirements, population biology, factors that currently limit Colorado River toad abundance and distribution, and factors that have contributed to the decline of the species in the LCR MSCP planning area.

CRTO2—Protect existing unprotected occupied Colorado River toad habitat. Based on results of research conducted under conservation measures CRTO1 and within funding constraints of the LCR MSCP, protect existing unprotected occupied Colorado River toad habitat that is located through the research program.

CRTO3—Conduct research to determine feasibility of establishing the Colorado River toad in unoccupied habitat. Conduct research necessary to determine the feasibility for successfully establishing the Colorado River toad in unoccupied habitat. If feasible, implement a pilot introduction into unoccupied habitat, and monitor the success of methods and establishment of the Colorado River toad in unoccupied habitat.

5.8.3.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures to conduct research to determine the species status and life requirements and techniques for reestablishing occurrences of the Colorado River toad will provide information necessary for successful management to maintain and increase the abundance of the Colorado River toad throughout its range.

5.8.4 Lowland Leopard Frog

5.8.4.1 Summary of Effects

Implementation of covered activities and LCR MSCP conservation measures will not result in take of the lowland leopard frog because it is not known to currently inhabit the LCR MSCP planning area.

5.8.4.2 Conservation Measures

LLFR1—Conduct research to better define the distribution, habitat requirements, and factors that are limiting the distribution of the lowland leopard frog. Develop and implement a multiyear integrated research program to determine the range, status, habitat requirements, population biology, factors that currently limit lowland leopard frog abundance and distribution, and factors that have contributed to the decline of the species in the LCR MSCP planning area.

LLFR2—Protect existing unprotected occupied lowland leopard frog habitat. Based on results of research conducted under conservation measures LLFRO1 and within funding constraints of the LCR MSCP, protect existing unprotected occupied lowland leopard frog habitat that is located through the research program.

LLFR3—Conduct research to determine feasibility of establishing the lowland leopard frog in unoccupied habitat. Conduct research necessary to determine the feasibility for successfully establishing the lowland leopard frog in unoccupied habitat. If

feasible, implement a pilot introduction into unoccupied habitat, and monitor the success of methods and establishment of the lowland leopard frog in unoccupied habitat.

5.8.4.3 Expected Outcomes with Implementation of Conservation Measures

Implementation of the LCR MSCP conservation measures to conduct research to determine the status and life requirements and techniques for reestablishing occurrences of the lowland leopard frog will provide information necessary for successful management to maintain and increase the abundance of lowland leopard frogs throughout its range.

5.9 Summary of Conservation Plan Elements that Minimize and Mitigate Effects to the Maximum Extent Practicable

The Conservation Plan is designed to fully mitigate adverse effects on all and contributes to the recovery of most covered species resulting from covered activities described in Chapter 2. In doing so, the LCR MSCP Conservation Plan meets the ESA section 10 standard to minimize and mitigate the impacts of the covered activities on covered species to the maximum extent practicable (50 C.F.R. §17.22(b)(2)(B)). This section describes how the Conservation Plan minimizes and mitigates, to the maximum extent practicable, impacts of the covered activities and the LCR MSCP implementation on the covered species. As described in Sections 5.3–5.7, the LCR MSCP Conservation Plan includes conservation measures to avoid and minimize effects of covered activities and habitat creation measures to fully replace affected covered species habitats.

Except for implementing the avoidance and minimization conservation measures, it is not considered practicable to further modify the proposed covered activities to reduce the level of potential impacts on covered species. As described in Chapter 9, the ability to modify operations to reduce the level of take is constrained by the Law of the River, and alternatives to changing points of diversions would likely be cost prohibitive and would potentially result in impacts on ESA-listed species in the modified action area. There also are no practical alternatives, other than implementing the LCR MSCP Conservation Plan minimization measures, to implementing covered activities that are necessary to maintain infrastructure (e.g., canals, drains, levees, channels, roads).

The LCR MSCP minimizes and fully mitigates effects on covered species using the following combined strategies:

- maintain a portion of important existing habitat for covered species in the LCR MSCP planning area that otherwise would degrade over time without management intervention;

- create habitat to establish new habitat in quantities equal to or greater than the extent of affected habitats, including management of created habitat to maintain and preserve ecological functions over the term of the LCR MSCP;
- avoid and minimize impacts on covered species and their habitat that could result from covered activities and LCR MSCP implementation;
- implement population enhancement measures that directly or indirectly increase abundance of covered species; and
- conduct monitoring and research necessary to assess and improve conservation measure effectiveness and adaptively manage implementation of the LCR MSCP Conservation Plan over time.

As described in Section 5.4.3, the LCR MSCP Conservation Plan provides for creation of:

- 5,940 acres of cotton-willow land cover designed and managed to replace and provide greater habitat value for associated covered species than the 2,132 acres of cottonwood-willow land cover affected by covered activities;
- 1,320 acres of honey mesquite land cover designed and managed to replace and provide greater habitat value for associated covered species than the up to 1,200 acres of honey mesquite land cover that could be affected by covered activities;
- 512 acres of marsh land cover designed and managed to replace and provide greater habitat value for associated covered species than the 243 acres of marsh land cover affected by covered activities; and
- 360 acres of backwaters designed to provide greater habitat value for associated covered species than the 399 acres of backwaters and river channel affected by covered activities.

In addition to replacing affected habitat, habitat created under the LCR MSCP Conservation Plan is expected to provide substantially greater habitat values for covered species than the affected habitats because:

- Saltcedar is currently the dominant vegetation in the LCR MSCP planning area, and native habitats are generally fragmented and in a degraded condition (e.g., remnant cottonwood-willow stands generally support few native trees and are dominated by saltcedar). To the extent practicable based on site conditions, cottonwood-willow, honey mesquite, marsh, and backwaters will be created in proximity to each other and in large blocks to recreate integrated mosaics of habitat that approximate the relationship among aquatic and terrestrial communities historically present along the LCR floodplain. In addition, created habitats will be designed and managed to be dominated by native vegetation.
- The LCR MSCP Conservation Plan includes a commitment to actively manage created habitats over the term of the LCR MSCP to ensure high habitat values are maintained (e.g., control of saltcedar, irrigation to maintain created habitats, implementing actions to reduce the risk of loss to wild fire or other destructive events), whereas most of the remaining native habitats in the LCR MSCP planning

area are not managed to maintain or increase habitat values and typically are not protected from loss to wild fires.

- As described in Section 5.5, to the extent practicable, created habitats will be located near existing occupied habitats to create larger blocks of habitat, thereby increasing the overall value of both the created and existing habitats, and increase the likelihood for rapid occupancy of created habitats by covered species.

In addition, the Conservation Plan includes a substantial commitment to conduct monitoring and research that provides the information necessary to adaptively manage Conservation Plan implementation and maximize benefits for covered species over the term of the LCR MSCP.

The following sections describe how conservation measures, to the maximum extent practicable, will minimize and mitigate effects of the covered activities and the LCR MSCP implementation on species groups.

5.9.1 Covered Mammal Species

The LCR MSCP Conservation Plan will create at least 1 acre of habitat for every acre of habitat affected by covered activities (Table 5-11). The ecology of the covered mammal species, factors that are limiting these species, and/or these species' microhabitat requirements are not well understood. The LCR MSCP Conservation Plan, in addition to fully mitigating the effects of habitat loss, however, includes conservation measures to undertake monitoring and research to address these uncertainties and provide information necessary for future beneficial management of these species.

5.9.2 Covered Bird Species

The LCR MSCP Conservation Plan will create at least 1 acre of Arizona Bell's vireo and the Sonoran yellow warbler habitat for every acre of habitat affected by covered activities and will create 2.0–3.4 acres of habitat to replace the habitat of the other covered bird species (Table 5-11). As described in Section 5.6.2, the LCR MSCP Conservation Plan also includes MRMs for covered bird species to provide the information necessary to adaptively manage its implementation and to maximize benefits of the Conservation Plan for these species over the term of the LCR MSCP. Other conservation measures that minimize and avoid impacts on covered birds species include:

- Establishing a $25 million fund contribution that will be used to maintain or increase the value of existing important southwestern willow flycatcher, yellow-billed cuckoo, Yuma clapper rail, and California black rail habitat over the term of the LCR MSCP. Although this conservation measure is directed specifically toward benefiting these species, other covered species that use these maintained habitats would also benefit.
- Avoiding affects on existing habitats at Topock Marsh by implementing actions to maintain the existing levels of water deliveries to Topock Marsh, thus avoiding impacts on habitat for 10 covered bird species, including 2,135 acres of southwestern

willow flycatcher habitat (the largest contiguous block of species habitat in the LCR MSCP planning area) and 2,224 acres of Sonoran yellow warbler habitat.

- Avoiding, to the extent practicable, implementing covered activities in covered bird species habitats during the breeding season to minimize potential adverse effects on nesting success, eggs, and juvenile birds. This conservation measure reduces the risk of effects on individuals as much as practicable without precluding the ability to implement the covered activities.

The conservation measures described above that apply to the southwestern willow flycatcher and Yuma clapper rail are designed to contribute to attaining the recovery goals identified in the *Final Southwestern Willow Flycatcher Recovery Plan* (U.S. Fish and Wildlife Service 2002b) and the *Yuma Clapper Rail Recovery Plan* (U.S. Fish and Wildlife Service 1983) that apply to the LCR MSCP planning area. The southwestern willow flycatcher recovery goal for the Lower Colorado Recovery Unit is the establishment of at least 525 nesting territories, and the recovery goal for the Yuma clapper rail is to protect sufficient wintering and breeding habitat to support a population of 700–1,000 breeding birds in the United States. The LCR MSCP will substantially contribute to these goals by:

- creating 2,207 acres of additional habitat specifically managed for the southwestern willow flycatcher in the LCR MSCP planning area;
- creating 269 acres of additional habitat specifically managed for the Yuma clapper rail in the LCR MSCP planning area; and
- providing funding to maintain existing protected occupied southwestern willow flycatcher and Yuma clapper rail habitats that are likely to become degraded in the future without management intervention and conservation measures.

5.9.3 Covered Fish Species

The LCR MSCP Conservation Plan will create 1 acre of backwater to provide flannelmouth sucker habitat and 0.9 acre to provide bonytail and razorback sucker habitat for every acre of backwater and river channel affected by covered activities (Table 5-11). Created backwaters will be managed specifically to support the habitat elements for these species and, therefore, are expected to provide substantially greater habitat value than the affected unmanaged habitat. In addition, nonnative fish would be excluded from created disconnected backwaters to eliminate the adverse effects of competition and predation by nonnative species on the covered fish species. This level of habitat mitigation, while not fully replacing the acreage of lost habitat, will provide for some of the replacement habitats to be isolated and free of nonnative fish that are the primary threat to the covered fish species.

In addition to replacement of bonytail and razorback sucker habitat, the LCR MSCP provides for stocking up to 620,000 subadult bonytail and 660,000 subadult razorback sucker to augment existing populations in the LCR MSCP planning area. These population augmentations will provide the nucleus for stable populations, reverse the declining trend in existing abundance, create opportunities for subsequent species research and management, provide significant benefits related to the effects of the

covered activities, and contribute to addressing other threats. The LCR MSCP also provides for contributing $400,000, in addition to replacement of existing flannelmouth habitat, to determine flannelmouth sucker habitat use, habitat preferences, and recruitment and to support decisions on habitat management activities for river channel and backwater habitats in Reach 3.

The LCR MSCP will provide for contributing $500,000 to the Glen Canyon Dam Adaptive Management Program or other entity approved by the USFWS to support implementation of planned, but unfunded, humpback chub conservation measures and, as appropriate, to fund humpback chub conservation measures in the lower Grand Canyon of the Colorado River upstream of Lake Mead NRA. The humpback chub population in Grand Canyon may use the riverine habitat created at the upper end of Lake Mead when water levels in the lake are low. These transitory habitats are created and destroyed based on changes to lake elevations with no permanent loss anticipated. There are no practicable minimization or avoidance measures or ways to replace the habitat within the full pool elevation of Lake Mead. Contributions to the approved humpback chub conservation program will provide for habitat establishment and research opportunities for the Grand Canyon population of the species.

The conservation measures described above for the bonytail, razorback sucker, and humpback chub are designed to contribute to attaining the recovery goals identified in the *Bonytail* (Gila elegans) *Recovery Goals: Amendment and Supplement to the Bonytail Recovery Plan* (U.S. Fish and Wildlife Service 2002c), *Razorback Sucker* (Xyrauchen texanus) *Recovery Goals: Amendment and Supplement to the Razorback Sucker Recovery Plan* (U.S. Fish and Wildlife Service 2002e), and *Humpback Chub* (Gila cypha) *Recovery Goals: Amendment and Supplement to the Humpback Chub Recovery Plan* (U.S. Fish and Wildlife Service 2002d). The goals for the bonytail and razorback sucker relevant to the LCR MSCP planning area are to (1) prevent their extinction, (2) establish and maintain a genetic refugium for each species, and (3) establish two self-sustaining populations of each species. The LCR MSCP will substantially contribute to attaining these goals by stocking large numbers of bonytail and razorback sucker into the LCR and conducting long-term monitoring and research related to their ecology and habitat requirements to obtain information necessary to direct future management activities. The humpback chub could occur in the LCR MSCP only in transitory river segments that may form when Lake Mead is below full pool elevation. Consequently, the LCR MSCP is providing funding for ongoing humpback chub conservation efforts that will help attain its recovery goals upstream of Lake Mead.

5.9.4 Other Covered Species

The LCR MSCP provides for mitigating the effects of covered activities on 192 acres of desert tortoise and 128 acres of flat-tailed horned lizard habitat by protecting 230 acres of unprotected occupied desert tortoise habitat and 230 acres of unprotected occupied flat-tailed horned lizard habitat. This level of mitigation is considered appropriate and is consistent with mitigation recommended in the document “Compensation for Desert Tortoise” (Desert Tortoise Conservation Team 1991) and the Flat-Tailed Horned Lizard Rangewide Management Strategy (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). In addition, to avoid and minimize impacts on individual desert

tortoises, the LCR MSCP Conservation Plan requires implementation of AMMs derived from USFWS's *Field Survey Protocol for Any Federal Action That May Occur within the Range of the Desert Tortoise* (U.S. Fish and Wildlife Service 1992) and the Desert Tortoise Council's *Guidelines for Handling Desert Tortoises during Construction Projects* (Desert Tortoise Council 1994). Reclamation will also continue to implement measures to avoid or minimize take of flat-tailed horned lizard that are consistent with measures identified in the 1997 BO (U.S. Fish and Wildlife Service 1997) and the Flat-tailed Horned Lizard Rangewide Management Strategy (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003).

LCR MSCP will assist and contribute to existing relict leopard frog research and conservation programs where appropriate, including contributing $100,000 to support implementation of planned, but unfunded, conservation measures for the relict leopard frog. Implementation of covered activities and LCR MSCP conservation measures will not result in permanent loss of relict leopard frog habitat, but could result in take of individuals associated with measures to create and maintain wetland areas. Changes in flow releases from Hoover Dam associated with implementation of flow-related covered activities could disrupt use of the LCR as a frog movement corridor (e.g., amount of flow). Effects of the covered activities cannot reasonably be mitigated within the LCR MSCP planning area, and AMMs are not practicable.

The LCR MSCP Conservation Plan will create at least 1 acre of MacNiell's sootywing skipper habitat for every acre of habitat affected by covered activities (Table 5-11). The ecology of this species, factors that are limiting to it, and its microhabitat requirements are not well understood. Consequently, the LCR MSCP, in addition to mitigating the effects of habitat loss, also includes conservation measures to undertake monitoring and research to address these uncertainties and provide information necessary for future beneficial management of MacNiell's sootywing skipper.

The LCR MSCP will provide $10,000 per year until 2030 to the Clark County MSHCP Rare Plant Workgroup to support implementation of planned, but unfunded, species conservation measures for the sticky buckwheat and threecorner milkvetch. Changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities could result in some low, unquantifiable, level of impact on sticky buckwheat and threecorner milkvetch plants that have established below the full-pool elevation, when reservoir elevations rise to elevations that inundate plants. This effect cannot reasonably be avoided or minimized; consequently, supporting funding for approved conservation programs within the LCR MSCP planning area is considered appropriate mitigation.

5.10 Timing of Implementing Conservation Measures

The Applicants intend to implement LCR MSCP conservation measures as quickly as efficient staffing, funding, and the time required to conduct necessary research relative to creating covered species habitats and required to evaluate and acquire lands that are suitable for creating covered species habitat will permit. It is not certain when future

flow-related activities (i.e., changes in points of diversion) will be implemented or whether all of these activities will be implemented. It is anticipated, however, that changes in points of diversion will not be implemented for several years following approval of the HCP. Because of the uncertainties surrounding species requirements, habitat creation techniques, and the capabilities of potential habitat creation sites to provide habitat, the LCR MSCP anticipates that the first few years of LCR MSCP implementation will focus on conducting research and adaptive management experiments (e.g., pilot habitat creation projects to test habitat creation techniques) to collect information necessary to successfully implement the LCR MSCP. Following collection of this information, implementation of the LCR MSCP is expected to rapidly accelerate, with most or all of the habitat creation conservation component of the LCR MSCP completed within 20–30 years of HCP approval. All created habitat, however, could be implemented earlier if efficient techniques for establishing habitats are identified through monitoring and research conducted in the first few years of implementation.

The anticipated implementation strategy for establishing cottonwood-willow, honey mesquite, and marsh land cover types to create habitats for associated covered species builds on information that will be gathered in the first few years of LCR MSCP implementation. It is presumed that during implementation Years 0–5, most habitat creation projects will be small in scale and designed to identify and verify the most cost effective means of creating high quality habitat. Larger scale projects would be implemented in Years 6–10 that are designed based on information gathered from previous plantings and partnerships with willing landowners. Implementation Years 11–30 will focus on large-scale habitat creation projects until the habitat creation objective acreage is achieved. The strategy for creation of both connected and disconnected backwaters assumes 60 acres of backwater will be created during each 4-year implementation period, with a goal of creating several small or one or two larger backwaters during any single year. Performance criteria for covered species habitats (Table 5-3) will be used to determine the extent of created cottonwood-willow, honey mesquite, marsh, and backwater that develops as habitat for covered species.

Tables 5-12a–d describe the proposed implementation rate and interim acreage goals for establishment of created habitats.

Table 5-12a. Anticipated Schedule for Establishment of Cottonwood/Willow

Years	Acres/Year	5-Year Total	Cumulative Total
1–5	50	250	250
6–10	150	750	1,000
11–15	300	1,500	2,500
16–20	300	1,500	4,000
21–25	300	1,500	5,500
26–30	–	440	5,940

Table 5-12b. Anticipated Schedule for Establishment of Honey Mesquite

Years	Acres/Year	5-Year Total	Cumulative Total
1–5	20	100	100
6–10	40	200	300
11–15	80	400	700
16–20	80	400	1,100
21–25	–	220	1,320
26–30	–	–	1,320

Table 5-12c. Anticipated Schedule for Establishment of Marsh

Years	Acres/Year	5-Year Total	Cumulative Total
1–5	10	50	50
6–10	20	100	150
11–15	40	200	350
16–20	40[a]	162	512
21–25	–	–	–
26–30	–	–	–

[a] Forty-two acres in year 16 and 40 acres per year in years 17–19.

Table 5-12d. Anticipated Schedule for Establishment of Backwaters

Years	Acres/Year	5-Year Total	Cumulative Total
1–5	15	60	60
6–10	15	60	120
11–15	15	60	180
16–20	15	60	240
21–25	15	60	300
26–30	15	60	360

5.11 Monitoring and Research

The implementing regulations for an HCP (50 C.F.R. §§17.22, 17.32, and 222.307) require a monitoring plan. The USFWS HCP Handbook includes general guidance on the components to be included in the monitoring plan included in an HCP. Additionally,

the USFWS "Five-Point Policy Guidance," published in the *Federal Register* on June 1, 2000 (65 FR 106, 35242–35257) states:

> The monitoring program will be based on sound science. Standard survey or other previously-established monitoring protocols should be used. Although the specific methods used to gather necessary data may differ depending on the species and habitat types, monitoring programs should use a multi-species approach when appropriate.

According to the USFWS, *monitoring* is a mandatory element of all HCPs. When the monitoring program is properly designed and implemented, the monitoring program for an HCP should provide information and data necessary to assess compliance and project impacts, as well as verify progress toward achievement of biological or ecological goals and objectives (65 FR 106:35253). Further, the USFWS states that monitoring approaches that are consistent with the HCP Handbook and addendum should be adequate for assessing whether the HCP is achieving its biological goals and objectives (65 FR 106:35246). The USFWS addendum further clarifies the HCP Handbook's monitoring policy by organizing the types of monitoring into three major elements, including: (1) compliance monitoring; (2) effects and effectiveness monitoring; and (3) monitoring to provide feedback for the adaptive management program.

Compliance monitoring is used to ensure that the HCP permittee is carrying out the terms of the HCP, incidental take permit, and implementation agreement, if used. The effects and effectiveness monitoring is intended to evaluate the effects of the permitted activity (i.e., covered projects) and determine whether the effectiveness of the conservation strategy of the HCP is consistent with the assumptions and predictions when the HCP was developed and approved (65 FR 106:35253).

The Five-Point Policy recommends that the effects and effectiveness monitoring should include the following:

- periodic accounting of incidental take that occurred in conjunction with the permitted activity;
- surveys to determine species status, appropriately measured for the HCP's conservation strategy (e.g., species presence, density, reproductive rates, etc.);
- assessments of habitat condition;
- progress reports related to implementation of the conservation strategy (e.g., acres of habitat created, acres acquired); and
- evaluations of the conservation strategy's success toward meeting the stated biological and ecological goals and objectives.

Finally, the USFWS recommends that permittees develop regular reports that describe and detail the results of the various monitoring program components related to the implementation of the HCP. The HCP, incidental take permit, or implementation agreement should specify the level of detail and quantification required in the monitoring report, as well as the frequency of reporting. Most monitoring programs require reports annually. The Five-Point Policy lists information generally needed in an annual monitoring report, including:

- biological goals and objectives of the HCP (which may need to be reported only once);
- objectives for the monitoring program (which may only need to be reported once);
- location of sampling sites;
- methods for data collection and variables measured;
- frequency, timing, and duration of sampling for the variables;
- description of the data analyses and who conducted the analyses; and
- evaluation of progress toward achieving measurable biological goals and objectives and other terms and conditions as required by the incidental take permit and the implementation agreement.

In the context of the USFWS HCP Handbook and the Five-Point Policy, a significant element of the LCR MSCP includes the implementation of a robust monitoring and research program to provide the information necessary to adaptively manage LCR MSCP implementation of conservation measures in accordance with the adaptive management process (Section 5.12) and to document successful implementation of the conservation measures. Generally, the elements of the monitoring and research program include: (1) system monitoring, (2) species monitoring and research, (3) habitat creation technology research, and (4) post-development or post-habitat creation monitoring.

The Program Manager, in cooperation with the USFWS, will direct development and implementation of the monitoring and research program. The LCR MSCP will maintain databases for storage and retrieval of monitoring and research data collected under the LCR MSCP and by others that are relevant to LCR MSCP covered species and their habitats, as well as for tracking implementation and success of LCR MSCP conservation measures. Monitoring and research will primarily be directed to fill known data and information gaps and/or those data needs identified through database review. Every attempt will be made to use and glean data from existing, ongoing programs and to direct the collection of data that would augment, not replace, these programs. Monitoring protocols and research studies will be designed to avoid excessive disturbance to covered species and to ensure that monitoring and research are conducted in compliance with all permit stipulations.

A very important function of the Program Manager will be to maintain close coordination with other recovery implementation programs and habitat conservation programs in the Colorado River watershed, including the Upper Colorado River Endangered Fish Recovery Program, the Glen Canyon Dam Adaptive Management Program, the Clark County MSHCP, and others that may develop through the life of the LCR MSCP. Additionally, communication and coordination will be maintained with other species conservation planning and habitat creation efforts that are in place within the range of the species covered under the LCR MSCP (e.g., southwestern willow flycatcher research and habitat creation activities along the middle Rio Grande in central New Mexico).

The purpose behind this close communication and coordination is to ensure and facilitate the transfer and management of data and information related to key species and the employment of state-of-the-art habitat creation technologies. LCR MSCP monitoring protocols will be developed in coordination with the National Fish and Wildlife

Foundation's Partner's in Flight programs in Arizona, California, and Nevada to ensure that results of LCR MSCP monitoring are compatible with and can be integrated with data collected on covered species and habitat creation efforts under these programs. This coordination will allow for comparable data to be collected that can be used to better evaluate the regional status and trends of species and to identify and direct future management efforts to benefit these species. Identification of such regional management needs based on coordinated regional monitoring efforts will not only help guide adaptive implementation of the LCR MSCP but will also provide such guidance for other species conservation programs. Additionally, monitoring protocols will be designed and developed that permit coordinated database management, as well as database compatibility with other conservation planning efforts (e.g., databases developed, maintained, and managed in the Glen Canyon Dam Adaptive Management Program, Upper Colorado River Basin Recovery Implementation Program, Roosevelt Lake Habitat Conservation Plan).

5.11.1 System Monitoring

System monitoring will be conducted to collect data on existing populations and habitats of covered species to determine their status, distribution, density, migration, productivity, and other ecologically important parameters. System monitoring will be implemented annually, with decreasing intensity over the term of the LCR MSCP. Collected data will be maintained in a GIS database (e.g., distribution of habitats, species observations) and other database formats as appropriate.

In the early years of LCR MSCP implementation, extensive data gathering will be conducted to acquire and sort data on covered species to identify data gaps and research questions that will be addressed through the adaptive management process. At the same time, ongoing monitoring of endangered species by Reclamation will continue. Additionally, productivity and survival for other avian species will be gathered through continued monitoring at two data Monitor Avian Productivity and Survival (MAPS) stations located in patches of riparian land cover along the LCR (one on created habitat and one on existing habitat that will not be affected by covered activities). If the appropriate sites are identified and become available for use, it may be feasible to establish one or more additional MAPS stations within the LCR MSCP planning area.

As data gaps are identified, monitoring activities, primarily directed toward covered species for which little is known from the LCR (i.e., mammals, amphibians, insects) will be designed, scheduled, and implemented. Monitoring data will itself be reviewed to determine species-specific and habitat creation–specific research needs. For example, the status and distribution of the Colorado River cotton rat is unknown. (None have been seen or collected for a few years.) Small mammal trapping will need to be implemented in areas previously known to be occupied by this species. If the species is located, species-specific research studies will need to be undertaken to determine the relationship between the organism and its environment. Data collected through such species-specific research efforts will then be used to refine or modify LCR MSCP conservation measures to ensure the species' LCR MSCP conservation goals are achieved.

An important aspect of system monitoring includes the development and use of consistent monitoring and research protocols. Monitoring and research plan designs and database management techniques and methodologies should, to the maximum extent practicable, conform to protocols identified or developed in existing species recovery plans, Partner's in Flight bird conservation plans, and other species-related conservation planning efforts.

It is anticipated that system monitoring could decrease during the later years of LCR MSCP implementation because postdevelopment monitoring (Section 5.11.4) on created sites will provide the data necessary to evaluate the overall health and well-being of these species.

5.11.2 Species Research

The LCR MSCP participants recognize that there are considerable data gaps for many of the covered species and that these data are needed to guide, through the adaptive management process, the design and implementation of effective conservation measures. Through the adaptive management process, LCR MSCP implementation will be informed and enhanced by the collection of basic life history data, such as food habits, migration timing, and the physical-, chemical-, and biological-limiting factors necessary to design, construct, and manage the requisite habitats necessary to ensure the continued survival of the species.

A primary example of a life history data gap is the paucity of information about the food habitats of some covered species. What type of food, how much of it, and when must it be available are unanswered questions for species such as the southwestern willow flycatcher and yellow-billed cuckoo—yet this information is needed if the LCR MSCP intends to create habitat for these species that "will support a greater abundance of insect prey production" than their affected habitats.

The Program Manager will determine, in cooperation with USFWS, the appropriate scope of these species-specific research programs and activities. As described for system monitoring, the LCR MSCP will coordinate with, participate in, and build on extant research for these species. Some of the species research items currently identified include brown-headed cowbird and starling control, bat roost and forage site identification, MacNeill's sootywing skipper habitat requirements, and flannelmouth sucker investigations below Davis Dam.

5.11.3 Restoration Research

Restoration technology and methodology research is a key element for successful implementation of habitat creation through the adaptive management process. Most of the habitats to be created under the LCR MSCP involve a continuation, completion, or expansion of activities currently being tested and implemented by Reclamation as part of previous BOs (e.g., some Reclamation projects, such as backwater development, have been implemented as mitigation as long as 30 years ago). Many of Reclamation's ongoing restoration projects are demonstration projects that were designed and implemented to answer some of the multitude of questions surrounding creation of native

aquatic, marsh, and riparian communities in the Colorado River floodplain. Much of this work will still be under investigation as the LCR MSCP moves into the implementation phase. In many ways, these activities are still conceptual in nature.

Basic research on such habitat creation–related activities as seed collection and dispersal, irrigation techniques, and soil conditioning techniques is needed early in the implementation of the LCR MSCP. These data, along with "how-to" information needed to physically create habitat, such as equipment needs, use, and storage, will allow for development of guidelines for implementing habitat creation projects to ensure that BMPs are the rule, not the exception. Examples of these technical how-to questions include:

- Can low-head rock weirs be used to raise water surface elevations in the surrounding floodplain?
- Can backwaters be constructed and protected to induce efficient production of native endangered fishes and yet still be connected to the mainstream to facilitate successful repatriation of larger fish into the aquatic system?
- Can the same type of earth-moving machinery be used to perform work around swales and sloughs as would be used on level ground?
- How are sprinkler pipe systems installed, maintained, and operated on newly seeded areas that exhibit undulating topography?
- How is heavy equipment mobilized into the center of a 40-acre marsh with soft bottoms and 12 inches of standing water?

These are a few of the questions regarding implementation techniques. The habitat creation research studies will be developed through the Program Manager in cooperation with the USFWS.

Initially, a major focus of habitat creation research will be to conduct site evaluations to collect the information necessary to select conservation areas based on the conservation area site-selection criteria (Section 5.5.1). Substantial pre-habitat creation evaluation and inventory will be required to ensure that the best sites are selected.

5.11.4 Postdevelopment Monitoring

Following completion of habitat creation activities (e.g., site grading, plant installation) at each conservation area, postdevelopment monitoring will be conducted to evaluate development of the site as covered species habitat (e.g., growth of vegetation, development of elements of species habitat) and use of the habitat by covered species. Data collected about how created habitat develops relative to the habitat creation techniques used to establish and maintain the habitat will be used to refine management techniques to ensure the most cost-effective approaches are used (e.g., water management). An element of postdevelopment monitoring also includes monitoring of the parameters established for created covered species habitats to determine whether the minimum habitat requirements established for each species' habitat are being achieved (Section 5.11.6).

5.11.5 Monitoring and Research Reporting

The Program Manager will prepare and annually submit to the USFWS a report describing monitoring and research activities undertaken during the previous year, results and analyses of the monitoring and research data, assessment of the effectiveness of conservation measures, and other applicable information required under the Five-Point Policy (Chapter 6, "Governance and Implementation Structure").

5.11.6 Minimum Habitat Creation Requirements of LCR MSCP Conservation Plan

The LCR MSCP has established minimum requirements that define the successful establishment of created habitat for each covered species. These minimum habitat requirements are listed in Table 5-3 and should be achieved to comply with the terms and conditions of the section 10 incidental take permit. Failure to achieve these minimum requirements elements could require implementation of the remedial measures described in Section 5.12.3, "Changed Circumstances and Remedial Measures." Alternative/modified requirements may be developed based on results of monitoring and research through the adaptive management process, with approval of the USFWS.

Monitoring will be conducted as described in Section 5.11.4, "Postdevelopment Monitoring," to determine whether the minimum habitat requirements for covered species are achieved by LCR MSCP created land cover types. Conformance with the commitments for fish augmentations and for funding of species conservation measures under other conservation programs described in Section 5.7, "Species-Specific Conservation Measures," will be tracked as part of maintaining the LCR MSCP implementation database.

5.12 Adaptive Management

The LCR MSCP describes a habitat-based approach for ensuring that mitigation is provided to offset the potential adverse effects of covered activities and LCR MSCP conservation measure implementation on all covered species and for contributing to the recovery of some LCR MSCP species over the 50-year term of the LCR MSCP. Uncertainty is an unavoidable component of creating and managing species habitats. To address such uncertainties, the Program Manager will implement the LCR MSCP based on the principles of adaptive management, which allow LCR MSCP conservation measures to be adjusted over time based on results of monitoring and research. This approach provides a greater measure of certainty that LCR MSCP goals for covered species are achieved over the long-term.

According to Kershner (1997):

> Adaptive management is the process whereby management is initiated, evaluated, and refined (Holling 1978; Walters 1986). It differs from traditional management by recognizing and preparing for the uncertainty that underlies resource management

> decisions. Adaptive management is typically incremental in that it uses information from monitoring and research to continually evaluate and modify management practices. It promotes long-term objectives for ecosystem management and recognizes that the ability to predict results is limited by knowledge of the system. Adaptive management uses information gained from past management experiences to evaluate both success and failure, and to explore new management options.

The USFWS's Five-Point Policy for HCPs (65 FR 106, June 1, 2000) defines adaptive management:

> broadly as a method for examining alternative strategies for meeting measurable biological goals and objectives, and then if necessary, adjusting future conservation management actions according to what is learned.

The LCR MSCP adaptive management process described in this section is intended to be consistent with this definition.

5.12.1 LCR MSCP Adaptive Management Process

Based on the best scientific and commercial information currently available, the Applicants believe the LCR MSCP conservation measures will effectively achieve the LCR MSCP covered species goals. However, conditions within the LCR MSCP planning area, existing habitat conditions, and status of covered species may change during the term of the LCR MSCP. In addition, it is possible that additional and different conservation measures, not contained within the LCR MSCP, will be suggested and proven to be more effective in achieving LCR MSCP covered species goals than those currently identified for LCR MSCP implementation. Finally, it may be found that the LCR MSCP conservation measures prove to be less effective in achieving LCR MSCP covered species goals than anticipated. Activities considered for implementation under the LCR MSCP adaptive management process, however, should not have impacts beyond those considered during the review and permitting process for the LCR MSCP Conservation Plan. To address these uncertainties, the LCR MSCP includes implementation of an adaptive management process to:

- gauge, in cooperation with the USFWS, the effectiveness of existing conservation measures;
- propose alternative or modified conservation measures, as the need arises; and
- address changed and unforeseen circumstances.

The adaptive management process will be administered by the Program Manager (Chapter 6, "Governance and Implementation Structure"), with input from the LCR MSCP Steering Committee, and will provide the Program Manager with objective scientific data and analyses on which to base management decisions.

This adaptive management process will also provide for professional, scientific reviews to evaluate the effectiveness of existing or proposed conservation measures, and the Program Manager will incorporate this review where appropriate. It is also intended that the adaptive management process will provide the basis for budget and funding decisions

throughout the term of the LCR MSCP. Figure 5-4 conceptually illustrates the LCR MSCP adaptive management process. Adaptive management, in conjunction with aggressive monitoring and research (described in Section 5.11), will provide the Program Manager with a process to effectively address uncertainties associated with successful implementation of the LCR MSCP.

The LCR MSCP adaptive management process is intended to be a flexible, iterative approach to long-term habitat creation and management of biological resources and will be influenced over time by the results of ongoing monitoring, research, and other sources of information. Conservation measures, habitat creation activities, and resource management techniques will be regularly evaluated in light of monitoring and research results regarding species needs, habitat creation successes and failures, and other factors. The intent of this evaluation process is to better achieve overall conservation and management goals as defined by measurable biological objectives.

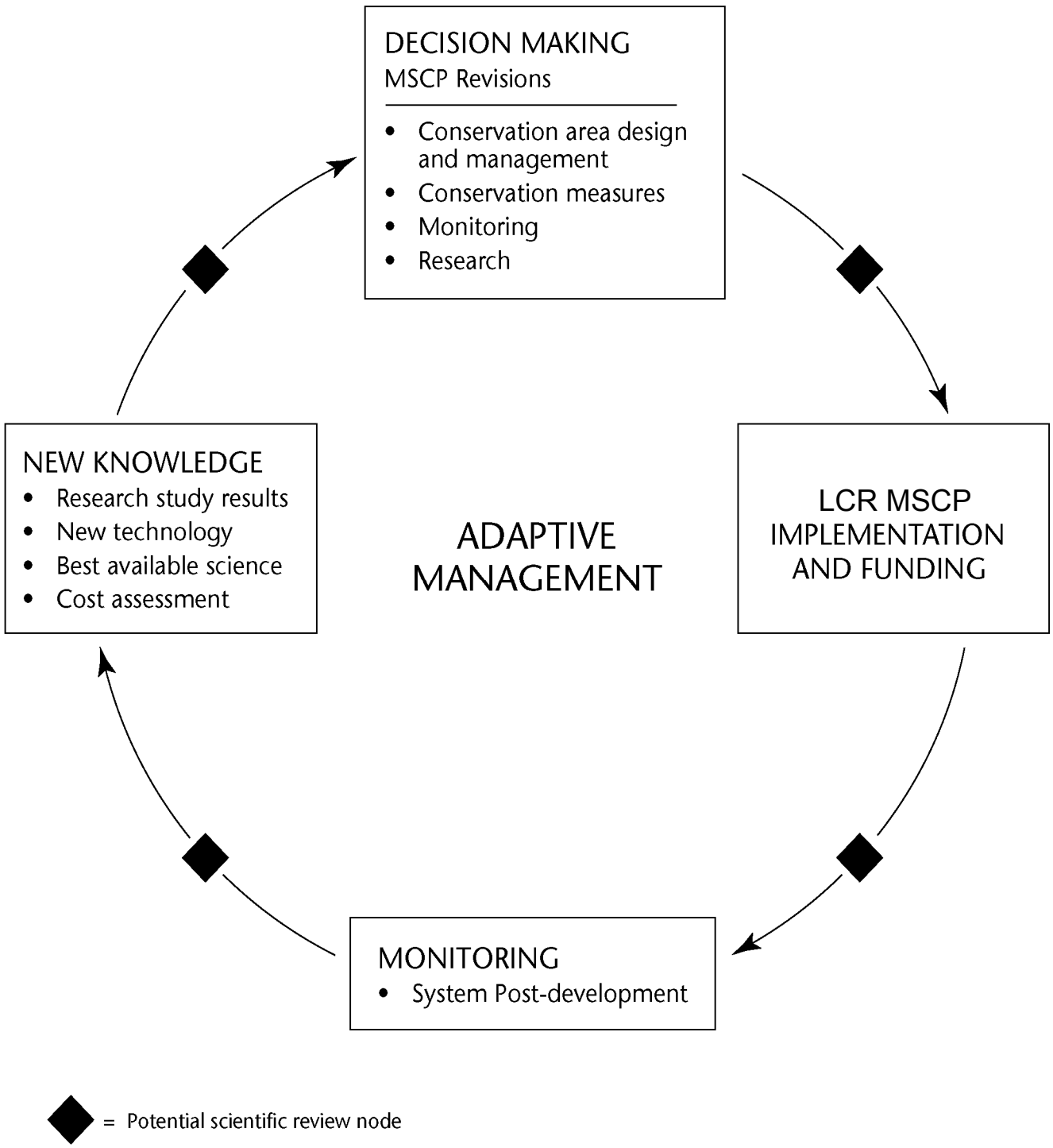
The cornerstone of the adaptive management process is the LCR MSCP monitoring and research program (Section 5.11). Information collected through monitoring and research will be used to design and manage created habitat and provide information to direct the fish augmentation element of the LCR MSCP. During the early phases of LCR MSCP implementation, monitoring and research will provide data to improve the efficacy of techniques to successfully create habitat. As habitats are created, the adaptive management process will allow for the experience gained through early projects to shape and refine future habitat creation projects.

The data collected, evaluated, and managed through the monitoring and research program will provide a scientific basis for modification of existing projects or development of alternative measures that will provide greater benefits or more efficient use of LCR MSCP resources. Such modified/alternative measures will be developed as written proposals and will be presented to the LCR MSCP Steering Committee by the Program Manager, together with an estimate of the costs. These proposals will be evaluated to ensure that they are consistent with the LCR MSCP goals and can be accomplished within the limits of the budget and financing assurances of the Applicants (see Chapter 7).

Action plans and budgets, reflecting the implementation of conservation projects, will be presented to the USFWS for its review and written concurrence that they conform to the terms and conditions necessary or appropriate for purposes of the incidental take authorization. Modified/alternative conservation measures and methods that have been generated through the adaptive management process, proposed by the Program Manager, reviewed by the LCR MSCP Steering Committee, and with USFWS concurrence will not require an amendment to the section 10 permit or reinitiation of section 7 consultation.

5.12.2 Adaptive Management Activities

Under the LCR MSCP, adaptive management focuses on two primary types of conservation measures—(1) the creation, function, and management of covered species habitats and (2) the effectiveness of fish augmentation strategies. This section generally describes the types of adaptive management–related activities that will be undertaken



Source: Adapted from *Statewide Strategy to Recover Salmon* (Washington State Joint Resources Cabinet 1999).

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Figure 5-4
Adaptive Management Process

early (e.g., the first 5 years) in LCR MSCP implementation. Detailed descriptions of adaptive management–related activities (e.g., pilot projects, study designs, research proposals) will be included in annual action plans and budgets developed by the Program Manager and submitted to the Steering Committee and USFWS for review.

5.12.2.1 Created Habitats

To address uncertainties surrounding species requirements, habitat creation techniques, and the capabilities of potential habitat creation sites to support habitat, the LCR MSCP anticipates that the first few years of LCR MSCP implementation will focus on conducting research and adaptive management experiments (e.g., pilot habitat creation projects to test habitat creation techniques) to collect information necessary to ensure successful creation of covered species habitats. As created habitats become established, it is anticipated that results of post-development monitoring conducted to determine the response of covered species to the conservation measures will be used to make subsequent adaptive management decisions.

Research studies to address key uncertainties that are anticipated to be conducted in the first 5 years of implementation include, but are not limited to, studies to:

- determine the microhabitat requirements for MacNeill's sootywing skipper to provide information necessary to select appropriate habitat creation sites and develop appropriate habitat creation designs and techniques;
- better define the elements of Colorado River cotton rat and Yuma hispid cotton rat habitat to provide information necessary to select appropriate habitat creation sites and develop appropriate habitat creation designs and techniques;
- identify appropriate habitat creation techniques (e.g., seed collection, soil conditioning, irrigation methods);
- identify appropriate methods for ensuring successful production of flying insects in created southwestern willow flycatcher habitat;
- identify appropriate habitat designs and management techniques to co-manage created habitat for both the southwestern willow flycatcher and yellow-billed cuckoo; and
- identify the effects of brown-headed cowbird nest parasitism and European starling nest site competition on the reproductive success of covered species.

Each habitat creation project will be designed in a manner to test habitat establishment techniques and identify appropriate habitat management techniques (e.g., appropriate irrigation schedules and weed control methods). For example, projects to establish native vegetation (e.g., cottonwood-willow) to provide habitat in existing saltcedar-dominated communities would be designed as pilot or demonstration projects to test establishment techniques (e.g., successful removal of saltcedar, subsequent control of saltcedar, irrigation requirements). Information learned from these initial habitat creation projects would be used to refine habitat creation site selection criteria and habitat established and management techniques that would be applied to subsequent projects.

Once created habitats have developed, results of post-development monitoring surveys to determine the use of created habitats by covered species would be used to assess the need to adjust the design of subsequent habitat creation projects, adjust management of the created habitat, or modify or adopt new conservation measures to address species needs. For example, if created habitats are not used by applicable covered species in future years, then:

- Additional research would be conducted to determine whether the created habitat provides for all of the species' needs and, if not, then:
  - the designs of subsequent created species habitat would be adjusted to ensure all of the species' habitat requirements are provided and
  - to the extent practicable, management of the created habitat would be adjusted to improve habitat for the species.
- If created habitat is not used and its lack of use is not related to habitat design or management (e.g., habitat is not limiting the population), funding may be reallocated, if appropriate, to implement new conservation measures that are more likely to benefit the species.

5.12.2.2 Fish Augmentation Strategies

The LCR MSCP will implement an adaptive management process to reevaluate the augmentation strategy for bonytail and razorback sucker, based on the results of monitoring and research. Monitoring and focused research will be components of the adaptive management process. For example, the stocking of 8,000 subadult bonytail and 24,000 subadult razorback suckers for 5 consecutive years below Parker Dam (conservation measures BONY3 and RASU3) will be conducted as adaptive management experiments, elements of which will include focusing augmentations in locations that currently support the species, followed by intensive monitoring and research for an estimated 7–8 years. Release of fish into the LCR will target a mix of riverine and lacustrine habitat types. Augmented bonytail and razorback sucker released will be marked with an appropriate batch-marking methodology and a statistically valid subset of released fish may also be PIT tagged or identified with other appropriate technology providing a similar level of individual fish identification. Monitoring will focus on determining key environmental correlates affecting survival, growth, movement, and reproduction (e.g., key habitat [e.g., depth, velocity, channel form, cover, substrate], continuity, water temperature, food, and predation).

Following the 7–8-year intensive monitoring and research period, the information and insights gained will focus expenditure of the remaining funds on those management activities potentially contributing the most to achieving the recovery goals for bonytail and razorback sucker. As appropriate, the management activities may include changes to the Applicants' proposed augmentation approach, rates, and targeted areas. The monitoring and research information will also guide maintenance, enhancement, and creation of bonytail and razorback sucker habitat (e.g., backwaters).

5.12.3 Changed Circumstances and Remedial Measures

The regulations governing section 10 incidental take permits provide for inclusion of remedial measures to address changed circumstances in an HCP. Remedial measures will be implemented, as necessary, to respond to changed circumstances. Changed circumstances are defined as "changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the USFWS and that can be planned for..." (50 C.F.R. §17.3). Changed circumstances for which the Program Manager will implement remedial measures should they occur are identified in Table 5-13.

Table 5-13. Changed Circumstances and Remedial Measures

Changed Circumstances	Remedial Measures
The creation of land cover as habitat for one or more covered species in accordance with the LCR MSCP Conservation Plan is unsuccessful, i.e., fails to provide essential habitat elements for one or more of the covered species whose habitat is expected to be provided by the land cover type.	The cause of failure will be identified through the monitoring and research that is part of the adaptive management process included in the LCR MSCP. The adaptive management process will be used to identify and develop measures to correct or replace the failed conservation measure or to implement an alternative conservation measure.
Insufficient water is available, regardless of cause (e.g., drought conditions, reduction in water allocations), to maintain established created land cover types as habitat for one or more covered species.	The Program Manager will coordinate with the USFWS to prioritize the distribution of available water among created habitats to ensure that the greatest benefits for covered species will be provided by the amount of water available for maintenance of created habitats.
Created backwater and marsh land cover that provide habitat for covered species in conservation areas are lost because of sedimentation resulting from floods.	Dredging will be implemented to restore patches of backwater and marsh land cover created as covered species habitat.
Created cottonwood-willow and honey mesquite land cover that provide habitat for covered species in conservation areas are lost as a result of floods.	Created habitats will be reestablished following loss to flooding. In the event of such loss, land management and created habitat restoration measures will be implemented in conservation areas to ensure the reestablishment of native vegetation through active management or natural processes.
Fish in rearing facilities or in the stocking process are lost, causing disruption of fish augmentation conservation measures.	Stocking will be increased in subsequent years and/or the time period will be extended within the permit term for fish augmentation to meet the total augmentation goals.
Rearing facilities or aquaculture techniques fail to provide sufficient numbers or sizes of fish to meet fish augmentation goals.	Other management activities will be identified, through monitoring and research, to provide benefits to the fish species.
A toxic or hazardous substance spill occurs, affecting LCR MSCP conservation areas.	In the event of such loss, land management and created-habitat restoration measures will be implemented in conservation areas to ensure the restoration of the conservation area through active management or natural processes.
Future listing of a non-listed covered species.	The USFWS will automatically authorize take of such newly listed covered species as prescribed by regulation (63 FR 35, February 23, 1998).

To address the potential for changed circumstances, the Applicants have allocated contingency funding above the cost of implementing the LCR MSCP conservation measures. This contingency funding provides the financial means to implement remedial measures in the event that changed circumstances occur. In the event that changed circumstances occur, the Program Manager will implement the remedial measures identified in Table 5-13, but no additional conservation or mitigation measures can be required without the Applicants' consent (50 C.F.R. §17.22[b][5]). Remedial measures will be implemented within the available LCR MSCP budget, including contingency funding committed by the LCR MSCP participants for changed circumstances.

The Program Manager will notify the USFWS within seven days after learning of the occurrence of a changed circumstance identified in Table 5-13. As soon as practicable, but no later than 30 days after learning of the changed circumstance, the Program Manager will develop an approach to implement the applicable remedial measures described in Table 5-13 to the extent necessary to correct the effects of the changed circumstance on covered species, and notify the USFWS of their implementation.

If the USFWS determines that changed circumstances have occurred and that the Program Manager and the Permittees have not responded in accordance with the appropriate existing LCR MSCP agreements, USFWS will so notify the Program Manager and the Permittees and will direct them to make the required changes. Within 30 days after receiving such notice, the Program Manager and the Permittees will make the required changes and report to the USFWS on their activities. Such changes are provided for in the LCR MSCP, and hence do not constitute unforeseen circumstances or require amendment of the Permit or the LCR MSCP.

5.12.4 Unforeseen Circumstances

Unforeseen circumstances are defined as (17 C.F.R. §17.3):

> changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the USFWS at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of the covered species."

In the event of unforeseen circumstances during the life of the LCR MSCP's incidental take permit, amendments to the HCP may be proposed by either the Applicants or USFWS to address these circumstances. The USFWS and Applicants would work together to identify opportunities to redirect resources to address unforeseen circumstances. Notwithstanding the foregoing, however, USFWS will not:

- require the commitment of additional land, water, or financial compensation by the Applicants other than those agreed to elsewhere in the HCP or
- impose additional restrictions on the use of land, water, or natural resources otherwise available for use by the Applicants under the original terms of the LCR MSCP HCP to mitigate the effects of the covered activities.

5.12.5 Recovery Plans

It is expected that additional recovery plans could be developed for Federally listed species or LCR MSCP species that become listed over the 50-year life of the LCR MSCP. The LCR MSCP adaptive management process allows for revisions of objectives and conservation measures to incorporate recovery strategies identified in new or revised recovery plans. The Program Manager will incorporate conservation measures identified in future or revised recovery plans when such measures:

- are expected to improve the effectiveness of the LCR MSCP in achieving covered species goals,
- can be achieved in the LCR MSCP planning area, and
- are compatible with the LCR MSCP covered species goals, conservation area framework and management, and LCR MSCP funding levels.

Chapter 6
Governance and Implementation Structure

A draft final FMA has been prepared that defines the means of governance and implementation of the LCR MSCP. The draft final FMA is attached as Exhibit A to this Final HCP. The final form and execution of the FMA by each non-federal party is subject to the approval and authorization of the governing body of that party. This chapter provides a summary of the proposed LCR MSCP governance and implementation structure. However, the final FMA will be the controlling document relating to the governance and implementation of the LCR MSCP and must be referred to for those requirements. The purpose of the FMA is to:

- Provide for the management and implementation of the LCR MSCP;
- Set forth the Federal and non-Federal cost share; and
- Provide for contributions to the LCR MSCP.

Reclamation will, as described in the FMA, manage and implement the LCR MSCP Conservation Plan, the terms and conditions of the LCR MSCP section 10(a)(1)(B) permit, and the reasonable and prudent measures of the section 7 BO. Reclamation will employ a Program Manager responsible for administering and implementing the LCR MSCP, with an office located in Arizona, California or Nevada. The duties of the Program Manager include:

- Administering and implementing the LCR MSCP in a manner that complies with the requirements of the ESA, other applicable Federal and state laws, and the LCR MSCP documents;
- Directing the preparation of schedules and cost estimates for implementation of the LCR MSCP, and an annual implementation work plan and budget, and periodic contribution payment schedules;
- Establishing accounts, as necessary and appropriate, for the administration of funds from any participant or contributor to the LCR MSCP; and
- Review, discuss with, and seek to reach consensus among members of the LCR MSCP Steering Committee.

The FMA establishes a LCR MSCP Steering Committee, whose members are divided into seven participant groups: Federal, Arizona, California, Nevada, Native American, Conservation, and Other Interested Parties. The FMA provides a process for additional members to join the Steering Committee. Reclamation and the Program Manager will cooperate with and coordinate management and implementation activities with the

Steering Committee. Meetings of the Steering Committee will be open to the public. The role of the Steering Committee includes:

- Coordinating implementation of the LCR MSCP with the Program Manager;
- Creating standing or ad hoc subcommittees or work groups as necessary to carry out its responsibilities;
- Reviewing matters presented to it by the Program Manager; and
- Appointing members to represent the interests of Permittees in any consultation, conference, re-initiation of consultation, or other process that may affect the implementation of the LCR MSCP.

Each the year during the term of the LCR MSCP, the Program Manager will develop and present to the Steering Committee an implementation report, work plan, and budget that include:

- A financial report;
- A description of all conservation measures initiated, continued, or completed during the previous year;
- A description of all conservation measures intended to be initiated or continued during the next 3-year period;
- The purpose for, and cost estimate of, all conservation measures intended to be initiated or continued during the next 3-year period;
- A tabulation and description of all conservation measures that have been completed from the commencement of the LCR MSCP to the date of the report;
- A tabulation of the habitat created or restored by the LCR MSCP;
- A description of any take known to have occurred during the previous year;
- All findings, conclusions, and results of monitoring, research, or conservation measures undertaken during the previous year;
- Any recommendation made by the USFWS or any state wildlife agency regarding the LCR MSCP;
- A listing of any incidental take authorizations issued pursuant to the LCR MSCP during the previous year; and
- The approval or rejection of any minor modifications or amendments to the LCR MSCP, or any LCR MSCP documents.

The Program Manager will submit the annual implementation report, work plan, and budget to the Service for its review and determination regarding the consistency of the past, current, and future implementation plans with the LCR MSCP, the section 10(a)(1)(B) permit, and the section 7 BO.

Chapter 7

Implementation Costs and Funding Sources

This section provides an estimated cost for implementing the LCR MSCP Conservation Plan (Section 7.1) and the source of funding to meet those costs (Section 7.2).

7.1 Cost to Implement the LCR MSCP

This section provides an estimate of the cost for implementing the LCR MSCP Conservation Plan. The analysis required many assumptions to be made regarding how the Conservation Plan will eventually develop and the unit cost for many items. Table 7-1 summarizes the costs associated with the implementation of the 50-year LCR MSCP. Cost categories include: program administration; land acquisition; planning, design, and engineering; habitat creation; environmental compliance; fish augmentation; conservation area management and maintenance; additional law enforcement and firefighting staff; existing habitat maintenance; Topock Marsh pumping; research, monitoring, and adaptive management; remedial measures; and water acquisition. Costs are summarized by 5-year period. Costs are based on the assumptions that 8,132 acres would be created, and that 30 conservation areas would be created under the LCR MSCP. All costs are in 2003 dollars. Implementation costs shall be adjusted annually for inflation.

This chapter provides a brief explanation of each cost category and an explanation of how costs in the category were derived.

7.1.1 Program Administration

Program administration cost involves the support of staff, facilities, and equipment to operate the office of the Program Manager within Reclamation (see Chapter 6, “Governance and Implementation Structure”). It is assumed that program administration costs would be necessary throughout the 50-year LCR MSCP. Program administration employees that are expected to be funded are the Program Manager, two group managers, a senior scientist, an information technology/database manager, a cooperative agreements and grant agreements specialist, a budget analyst, two secretaries, and a clerk.

These costs are based on the assumption that the Reclamation would host the Program Manager, and that support personnel would be Reclamation employees. The costs

include the yearly salary for each employee plus the costs of benefits, regional overhead, and LCR MSCP overhead.

Staff for planning, engineering, and design; fish augmentation and monitoring; conservation area management and maintenance; and research, monitoring, and adaptive management are part of the LCR MSCP office, but staff costs are considered project costs and are included within the other cost categories.

For additional assumptions about the program administration cost category, see Section N.1 in Appendix N.

7.1.2 Land Acquisition

To estimate LCR MSCP Conservation Plan implementation costs, it is assumed that one-third of the land required for creation would be purchased from private landowners, one-third would be leased from tribes, and one-third would be public land. The purchase cost for private land is assumed to be $6,000 per acre. The lease cost for tribal land is assumed to be $325 per acre per year. Land purchased and lease costs will certainly vary across the LCR MSCP planning area, but these costs were used as reasonable estimates of average costs. It is assumed that public land has no associated land acquisition costs. Because of the need for additional land to support conservation area infrastructure and buffer areas, it is assumed that 1.15 times more land than is needed for meeting habitat creation goals would be bought and leased.

For additional assumptions about the land acquisition cost category, see Section N.2 in Appendix N.

7.1.3 Planning, Design, and Engineering

It is assumed that the staff who conduct planning, engineering, and design work would also conduct creation work. Planning, design, and engineering employees that are expected to be funded are three project managers and three technical support staff. One-third of these staff positions would be funded for planning, engineering, and design. The remaining two-thirds would be funded for the habitat creation cost category (Section 7.1.4).

These costs are based on the assumption that planning, design, and engineering personnel would be Reclamation employees. Annual costs for each position include salary, benefits, overhead, and travel costs. Planning, design, and engineering positions are funded annually for years 1–20.

In addition to staff costs, it is assumed that technical costs for planning, engineering, and design would be incurred for each conservation area. These costs are assumed to vary with the level of development of the land on which the conservation area would be created, ranging from $100,000 per conservation area for conservation areas that are on agricultural land and would require no additional design to $240,000 per conservation

Table 7-1. Summary of LCR MSCP Conservation Plan Implementation Costs (rounded to the nearest $10,000)[a]

Cost Category	Years 1–5	Years 6–10	Years 11–15	Years 16–20	Years 21–25	Years 26–30	Years 31–50	Total
Program administration	$5,090,000	$5,090,000	$5,090,000	$5,090,000	$5,090,000	$5,090,000	$20,370,000	$50,910,000
Land acquisition	$1,000,000	$14,500,000	$7,250,000	$7,250,000	$5,000,000	$5,000,000	$20,000,000	$60,000,000
Planning, design, and engineering	$1,590,000	$2,990,000	$3,210,000	$3,270,000	$0	$0	$0	$11,060,000
Habitat creation	$11,560,000	$43,850,000	$43,860,000	$43,860,000	$0	$0	$0	$143,130,000
Environmental compliance	$380,000	$950,000	$950,000	$780,000	$0	$0	$0	$3,060,000
Fish augmentation	$4,000,000	$6,000,000	$4,000,000	$3,000,000	$3,000,000	$3,000,000	$11,000,000	$34,000,000
Conservation area management and maintenance	$2,410,000	$2,710,000	$4,780,000	$5,130,000	$5,130,000	$5,890,000	$26,620,000	$52,670,000
Law enforcement staff	$500,000	$500,000	$500,000	$930,000	$930,000	$930,000	$3,710,000	$8,000,000
Firefighting staff	$500,000	$500,000	$930,000	$1,350,000	$1,350,000	$1,350,000	$5,390,000	$11,370,000
Existing habitat maintenance	$2,500,000	$22,500,000	$0	$0	$0	$0	$0	$25,000,000
Topock marsh pumping	$540,000	$240,000	$240,000	$240,000	$240,000	$240,000	$960,000	$2,700,000
Monitoring, research, and adaptive management	$24,000,000	$29,670,000	$28,170,000	$19,170,000	$11,000,000	$11,000,000	$38,000,000	$161,010,000
Remedial measures	$0	$1,330,000	$3,980,000	$3,980,000	$3,980,000	$0	$0	$13,270,000
Water acquisition	$2,000,000	$6,870,000	$7,860,000	$5,860,000	$5,000,000	$5,000,000	$17,410,000	$50,000,000
Total (in 2003 dollars)	$56,070,000	$137,700,000	$110,820,000	$99,910,000	$40,720,000	$37,500,000	$143,460,000	$626,180,000

Notes:

[a] Assumptions used to develop this cost estimate are provided in Sections 7.1.1–7.1.14.

[b] A total of $25,000,000 would be contributed for maintenance of existing habitat, with $2,500,000 contributed in years 1–5 and $22,500,000 in years 6–10. These contributions would be placed in an interest-bearing account and used for maintaining existing habitat throughout the 50-year term of the LCR MSCP.

area for conservation areas that are on undeveloped land and would require additional design.

For additional assumptions the planning, design, and engineering cost category, see Section N.3 in Appendix N.

7.1.4 Habitat Creation

It is assumed that 5,940 acres of cottonwood-willow, 1,320 acres of honey mesquite, 360 acres of backwaters, and 512 acres of marsh would be created as part of the LCR MSCP. It is assumed that approximately 8 percent of the land cover types would be created in years 1–5, and approximately 30 percent would be created in years 6–10, 11–15, and 16–20, respectively. Although the schedule for creating LCR MSCP habitat assumes that all LCR MSCP habitat will be established over 30 years (Section 5.10, "Timing of Implementing Conservation Measures"), the cost estimate assumes that all the habitat could be created in the first 20 years of implementation if efficient habitat creation techniques are identified during the first few years of implementation.

Habitat creation includes costs for site preparation (including grading), planting stock, materials, site construction (including excavation), and irrigation system construction. The average creation costs per acre of each land cover type for those potential conservation areas for which a cost summary was developed are described in Table 7-2.

Table 7-2. Creation Costs per Acre by Land Cover Type and Method

Land Cover Type	Method	Existing Land Cover Type	Cost per Acre
Cottonwood-willow	Creation	Undeveloped land	$30,500
Cottonwood-willow	Creation	Agricultural land	$4,900
Mesquite	Creation	Undeveloped land	$11,600
Mesquite	Creation	Agricultural land	$4,600
Marsh	Creation	Marsh	$22,500
Backwaters	Creation	River and undeveloped land	$60,000

It is assumed that 40 percent of cottonwood willow and honey mesquite creation would occur on undeveloped land and 60 percent would occur on agricultural land.

Staff costs are assumed to include two-thirds of the positions and two-thirds of travel costs listed under the planning, engineering, and design cost category (Section 7.1.3). It is assumed that these positions would be funded annually for years 1–20.

For additional assumptions about the habitat creation cost category, see Section N.4 in Appendix N.

7.1.5 Environmental Compliance

It is assumed that environmental compliance would be required for all creation projects associated with conservation areas. It is assumed that creation projects of different sizes would incur different levels of environmental compliance costs. Environmental compliance costs include average costs for contracting the preparation and submittal of compliance documents and applications associated with the regulations and permits listed below.

- NEPA;
- sections 401 and 404 of the Federal Clean Water Act;
  - Nationwide Permit 27, "Stream and Wetland Restoration Activities;" and
- section 106 of the National Historic Preservation Act (NHPA) (cultural resource inventory only; if significant cultural resources are found, the cost of compliance with section 106 of the NHPA would increase considerably).

For additional assumptions about the environmental compliance cost category, see Section N.5 in Appendix N.

7.1.6 Fish Augmentation

Fish augmentation costs include the costs associated with spawning and rearing razorback sucker and bonytail, conducting research, and tagging and distributing the fish. It is assumed that four existing fish rearing facilities would rear 660,000 razorback sucker and 620,000 bonytail over the 50 years of the LCR MSCP: Willow Beach National Fish Hatchery, Achii Hanyo (a satellite facility of Willow Beach National Fish Hatchery), Dexter Technical Center, and Bubbling Ponds Hatchery. In addition, it is assumed that isolated rearing ponds would be used to complete rearing of both species and to conduct research. If additional facilities are needed, the LCR MSCP implementing entity would work with possible providers of additional facilities to meet the need.

For additional assumptions about the fish augmentation cost category, see Section N.6 in Appendix N.

7.1.7 Conservation Area Management and Maintenance

Conservation area management and maintenance include the costs associated with site managers; maintenance staff; law enforcement and firefighting personnel; and management and maintenance facilities, equipment, utilities, and activities. These staff, facilities, and equipment are in addition to the staff, facilities, and equipment for program administration described in Section 7.1.1. Conservation area management and maintenance employees that are expected to be funded are two site managers, two supervisors, two full-time laborers, and two half-time laborers.

These costs are based on the assumption that management and maintenance personnel would be Reclamation employees. Annual costs for each position include the salary, benefits, and overhead costs described under the program administration cost category (Section 7.1.1). However, conservation area management and maintenance staff would report to the Yuma regional office, where regional office overhead is 15 percent higher.

It is assumed that there would be one site manager for every 5,000 acres of conservation area land and one laborer for every 2,000 acres of conservation area. A field facility would be built for every site manager. It is assumed that one vehicle would be leased for every site manager, and one vehicle would be leased for every two maintenance workers.

Additional maintenance costs include the costs to maintain this other equipment, fences, and roads; to pump water for irrigation of creation sites; to dredge backwaters; to control cowbirds; and to maintain nesting boxes.

In addition to routine maintenance performed by the site managers and laborers, it is assumed that major habitat maintenance would be conducted by staff from the Yuma area office. Major habitat maintenance includes replacement and maintenance of the equipment required for such maintenance.

For additional assumptions about the conservation area management and maintenance cost category, see Section N.7 in Appendix N.

7.1.8 Law Enforcement Staff

It is assumed that BLM, USFWS, AGFD, CDFG, and NDOW employees would conduct law enforcement activities, and that the LCR MSCP would fund the appropriate number of employees needed to cover additional LCR MSCP land (land that was not already in public ownership).

The cost of employing this additional staff is based on the cost per employee per year of Reclamation law enforcement staff.

It is assumed that one additional law enforcement officer would be needed for each additional 5,000 acres of conservation area. To put this number in context, the current level of law enforcement along the LCR corridor is approximately one law enforcement employee per 24,000 acres. This number is based on the number of employees from the BLM, AGFD, CDFG, NDOW, and USFWS that currently work along the river corridor and is based on the assumption that the area covered by law enforcement along the LCR is similar in extent to the LCR MSCP planning area (Werner pers. comm.). Most employees work just along the river corridor; however, some employees have districts that are not limited to the river corridor, so the number might be an underestimate. In addition, sheriff offices along the river occasionally patrol the river; watercraft officers regularly patrol by boat, primarily to enforce watercraft laws (Werner pers. comm.).

For additional assumptions about the law enforcement staff cost category, see Section N.8 in Appendix N.

7.1.9 Wildland Firefighting Staff

It is assumed that the LCR MSCP would also fund the appropriate number of wildland firefighters needed to cover additional LCR MSCP land (land that was not already in public ownership). It is expected that one additional wildland firefighter would be needed for each 2,500 acres of conservation area. This is believed to be more than sufficient because the Lower Colorado River Interagency Fire Management Group (which is the consolidated fire program for the BLM, USFWS, and BIA in the approximately 3 million acres covered by the BLM's Lake Havasu and Yuma field offices and other USFWS and BIA lands within the field office boundaries) employs 33 people, with jobs ranging from fire management officer to crew person (Werner pers. comm.). This number equates to approximately one fire-related employee per 91,000 acres.

It is assumed that the site manager and maintenance personnel (Section 7.1.7) would implement the fire management plan.

For additional assumptions about the wildland firefighting staff cost category, see Section N.9 in Appendix N.

7.1.10 Existing Habitat Maintenance

In years 1–5, $2,500,000 would be contributed for maintenance of existing habitat. This contribution would be placed in an interest-bearing account and used for maintaining existing habitat throughout the 50-year LCR MSCP. An additional $22,500,000 will be deposited in the account during years 6–10. This additional contribution will provide a total of $25,000,000 to be used for the maintenance of existing habitat within the planning area of the LCR MSCP.

7.1.11 Topock Marsh Pumping

It is assumed that pumps would be purchased to deliver water to Topock Marsh and that the cost of pumping throughout the 50-year LCR MSCP would be covered. For additional assumptions about the Topock Marsh pumping cost category, see Section N.10 in Appendix N.

7.1.12 Monitoring, Research, and Adaptive Management

Monitoring, research, and adaptive management costs include restoration research, species research, postdevelopment monitoring, and system monitoring. These costs are based on extrapolation of Reclamation's current monitoring and research costs to cover the entire LCR MSCP monitoring, research, and adaptive management program.

System monitoring would include the monitoring of existing populations and habitats of covered species to determine their status, distribution, density, migration, productivity, and other ecologically important parameters. System monitoring would be implemented annually, with decreasing intensity over the term of the LCR MSCP. Costs for system monitoring would include the development of a monitoring database.

Species research includes research on basic life history data such as food habits; migration timing; and the physical, chemical, and biological limiting factors necessary to design, construct, and manage the habitats necessary to ensure the continued survival of the species. It is assumed that the LCR MSCP would coordinate with, participate in, and/or build upon existing research for these species.

Restoration research includes basic research on cottonwood-willow, honey mesquite, marsh, and backwater development and management. Research would be conducted on such topics as seed collection and dispersal; irrigation techniques; soil conditioning techniques; fish rearing techniques; and equipment needs, use, and storage. In addition, site evaluations would be conducted to collect the information necessary to select conservation areas based on the conservation area site selection criteria.

Postdevelopment monitoring includes evaluation of the development of covered species habitat in each conservation area (e.g., growth of vegetation, development of constituent elements of species habitat) and use of the habitat by covered species. Data collected about how created habitat develops relative to the habitat creation techniques used to establish and maintain the habitat will be used to refine management techniques and ensure that the most cost-effective approaches are employed (e.g., water management). In addition, postdevelopment monitoring for created habitats also includes monitoring of the minimum requirements for achieving habitat creation goals. Management of the monitoring database is also included under postdevelopment monitoring.

For additional assumptions about the monitoring, research, and adaptive management cost category, see Section N.11 in Appendix N.

7.1.13 Remedial Measures

Remedial measures are actions that the LCR MSCP Implementing Entity will take in response to changed circumstances. It is assumed that the cost of remedial measures will be 10 percent of the total cost of habitat creation. This assumption is based on the following considerations.

- Based on past experience developed through habitat restoration projects implemented in the LCR MSCP planning area, techniques for creating habitats along the LCR have improved substantially and the likelihood for success is considered to be greater than for past efforts.
- Unlike past habitat restoration efforts, the LCR MSCP Conservation Plan criteria for selecting habitat creation sites are designed to select sites with the greatest potential for success (e.g., agricultural lands), thus removing a primary cause for the failure of past habitat restoration efforts.

- Unlike past habitat restoration efforts, the LCR MSCP Conservation Plan includes funding for long-term care and maintenance of created habitats (i.e., there are funds committed for averting failure through ongoing habitat maintenance activities that are in addition to funding provided for remedial measures).
- The LCR MSCP Conservation Plan provides funding for long-term monitoring and research to provide information necessary to adaptively manage its implementation to improve implementation success over time. Through adaptive management, therefore, it is expected that the likelihood for failure of created habitats will continuously decline over time as methods are improved.
- Techniques for rearing razorback sucker and bonytail are now well advanced and the likelihood for failure is low.

7.1.14 Water Acquisition

Water acquisition costs can be calculated in a number of ways. For example, water rights can be bought or leased by the acre along with agricultural lands or, when land does not come with associated water rights, water can be bought separately by the acre-foot. In addition, an annual use fee, or "indemnification fee," of some predetermined contractual amount could be paid for fallowing land. The majority of the proposed programs along the LCR to date (Metropolitan-PVID and Metropolitan-IID) have involved a water conservation program that has created water for use in the M&I sectors outside of the LCR MSCP planning area. Consequently, the costs associated with these programs reflect the costs associated with the water conservation program and the subsequent shift to the urban sector. These costs may not accurately reflect the costs associated with conserving water in an agricultural district and then using the saved water for habitat conservation purposes in another portion of the same district or in the same general locale. The water purchase cost that is used in this cost estimate is based on the costs recently agreed to between PVID and Metropolitan, and is assumed to be $206 per acre-foot.

For additional assumptions about the water acquisition cost category, see Section N.12 in Appendix N.

7.2 Funding Sources and Assurances

By letters dated August 17, 2004 the water and power agencies of Arizona, California, and Nevada committed to the Secretary of the Interior to share the current estimate of LCR MSCP costs equally with the United States on a 50/50 Federal/non-Federal basis. The Federal and non-Federal funding levels will be adjusted in accordance with an inflation index to assure that the funding is sufficient to provide for increased costs due to inflation through the term of the LCR MSCP.

The Federal parties agree to assure funding of their 50 percent share of the LCR MSCP costs. In addition, the Federal parties agree to assure funding for any increased cost of the LCR MSCP, except for inflationary increases as described above and any costs

associated with coverage of any additional species or resulting from any additional covered actions or activities.

The non-Federal parties agree to assure funding of their 50 percent cost share. The non-Federal cost share will be paid as follows: California parties will pay 50 percent of the non-Federal share of the costs, and Arizona and Nevada parties will each pay 25 percent of the non-Federal share of the costs.

To confirm their funding commitments, the non-Federal parties will execute an FMA providing for the funding, implementation and management of the LCR MSCP. The draft final FMA is attached to this HCP as Exhibit A. The final form and execution of the FMA by each non-Federal party is subject to the approval and authorization of the governing body of that party.

Chapter 8
Assurances

This chapter provides a discussion of the assurances requested by the Applicants from the USFWS under the "no surprises rule" (50 C.F.R. §§17.22(b)(5), 17.32(b)(5), and 222.307(g)) when the Applicants become Permittees under the LCR MSCP section 10(a)(1)(B) permit. The Applicants and the USFWS will execute an Implementation Agreement that assures the LCR MSCP will be implemented by the Federal and non-Federal parties in accordance with the ESA, the section 10(a)(1)(B) permit, and the section 7 BO. The draft final of the Implementation Agreement is attached to this HCP as Exhibit B. The final form and execution of the Implementation Agreement by each non-Federal party is subject to the approval and authorization of the governing body of that party.

Through the section 10(a)(1)(B) permit and the Implementation Agreement, the USFWS will provide assurances and other commitments to the Permittees. These include the assurance that, provided the Permittees have complied with their obligations under the HCP, the section 10(a)(1)(B) permit, and the Implementation Agreement, the USFWS can require Permittees to provide mitigation only in accordance with applicable Federal law and regulations and the terms of the Implementation Agreement.

On June 10, 2004, the court in *Spirit of the Sage Council v. Norton*, Civil Action No. 98-1873 (D.D.C.) ordered that, until the USFWS completes a rulemaking on revocation standards for incidental take permits, the USFWS may not approve new incidental take permits or related documents containing "no surprises" assurances. The order specifically allows for the USFWS to issue incidental take permits that do not contain "no surprises" assurances. Therefore, the "no surprises" assurances contained in this HCP and the Implementation Agreement are currently unenforceable and ineffective with respect to the LCR MSCP section 10(a)(1)(B) permit. The remainder of the permit, the HCP, and the Implementation Agreement will remain in full force and effect to the maximum extent permitted by law. In addition, in the event that any future judicial decision or determination holds that the "no surprises" assurances rule (or similar successive rule) is vacated, held unenforceable or enjoined for any reason or to any extent, the LCR MSCP section 10(a)(1)(B) permit, the HCP, and the Implementation Agreement shall be enforceable only to the degree allowed by any such decision or determination, provided that the remainder of the section 10(a)(1)(B) permit, the HCP, and the Implementation Agreement shall remain in full force and effect to the maximum extent permitted by law. In the event that the "no surprises" assurances rule is vacated, held unenforceable, or enjoined by a judicial decision or determination, including the June 10, 2004 order described above, but is later reinstated or otherwise authorized, the assurances provided under the reinstated or revised rule shall automatically apply to the LCR MSCP section 10(a)(1)(B) permit, the HCP, and the Implementation Agreement in

place of the "no surprises" assurances provisions contained in those documents. If, in response to any judicial decision or determination, the "no surprises" assurances rule is revised, the "no surprises" assurances provisions in the LCR MSCP section 10(a)(1)(B) permit, the HCP, and the Implementation Agreement shall be automatically amended in a manner consistent with the revised rule. Pursuant to the June 10, 2004 order in *Spirit of the Sage Council v. Norton*, Civil Action No. 98-1873 (D.D.C.), until the USFWS adopts new revocation rules specifically applicable to incidental take permits, all incidental take permits issued by the USFWS shall be subject to a general revocation standard in 50 C.F.R. §13.28(a)(5). Additionally, notwithstanding anything to the contrary in the HCP and Implementation Agreement, the USFWS retains statutory authority, under both sections 7 and 10(a)(1)(B) of the ESA, to revoke incidental take permits that are found likely to jeopardize the continued existence of a listed species.

Chapter 9

Alternatives to Take Considered and Rejected

The ESA requires that section 10(a)(1)(B) permit applicants specify in the HCP what alternative actions to the taking of Federally listed species were considered and the reasons why those alternatives are not proposed to be used (50 CFR §17.22(b)(1)(iii)(C)). The USFWS/National Marine Fisheries Service HCP Handbook (U.S. Fish and Wildlife Service/National Marine Fisheries Service 1996) identifies two alternatives commonly used in HCPs: 1) an alternative that would reduce take below levels anticipated for the proposed project and 2) an alternative that would avoid take and hence not require a permit from USFWS ("no-action alternative"). This chapter identifies alternative measures considered that would minimize or avoid the potential for take of each Federally listed species covered in this HCP. These measures were not included in the LCR MSCP Conservation Plan because they were determined not to be practicable.

9.1 River Operations and Water Conveyance Alternatives to Avoid the Taking of Listed Species

Alternatives were considered that would avoid or reduce take of razorback sucker, bonytail, southwestern willow flycatcher, and Yuma clapper rail that result from ongoing river operations and proposed future operations. These alternatives include modified operations of the LCR dams and construction of new water conveyance systems to reduce the adverse effects on these listed species.

9.1.1 Modify Operations of LCR Dams for Water Delivery and Power Generation

This alternative would involve the modification of present LCR dam operations in the delivery of 7.5 maf of water plus surplus flows and the generation of power to reduce the extent of stranding of razorback sucker and bonytail and to prevent the loss of habitat for razorback sucker, bonytail, southwestern willow flycatcher, and Yuma clapper rail that results from fluctuating river flows and declines in surface water elevations and groundwater elevations. Major dams on the LCR are, from north to south, Hoover Dam, Davis Dam, Parker Dam, Headgate Rock Diversion Dam, Palo Verde Diversion Dam, Imperial Dam, Laguna Dam, and Morelos Diversion Dam. Reclamation-operated

Hoover, Davis, and Parker Dams are the most influential structures on the LCR and are critical to controlling the flow patterns of river. The principal responsibilities of Reclamation in managing the LCR are:

- flood control, improvement of navigation, and river regulation;
- storage and delivery of Colorado River water for reclamation of lands and municipal, industrial, and other beneficial purposes; and
- generation of electrical power.

Reclamation is also responsible for deliveries of Colorado River water to Mexico under the 1944 Water Treaty.

Existing physical conditions restrict the ability of Reclamation to modify operations of LCR dams to avoid or minimize take. For example, controlled releases from Hoover Dam are limited to approximately 73,000 cfs, controlled releases from Davis Dam are limited to 44,000 cfs, and controlled releases from Parker Dam are limited to 22,600 cfs. Limitations on controlled release levels limit the ability to create peak flows similar to historic, predam conditions of approximately 120,000 cfs. The existing dams along the LCR have altered sediment transport characteristics of the river, which has resulted in the lowering of the river bed and water surface, thereby substantially increasing the flows needed to achieve overbank flooding that would benefit riparian habitat. Hydrologic and hydraulic analyses by Reclamation indicate that flows of 50,000 cfs are the threshold for overbank inundation for most of the undeveloped portions of the LCR (areas with natural or unarmored banklines). These physical limitations of the existing facilities and river channel restrict the extent to which river operations can be modified to benefit razorback sucker, bonytail, southwestern willow flycatcher, and Yuma clapper rail.

The Law of the River severely constrains Reclamation's flexibility in operations of its dams on the LCR. Actions by Reclamation in the operation of LCR dams are, for the most part, nondiscretionary. A detailed description of Reclamation's discretionary and nondiscretionary actions on the LCR is provided in Chapter 2 of the LCR MSCP BA, the companion document to this LCR MSCP HCP. The LCR MSCP Conservation Plan includes measures (see conservation measure RASU7) by which Reclamation will conduct discretionary actions to continue existing operations on Lake Mead and Lake Mohave that minimize take and benefit razorback sucker and bonytail during the term of the LCR MSCP. The constraints imposed on Reclamation by the Law of the River are such that discretionary modifications to present operations could not be implemented that would result in avoidance or substantial reduction in take of razorback sucker, bonytail, southwestern willow flycatcher, or Yuma clapper rail. No practicable means exists for Reclamation to modify operations of LCR dams to avoid take of these species.

9.1.2 Construct New Water Conveyance Systems for Water Transfers

This alternative would involve the construction of new conveyance facilities to reduce the extent of stranding of razorback sucker and bonytail on the LCR and to prevent the loss of habitat for razorback sucker, bonytail, southwestern willow flycatcher, and Yuma

clapper rail that results from declines in surface water elevations and groundwater elevations in the LCR MSCP planning area. The proposed future changes in points of diversion of up to 1.574 maf of LCR flow are needed to accomplish water transfers in California, Arizona, and Nevada. These changes in points of diversion from downstream to upstream locations would result in surface water and groundwater declines in Reaches 3–5. As an alternative to changing the points of diversion on the LCR, existing points of diversion could be used to accomplish water transfers if new water conveyance facilities were constructed. For example, the transfer of water from IID to SDCWA, as proposed, would be implemented by changing the point of diversion from Imperial Reservoir to Lake Havasu such that water can be conveyed via the Colorado River Aqueduct to SDCWA. This covered activity is expected to result in surface water and groundwater declines in Reaches 4 and 5 that would result in take of razorback sucker, bonytail, southwestern willow flycatcher, and Yuma clapper rail. The existing diversion at Imperial Reservoir could be used to deliver water to SDCWA if the AAC was extended to reach SDCWA facilities in San Diego. Considering the substantial logistical difficulties and high cost of tunneling and lifting this water across the Peninsular Ranges and the potential for take of additional ESA-listed species (in desert and coastal southern California) to extend the AAC in comparison to using the existing Colorado River Aqueduct, this alternative was rejected as not practicable.

It is not possible to analyze the feasibility of extending existing conveyance facilities in Arizona and Nevada to avoid impacts associated with the change in points of diversion. No specific transfers have been identified at this time, so the physical location of the source and the destination of Colorado River water that may be transferred in the future is uncertain. Additional information about the physical, legal, and cost constraints of alternative strategies cannot reasonably be evaluated without additional information.

9.2 Alternative Measures to Avoid the Taking of Southwestern Willow Flycatcher

The primary mechanism resulting in impacts on southwestern willow flycatcher is the decline in groundwater that adversely affects moist soils and ponded water that support flying insect prey abundance, the vegetative composition and structure that support nesting habitat, and the regeneration of vegetation that supports habitat. This potential loss of habitat could result in harm (i.e., death or injury) to southwestern willow flycatcher and hence could constitute take. An alternative measure that would minimize or avoid take of southwestern willow flycatcher is to prevent groundwater decline by supplementing existing habitat sites with irrigation water. This measure would require the engineering of most or all southwestern willow flycatcher habitat identified as potentially affected by covered activities. Engineering methods would include pumps, irrigation pipe, and appurtenant facilities. Most sites would require the construction of access roads and electrical connections to operate the irrigation systems. Irrigation would be managed by maintenance staff to ensure proper timing of supplemental water application. This approach to avoiding take of southwestern willow flycatcher will be implemented under the LCR MSCP Conservation Plan at Topock Marsh where large patches of willow flycatcher habitat are supported and water management infrastructure is present. At Topock Marsh, existing pump and delivery facilities will be improved to

address potential lower river and groundwater levels and ensure that impacts on willow flycatcher habitat are avoided.

This alternative to the take of southwestern willow flycatcher was rejected based on logistical, cost, legal, and effectiveness considerations. While some existing flycatcher habitat may be accessible for establishing irrigation systems (e.g., Topock Marsh), many of these habitat sites are small patches with no present access or electrical connections. The logistics of providing access and electrical connections for pumping equipment to all habitat patches is impractical and would likely result in substantial impacts on biological and other resources. Land ownership patterns may also prevent access. The inefficiency of developing the infrastructure, providing staff, and paying for water for a large number of small sites would be prohibitively expensive relative to concentrating habitat into a smaller number of larger sites. Southwestern willow flycatcher habitat patches are widely distributed across the LCR and pumping water directly from the adjacent river may not be feasible in some locations. Each habitat site will have a unique set of topographic, hydrologic, soil, and vegetation characteristics, and in many cases it is likely that irrigation water would not be effective in preventing impacts on habitat.

9.3 Alternative Measures to Avoid the Taking of Yuma Clapper Rail

The primary mechanism resulting in impacts on Yuma clapper rail is the decline in surface- and groundwater that adversely affects marsh and open water habitats that support this species. This potential loss of habitat could result in harm (e.g., death or injury) to Yuma clapper rail and hence could constitute “take” under the ESA. An alternative measure that would minimize or avoid the take of Yuma clapper rail is to prevent surface- and groundwater decline by supplementing existing habitat sites with water. This measure would require the engineering of most or all Yuma clapper rail habitat identified as potentially affected by covered activities. Engineering methods would include pumps, conveyance pipe, and appurtenant facilities. Most sites would require the construction of access roads and electrical connections to operate the pump systems. Pumping would be managed by maintenance staff to ensure proper timing of supplemental water application. This approach to avoiding take of Yuma clapper rail will be implemented under the LCR MSCP Conservation Plan at Topock Marsh where large patches of rail habitat are supported and water management infrastructure is present. At Topock Marsh, existing pump and delivery facilities will be improved to address potential lower river and groundwater levels, and ensure that impacts on Yuma clapper rail habitat are avoided.

This alternative to the take of Yuma clapper rail was rejected based on logistical, cost, legal, and effectiveness considerations. While some existing Yuma clapper rail habitat may be accessible to provide supplemental water (e.g., Topock Marsh), many of these habitat sites are small patches with no present access or electrical connections for pumping equipment. The logistics of providing access and electrical connections to all habitat patches is impractical and would likely result in substantial impacts on biological and other resources. Land ownership patterns may also prevent access to habitat sites. The inefficiency of developing the infrastructure, providing staff, and paying for water

for a large number of small sites would be prohibitively expensive relative to concentrating habitat into a smaller number of larger, accessible sites. Yuma clapper rail habitat patches are widely distributed across the LCR and pumping water directly from the adjacent river may not be feasible in some locations. Even at habitat sites where pump systems could be established, it is not certain that supplemental water would be sufficient to offset the adverse effects on habitat of declining surface and ground water. Each habitat site will have a unique set of topographic, hydrologic, soil, and vegetation characteristics and, in many cases, it is likely that supplemental water would not be effective in preventing impacts on habitat.

9.4 Alternative Measures to Avoid the Taking of Razorback Sucker, Bonytail, and Flannelmouth

The primary mechanism potentially resulting in the take of razorback sucker, bonytail, and flannelmouth is the loss of river and backwater habitats as a result of reductions in flow in Reaches 3–5 from proposed changes in points of diversion. In addition, these fish may be removed from the river through diversions and separated from their populations. To avoid flow reductions resulting from changes in points of diversion, an alternative to the take of these fish species considered is not to change points of diversion from downstream to upstream locations. This alternative would not meet the project purpose and is therefore rejected.

Impacts on fish resulting from diversions could be minimized by installing fish screens at all diversions. This alternative to the take of fish was rejected because installing fish screens on the large number of diversions from the LCR is prohibitive given the high cost and minimal benefit of the endeavor. The available fish screen technology would not prevent entrainment of larvae, the life stage likely most vulnerable to entrainment. Given the small proportion of the population potentially exposed to diversions (i.e., movement by the points of diversion), the level of mortality attributable to other factors (e.g., egg, larval, and juvenile predation), and unavoidable entrainment of the vulnerable larval life stage, fish screens would not benefit the species population to any measurable degree.

9.5 Alternative Measures to Avoid the Taking of Humpback Chub

The humpback chub has been extirpated from the LCR below Hoover Dam. Based on efforts to recover the humpback chub in the Colorado River upstream of Lake Mead, however, humpback chub could potentially inhabit transitory river segments of the Colorado River within the full-pool elevation of Lake Mead. The mechanism that could result in take of humpback chub is the periodic loss of transitory Colorado River segments that form in Lake Mead (and could be occupied by humpback chub when it is below full-pool elevation) and that are subsequently inundated when reservoir elevations rise. The number of humpback chub that could be affected over the term of the LCR MSCP, however, is expected to be relatively small. Impacts on the humpback chub could be minimized by changing reservoir operations. However, for the reasons described in

Section 9.1.1, "Modify Operations of LCR Dams for Water Delivery and Power Generation," this alternative is not considered practicable.

9.6 Alternative Measures to Avoid the Taking of Desert Tortoise

Covered activities under the LCR MSCP HCP, in combination with the implementation of the LCR MSCP Conservation Plan, are expected to result in some low, unquantifiable, level of direct mortality of individuals of desert tortoise associated with operation of vehicles and equipment in desert tortoise habitat over the 50-year term of the LCR MSCP. Small amounts of habitat suitable for desert tortoise could be removed as a result of non-Federal non-flow-related covered activities and implementation of the LCR MSCP Conservation Plan. However, the amount of habitat removal is expected to be minimal and is not expected to result in harm (i.e., injury or mortality of individuals). Measures to avoid and minimize direct mortality of tortoises and the removal of tortoise habitat are included in the conservation plan (conservation measures DETO1, DETO2, and AMM5). Federal actions addressed in the companion LCR MSCP BA (i.e., BIA-approved expansion of irrigated agricultural on tribal land) would result in more substantial impacts on desert tortoise habitat. These effects on desert tortoise are addressed in the LCR MSCP BA, and conservation measures to address these effects on desert tortoise are provided in the LCR MSCP Conservation Plan (conservation measures DETO1 and DETO2). All measures necessary to avoid and minimize take of desert tortoise by non-Federal entities have been included in the LCR MSCP Conservation Plan. These measures are practicable, and additional or alternative measures are not necessary.

Chapter 10

Experts Contacted and Peer Review Process

10.1 Experts Contacted

The individuals listed below are experts in the ecology and management of species addressed in the LCR MSCP Conservation Plan and habitats associated with the LCR. These individuals were contacted during the course of the development of the LCR MSCP Conservation Plan and provided some contribution of their knowledge and expertise.

Name	Title	Organization
Patti Aaron	Environmental Specialist—Biology	Bureau of Reclamation
Ray Ahlbrandt	GIS Specialist	Bureau of Reclamation
Rob Bettaso	Native Fish Program Manager	Nongame Branch, Arizona Game and Fish Department
Kathleen Blair	Ecologist	U.S. Fish and Wildlife Service, Bill Williams National Wildlife Refuge
Quenton Bradwich	Wildlife Biologist	Utah Division of Wildlife Resources, Page, Arizona
Patricia Brown	Bat Consultant	Bishop, California
Tom Burke	Biology Group Manager	Bureau of Reclamation
Andrew Clark	Fisheries Program Manager	Arizona Game and Fish Department
Don Clark	Wildlife Research Biologist	Texas A&M University, College Station, Texas
Robert W. Clarkson	Biologist	Bureau of Reclamation, Phoenix, Arizona
Courtney Conway	Assistant Director	Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona, Tucson, Arizona
Bruce Ellis	Supervisory Environmental Specialist	Bureau of Reclamation
Jackie Ferrier	Biologist	Imperial National Wildlife Refuge, U.S. Fish and Wildlife Service
Chester Figiel	Hatchery Manager	Willow Beach National Fish Hatchery, U.S. Fish and Wildlife Service

Name	Title	Organization
Terry Fulp	Boulder Canyon Area Office Manager	Bureau of Reclamation
Glen Gould	Ecologist	Bureau of Reclamation
Wayne Gustaveson	Wildlife Biologist	Utah Division of Wildlife Resources, Page, Arizona
Murrelet Halterman	Ornithologist	Southern Sierra Research Station, Weldon, Kern Co.
Charles Harris	Wildlife Biologist	Idaho Department of Fish and Game, Boise, Idaho
William Hunter	Research Ecologist	U.S. Fish and Wildlife Service
William Bradford Jacobson	Fisheries Program Manager	Arizona Game and Fish Department
Nathan Lenon	Environmental Specialist—Biology	Bureau of Reclamation
Paul C. Marsh	Associate Professor	Department of Biology, Arizona State University, Tempe, Arizona
Zane Marshall	Principal Biologist	Southern Nevada Water Authority
Julie Martinez	GIS Specialist	Bureau of Reclamation
Chuck McAda	Fish Biologist	Grand Junction, Colorado, U.S. Fish and Wildlife Service
Robert McKernan	Ornithologist	San Bernardino Natural History Museum, Redlands, California
Marty Meisler	Senior Environmental Specialist	The Metropolitan Water District of Southern California
Chuck Minckley	Fish Biologist	U.S. Fish and Wildlife Service
Wendell L. Minckley	Professor	Department of Zoology and Center for Environmental Studies, Arizona State University, Tempe, Arizona
Terry Murphy	Ecological Restoration Group Manager	Bureau of Reclamation
Theresa Olson	Wildlife Biologist	Bureau of Reclamation
Frank Pfeifer	Biologist; Project Leader for Vernal Field Station	U.S. Fish and Wildlife Service, Vernal, Utah
Fred Phillips	Director	Phillips Consulting
Elizabeth Pierson	Bat Biologist	Berkeley, California
Barbara Raulston	Wildlife Biologist	Bureau of Reclamation
Jim Rorabaugh	Biologist	U.S. Fish and Wildlife Service
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10.2 Peer Review Process

The LCR MSCP Steering Committee commissioned two separate scientific reviews of interim conservation strategy documents during program development in 1999 and 2002. The two review processes are described below. Both groups of reviewers were asked to focus on the technical and scientific merits of the respective documents. Policy and political issues related to HCP development were considered outside of the expertise of the scientific panels and were not included in the review. Also, because the documents were still in draft stage, the reviewers did not address issues regarding technical writing.

10.2.1 American Institute of Biological Sciences 1999 Review

The first scientific review was conducted by the American Institute of Biological Sciences (AIBS) from June through October 1999. The subject of the review was the *Draft Conservation Strategy for the Lower Colorado River Multi-Species Conservation Program* prepared by Ogden Environmental and Energy Services Co., Inc. (Ogden). The objective was to review the draft Conservation Strategy for completeness and scientific merit, to aid in preparing the draft strategy for approval and endorsement by the LCR MSCP Steering Committee. The draft Conservation Strategy was an interim product intended to detail the scientific approach and technical knowledge to be used in the subsequent development of a conservation plan.

AIBS convened a six member panel comprising:

Bertin W. Anderson, Ph.D. (Panel Chair): Bertin W. Anderson is founder and President of the Revegetation and Wildlife Management Center. His expertise lies in classifying wildlife densities associated with southwestern riparian and marsh habitat on a species-by-species basis for terrestrial vertebrates, specifically birds and small mammals.

James E. Deacon, Ph.D.: James E. Deacon is Distinguished Professor, University of Nevada Las Vegas, Department of Environmental Studies. He specializes in the conservation of desert fishes.

Laura F. Huenneke, Ph.D.: Laura F. Huenneke is Professor and Department Chair, New Mexico State University, Department of Biology. She has considerable expertise in assessing spatial and temporal patterns in desert community primary productivity.

Robert D. Ohmart, Ph.D.: Robert D. Ohmart is Professor of Biology, Department of Biology, Center for Environmental Studies, Arizona State University. He focuses on biotic and abiotic factors that are important in the development of proper function conditions in western streams; the ecology of western riparian obligate vertebrate species; and studying how the impacts of major stressors to these species can be mitigated to avoid species density reductions and extirpation.

Juliet C. Stromberg, Ph.D.: Juliet C. Stromberg is Associate Professor, at the Arizona State, University, Department of Plant Biology. She has worked extensively in the areas of riparian restoration in arid-region riparian ecosystems.

Gary Voelker, Ph.D.: Gary Voelker is Curator, University of Nevada Las Vegas, Barrick Museum of Natural History. He has field experience in the collection of avian specimens throughout the southwest. His research includes historical biogeography and the evolution of migration in widely distributed avian taxa.

One of the key recommendations of the panel was to change the approach utilized in the LCR MSCP from a species based approach to a habitat approach. This would entail creation of integrated habitat mosaics in areas along the river ranging from aquatic to mesquite communities.

The panel briefed the Steering Committee on their review and recommendations on July 12, 1999, and submitted a final report on October 28, 1999. Key recommendations included the following:

1. Employ a habitat-based, rather than species-based, approach.
2. Focus on restoration and management of an integrated mosaic of habitat types, including open water, backwater, marsh, riparian, and mesquite habitats,
3. Prioritize development and implementation of the conservation plan based on the following general cornerstone strategies:
    a. restore or rehabilitate natural ecological processes and conditions;
    b. protect, enhance, restore habitat and protect large blocks of habitat;
    c. directly manipulate biotic populations and restore natural biotic communities; and
    d. implement research, monitoring, and adaptive management.

10.2.2 M3 Research 2002–2003 Review

The second peer review process was conducted on the Conservation Plan between November 5, 2002 and January 21, 2003. In November 2002 M3 Research of Olathe, Colorado was requested to establish a review team and conduct a review of various LCR MSCP planning documents completed in 2002. Dr. Lawrence Garrett, Principal investigator of M3 Research, assisted by Dr. Lawrence E. Stevens, Stevens Consulting, Flagstaff, AZ, established the team, and Dr. Garrett facilitated the review. Three on-site meetings were conducted in Las Vegas, Nevada, to permit interaction among the LCR MSCP Steering Committee, LCR MSCP Science Review Subcommittee, LCR MSCP technical consultants, and the Science Review Team. A final report was submitted on January 21, 2003 to document the review.

The charge to the Science Review Team was to provide a review of the technical and scientific basis for the Conservation Plan as well as the provided information that supports the LCR MSCP. Specific attention was to be given to the habitat requirements of specified focus species, the research and monitoring plan, the conservation plan, and the proposed adaptive ecosystem management process. These areas were also addressed in responding to 20 questions posed by the LCR MSCP technical consultants and Steering Committee.

The Science Review Team of 6 members was selected from a list of 18 active, interdisciplinary scientists. Scientists were required to have working knowledge of ecosystems of the Southwest, but have no involvement with the LCR MSCP. Dr. L. David Garrett of M3 Research operated as the team leader, facilitating the science review effort and developing associated reports. He was supported in those efforts by Dr. Lawrence E. Stevens, Principal of Stevens Consulting.

The Science Review Team was comprised of the following members:

L. David Garrett, Ph.D.: David Garrett of M3 Research specializes in riparian and terrestrial restoration programs. Dr. Garrett's academic training is forest biology, ecosystem analysis, and economics. He has extensive experience in Southwest riparian, riverine and watershed systems assessment and restoration.

Lawrence E. Stevens, Ph.D.: Lawrence Stevens' academic background is in regulated river ecology, particularly riparian and plant ecology. He was the reviewer for plant and riparian ecology studies and planned management actions. Dr. Stevens also assisted Dr. Garrett in facilitating the review.

William E. Haas: William Haas is Principal Biologist with Varanus Biological Services Inc., San Diego. He has conducted extensive study of birds of the Southwest and West, and is an authority on western protected species.

David K. Kreamer, Ph.D.: David Kreamer is Professor of Geoscience and past Director of the Water Resources Management Graduate Program at the University of Nevada, Las Vegas. He has extensive expertise in flow evaluations and water quality.

Rich A. Valdez, Ph.D.: Rich Valdez is a certified Fisheries Scientist and principal Fish Ecologist for Valdez Consulting of Logan, Utah. He has conducted extensive systems studies of the long-lived native fishes of the Colorado River.

Ellen E. Wohl, Ph.D.: Ellen Wohl is a Professor of Hydrology at Colorado State University. She is an expert on flow and geomorphology, and their implications to biotic communities.

The Science Review Team concluded that:

1. The LCR MSCP technical consultant's approach was correct in preparing the Conservation Plan;
2. Mitigation offered is reasonable and commendable;
3. Data are lacking for nearly all species; therefore, there is significant weakness in the supporting science base;
4. Adaptive ecosystem management is the best approach to determining solutions;
5. A true MSCP is driven by an ecosystem approach and by a goal of achieving ecosystem health, but, because of the current lack of data, the LCR MSCP is more a mitigation program to avoid jeopardy;
6. The LCR MSCP Steering Committee should establish clear, appropriate criteria for selecting and prioritizing ecosystem programs/species to be included;
7. Front-loading the implementation phase with research and monitoring is needed to gain better insight on species needs and to test habitat restoration concepts before committing to large-scale actions;
8. An adequate process is needed by which stakeholder concerns are resolved or mitigated; and
9. Maintenance of broad stakeholder participation is critical to an adequate design.

The LCR MSCP Steering Committee accepted the report from the Science Review Team at its February 27, 2003 meeting. The Steering Committee agreed to accept the findings and recommendations of the report and instructed the technical consultants to incorporate them in the LCR MSCP Conservation Plan as appropriate.

Chapter 11

List of Preparers

11.1 LCR MSCP Preparers

Name	Title	Organization
Aaron, Patti	Environmental Specialist—Biology	Bureau of Reclamation
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11.2.1 SAIC

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11.2.2 Jones & Stokes

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11.2.3 Other Consultants

Name	Title	Organization
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Phillips, Fred	Director	Phillips Consulting
Stafford, Leslie	Consultant	EcoPlan Associates, Inc.

Chapter 12

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Exhibit A

Draft Final Funding and Management Agreement

Draft Final
11/22/04

LOWER COLORADO RIVER MULTI-SPECIES CONSERVATION PROGRAM

FUNDING AND MANAGEMENT AGREEMENT

(date to be inserted)

LOWER COLORADO RIVER
MULTI-SPECIES CONSERVATION PROGRAM

FUNDING AND MANAGEMENT AGREEMENT

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LOWER COLORADO RIVER
MULTI-SPECIES CONSERVATION PROGRAM

FUNDING AND MANAGEMENT AGREEMENT

1. PARTIES

This Lower Colorado River Multi-Species Conservation Program (LCR MSCP) Funding and Management Agreement (Agreement) is made and entered into by and among the following Parties:

Arizona Parties: The Arizona Department of Water Resources, the Arizona Game and Fish Commission, the Arizona Power Authority, the Central Arizona Water Conservation District, the Yuma Mesa Irrigation and Drainage District, the Yuma Irrigation District, the North Gila Valley Irrigation and Drainage District, the Wellton-Mohawk Irrigation and Drainage District, the Yuma County Water Users Association, the Salt River Project Agricultural Improvement and Power District, and the Mohave County Water Authority;

California Parties: The Coachella Valley Water District, the Colorado River Board of California, the Imperial Irrigation District, the Palo Verde Irrigation District, the San Diego County Water Authority, the Southern California Public Power Authority, Bard Irrigation District, California Department of Fish and Game, and The Metropolitan Water District of Southern California;

Federal Parties: The Bureau of Reclamation (Reclamation), the United States Fish and Wildlife Service (Service), the National Park Service (NPS), the Bureau of Indian Affairs (BIA), and the Bureau of Land Management (BLM), and the Western Area Power Administration (Western).

Nevada Parties: The Colorado River Commission of Nevada, the Nevada Department of Wildlife, Basic Water Company, and the Southern Nevada Water Authority.

2. RECITALS

A. Purposes

The Lower Colorado River Multi-Species Conservation Program is a cooperative effort between Federal and non-federal entities whose purposes are to:

- conserve habitat and work toward the recovery of threatened and endangered species, as well as reduce the likelihood of additional species being listed;
- accommodate present water diversions and power production and optimize opportunities for future water and power development, to the extent consistent with the law; and
- provide the basis for incidental take authorizations.

B. Memorandum of Understanding

In November 1994, the United States, through the U.S. Department of the Interior; the Arizona Department of Water Resources and the Arizona Game and Fish Commission; the Colorado River Board of California and the California Department of Fish and Game; and the Colorado River Commission of Nevada, and the Division of Wildlife of the Nevada State Department of Conservation and Natural Resources entered into a Memorandum of Understanding to create a forum for the consideration of all matters related to the effects of water and power resources development, management, operations, maintenance and replacement, and activities to offset those effects, to endangered, threatened, and candidate species within the historic floodplain of the mainstream of the Colorado River and from the full pool elevation of affected reservoirs (Lakes Mead, Mohave, and Havasu) downstream to the Southerly International Boundary with Mexico.

C. Memorandum of Agreement

On August 2, 1995, the parties to the Memorandum of Understanding entered into a Memorandum of Agreement for Development of a Lower Colorado River Multi-Species Conservation Program, which was clarified in a Memorandum of Clarification,

signed in June 1996, to acknowledge Federal activities within the 100-year floodplain of the lower Colorado River (LCR) which are subject to section 7 consultation under the Endangered Species Act (ESA) and to remove any implication of a guarantee of exemption for the signatories from the requirements of that act.

D. LCR MSCP Agreement

On June 26, 1996, the U.S. Department of the Interior and representatives of the three lower Colorado River basin states of Arizona, California, and Nevada entered into that certain "Lower Colorado River Multi-Species Conservation Program Agreement" by which they agreed, subject to appropriation, to a sharing between Federal Parties and State Parties of the costs of developing the LCR MSCP and implementing certain interim conservation measures during fiscal years 1996 through 1999.

E. Joint Participation Agreement

Effective on or about May 1, 1997, representatives of the U.S. Department of the Interior (on behalf of the Bureau of Land Management, the Bureau of Reclamation, the Fish and Wildlife Service, and the National Park Service) and the three lower Colorado River basin states of Arizona, California, and Nevada entered into that certain "Lower Colorado River Multi-Species Conservation Program Joint Participation Agreement" to jointly develop a Lower Colorado River Multi-Species Conservation Program and to formally establish the Steering Committee and other organizational structures necessary for the development of the LCR MSCP.

F. Cost Sharing Agreement

Effective on or about May 1, 1997, representatives of the three lower Colorado River basin states of Arizona, California, and Nevada entered into that certain "Lower Colorado River Multi-Species Conservation Program Inter-State Cost-Sharing Agreement" to provide funding commitments and arrangements with respect to the non-federal portion of the costs of the Program. That agreement was amended, effective February 15, 2001, to provide additional funding with respect to the non-federal portion of the costs of the Program for fiscal years 2000 through 2002. Funding for development of the LCR MSCP has been extended through the Effective Date of this Agreement.

G. Completion and Approval

The Parties now desire to implement the LCR MSCP over a 50-year period. To that end, the Parties are entering into this Agreement, in order to:

- Provide for the management and implementation of the LCR MSCP,
- Set forth the Federal and non-federal cost share, and
- Provide for Contributions to the LCR MSCP.

3. DEFINITIONS

The capitalized terms used in this Agreement shall have the meaning ascribed to them in this section. To the extent that the definitions incorporate covenants and agreements, such covenants and agreements shall bind the Parties. Terms used in this Agreement and specifically defined in the ESA or in regulations adopted by the Service under the ESA have the same meaning as in the ESA and those implementing regulations, unless this Agreement expressly provides otherwise.

1. **"2001 Biological Opinion"** means that biological opinion issued by the Service on January 12, 2001 entitled "Biological Opinion for Interim Surplus Criteria, Secretarial Implementation Agreements, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary, Arizona, California, and Nevada."

2. **"Adaptive Management Program"** means the program of Adaptive Management that will be undertaken by the Parties as part of the Conservation Plan as described in section 5.12 of the HCP.

3. **"Agreement" or "FMA"** means this Funding and Management Agreement.

4. **"BA"** means that biological assessment for the specified Covered Actions and prepared for the LCR MSCP by the Federal Parties and transmitted to the Service on *(date to be inserted)* in accordance with section 7 of the ESA.

5. **"Biological Opinion" or "BO"** means the section 7 biological opinion issued by the Service for the LCR MSCP.

6. **"Budget"** means the Program Implementation Budget of the LCR MSCP.

7. **"Chair"** means the elected Chairperson of the LCR MSCP Steering Committee.

8. **"Commissioner"** means the Commissioner of the Bureau of Reclamation and/or his/her designee.

9. **"Conservation Measure"** means measures identified in Chapter 5 of the HCP for the benefit of the Covered Species including specific activities implemented on an annual basis by the Program Manager or, in appropriate circumstances, other Parties to this Agreement.

10. **"Conservation Plan"** means the Habitat Conservation Plan described in section 11 of the Implementing Agreement.

11. **"Contribution"** means in-kind goods or services approved by the Steering Committee and Program Manager or funds provided to Reclamation to be used in implementing the LCR MSCP.

12. **"Contributor"** means a Party to this Agreement that makes a Contribution.

13. **"Covered Actions"** means those actions described in Chapter 2 of the BA, for which Incidental Take Authorization for Covered Species is sought pursuant to the LCR MSCP.

14. **"Covered Activities"** means those activities described in Chapter 2 of the HCP, for which Incidental Take Authorization for Covered Species is sought pursuant to the LCR MSCP.

15. **"Covered Species"** means those twenty-seven (27) species listed in Table 1-2 of the HCP for which Incidental Take Authorization for Covered Actions and Covered Activities is sought pursuant to the LCR MSCP.

16. **"Days"** means calendar days unless otherwise specified. If the date of performance is on a Saturday, Sunday, or observed state or Federal holiday, the date of performance shall be construed to be the next business day subsequent to the calculated date of performance.

17. **"Dispute"** means a controversy described in section 7 of this Agreement and which is subject to the process for resolution provided in section 7 of this Agreement.

18. **"Effective Date"** means the date on which this Agreement takes effect as provided in section 6.1 of this Agreement.

19. **"EIS/EIR"** means the joint environmental impact statement and environmental impact report issued pursuant to NEPA and the California Environmental Quality Act for the LCR MSCP.

20. **"ESA"** means the Federal Endangered Species Act of 1973, as amended.

21. **"Escrow Account"** means an interest bearing account established by one or more of the State Parties and made available to Reclamation to administer and implement the LCR MSCP.

22. **"Fiscal Year"** means the Federal fiscal year, beginning October 1 of one calendar year and ending September 30 of the following calendar year.

23. **"Habitat Conservation Plan"** or **"HCP"** means the habitat conservation plan prepared by the State Parties pursuant to section 10(a)(1)(B) of the ESA for purposes of the LCR MSCP.

24. **"Implementing Agreement"** or **"IA"** means that certain Lower Colorado River Multi-Species Conservation Program Implementing Agreement between the Federal Parties and the Permittees of the section 10(a) incidental take permit issued by the Service in connection with the LCR MSCP.

25. **"Incidental Take Authorization"** means, collectively, (i) the LCR MSCP section 10(a)(1)(B) incidental take permit and (ii) any incidental take statement issued by the Service as part of a Biological Opinion which authorizes take by Federal agencies pursuant to the LCR MSCP.

26. **"LCR MSCP**" means the Lower Colorado River Multi-Species Conservation Program.

27. **"Member"** means a member of the Steering Committee.

28. **"Participant Group"** means a group of organizations participating in the Steering Committee as described in section 7.3.1 of this Agreement.

29. **"Party"** means an entity that is a signatory to this Agreement. Such entities may be referred to individually as "Party" or collectively as "Parties."

30. **"Permit"** means the section 10(a)(1)(B) incidental take permit issued by the Service pursuant to the HCP for the LCR MSCP.

31. **"Permittee"** means a non-federal person, firm, or entity that has been authorized to take Covered Species pursuant to the IA and the Permit.

32. **"Program Account"** means a financial account established by Reclamation to manage funding associated with implementation of the LCR MSCP.

33. **"Program Documents"** means the HCP, BA, EIS/EIR, FMA, IA, BO, and the Permit.

34. **"Program Manager"** means an employee of Reclamation whose responsibility it is to plan for and take such actions as may be required to implement the LCR MSCP pursuant to the provisions of this Agreement and the IA.

35. **"Reclamation"** means the United States Bureau of Reclamation.

36. **"Secretary"** means the Secretary of the Interior and/or his/her designee.

37. **"State Parties"** means, collectively, the entities described as an Arizona Party, a California Party, and a Nevada Party.

38. **"Steering Committee"** means the body established by section 7.3 of this Agreement.

39. **"Voting Representative"** means the representative of a Member, designated pursuant to section 7.3.6 of this Agreement, who is authorized to vote and otherwise act in the Member's behalf on matters before the Steering Committee.

4. PRIORITY OF PROGRAM DOCUMENTS

4.1 Program Documents

The terms of this Agreement and the terms of the other Program Documents are intended by the Parties, and shall be interpreted, to be complementary. In the event of any conflict between the terms of this Agreement and the HCP, BA, or EIS/EIR, the terms of this Agreement will control. In the event of a conflict between the IA and this Agreement, the terms of this Agreement will control.

4.2 Permit Controls

The terms of the Permit and the terms of the other Program Documents are intended by the Parties, and shall be interpreted, to be complementary. In the event of any conflict among the terms of the Permit and other Program Documents, the terms of the Permit will control.

5. PREVIOUS AGREEMENTS SUPERSEDED

This Agreement and the IA are intended to be final and binding agreements among the Parties regarding the LCR MSCP. All other agreements and understandings, written or oral, which have previously been entered into or agreed to by and among the Parties prior hereto regarding the LCR MSCP are superseded by this Agreement and the IA. Notwithstanding the foregoing, nothing in this Agreement or the other Program Documents shall be deemed to supersede any agreement related to the 2001 Biological Opinion and the implementation of the reasonable and prudent measures set forth in the 2001 Biological Opinion.

6. EFFECTIVE DATE AND TERM

6.1 Effective Date

This Agreement shall become effective as of the date the Permit is issued by the Service.

6.2 Term of Agreement

This Agreement shall remain in effect for a term of fifty (50) years from the Effective Date, unless terminated or extended prior to that date.

7. MANAGEMENT AND IMPLEMENTATION

7.1 Management—In General

Management of the LCR MSCP and implementation of its terms and the terms of the Permit and the Biological Opinion shall be the responsibility of Reclamation, which, in consultation with the Steering Committee, will employ a person who shall be designated the Program Manager of the LCR MSCP. Reclamation shall cooperate with and coordinate its management and implementation activities for the LCR MSCP with the Service and the other Members of the Steering Committee.

7.2 Management by Reclamation

7.2.1 Program Manager

The Regional Director of the Lower Colorado Region of Reclamation (Regional Director), in consultation with the Steering Committee, shall appoint a Program Manager, who shall be responsible for operation, management, and implementation of the provisions, terms, and conditions of the Conservation Measures. The Program Manager shall be under the supervision of the Regional Director and shall have an office located within Arizona, California, or Nevada.

7.2.2 Duties of Program Manager

The Program Manager shall take appropriate action to implement the Conservation Plan and Conservation Measures and obligations set forth in this Agreement, consistent with the provisions of the Program Documents, including but not limited to the following:

A. Administer and implement the LCR MSCP in a manner that complies with the requirements of the ESA, other applicable Federal and state laws, and the Program Documents.

B. Direct the preparation of Program implementation schedules and cost estimates, an annual Program Implementation Work Plan and Budget and periodic Contribution payment schedules, and, as necessary, direct the preparation of any changes to these documents.

C. Establish one or more Program Accounts, as deemed necessary and appropriate, for the administration of funds from any Contributor or other participant in the LCR MSCP.

D. Review and discuss with, and attempt to seek a consensus among, Members of the Steering Committee and its subcommittees and work groups, including, without limitation, those matters described in section 7.3.12 of this Agreement, and attempt to resolve any Dispute in accordance with sections 7.3.14 and 7.3.15 of this Agreement.

7.3 Steering Committee

7.3.1 Established

The Parties hereby establish the Lower Colorado River Multi-Species Conservation Program Steering Committee whose initial Members have been divided into seven Participant Groups and are identified as:

1. *The Federal Participant Group:*
   - Bureau of Reclamation
   - Fish and Wildlife Service
   - National Park Service
   - Bureau of Land Management
   - Bureau of Indian Affairs
   - Western Area Power Administration

2. *The Arizona Participant Group:*
   - Arizona Department of Water Resources
   - Arizona Game and Fish Department (implementing entity for Arizona Game and Fish Commission)

- Arizona Power Authority
- Central Arizona Water Conservation District
- Yuma Mesa Irrigation and Drainage District
- Yuma Irrigation District
- North Gila Valley Irrigation and Drainage District
- Salt River Project Agricultural Improvement and Power District
- Wellton-Mohawk Irrigation and Drainage District
- Yuma County Water Users Association
- Mohave County Water Authority

3. *The California Participant Group:*

- Coachella Valley Water District
- Colorado River Board of California
- Bard Water District
- California Department of Fish and Game
- Imperial Irrigation District
- Palo Verde Irrigation District
- San Diego County Water Authority
- Southern California Public Power Authority
- The Metropolitan Water District of Southern California

4. *The Nevada Participant Group:*

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

5. *The Native American Participant Group:* (Note: Participant Group will be contacted to determine interest in being a member.)

6. *The Conservation Participant Group:* (Note: Participant Group will be contacted to determine interest in being a member.)

7. *The Other Interested Parties Participant Group:* (Note: Participant Group will be contacted to determine interest in being a member.)

Each Member shall be responsible for any costs incurred by Members in attending meetings and functions of the Steering Committee, any of its subcommittees, or its work groups.

7.3.2 Additional Members

The Steering Committee may consist of any number of participating organizations within the seven Participant Groups. The Steering Committee may provide in its by-laws, consistent with the provisions of section 7.3.3, if, when, and how, additional Members may be added to the Steering Committee subject to the following conditions.

A. Members within the Federal Participant Group must be agencies of the Federal government or entities created pursuant to Federal law.

B. Members within the Arizona Participant Group must be Permittees that undertake or implement Covered Activities within the state of Arizona.

C. Members within the California Participant Group must be Permittees that undertake or implement Covered Activities within the state of California.

D. Members within the Nevada Participant Group must be Permittees that undertake or implement Covered Activities within the state of Nevada.

E. Members within the Native American Participant Group must be Native American tribes whose lands are located adjacent to, or who divert water from, the LCR.

F. Members within the Conservation Participant Group must be conservation or environmental organizations having an interest in the LCR.

G. Members within the Other Interested Parties Participant Group must be public or private organizations not described in sections A through F, inclusive, that have an interest in the LCR, and wish to participate in the implementation of the LCR MSCP.

7.3.3 Application for Membership

Any interested public or private entity may apply for membership on the Steering Committee within the appropriate Participant Group, set forth in section 7.3.2 of this Agreement, by submitting a letter of interest to the Chair. The letter must:

A. Describe the nature of the organization and its interest in the affairs of the LCR MSCP.

B. Identify the Participant Group within which it wishes to participate.

C. Identify a contact for the organization or entity.

D. State that it will abide by the terms of this Agreement and the by-laws of the Steering Committee and regularly attend Steering Committee meetings.

At its next meeting the Steering Committee shall review the application. If the application complies with this section and the by-laws, the Steering Committee shall notify the entity and the Program Manager in writing that the entity may participate in the Program as a Member of the Steering Committee within the Participant Group specified in the Steering Committee's notice. Members shall not be required to be Permittees unless they are a Member of the Arizona, California, or Nevada Participant Groups. Acceptance of a new Member to the Steering Committee shall not constitute that entity's designation as a Permittee.

7.3.4 Suspension or Termination

The Steering Committee may suspend or terminate the membership of any Member if the Steering Committee determines that the Member no longer meets the conditions of eligibility for its Participant Group, or has dissolved, or has violated any provision of this Agreement or the by-laws of the Steering Committee.

7.3.5 Reinstatement

The Steering Committee may reinstate a suspended or terminated membership upon the application of the suspended or terminated Member and satisfaction of the provisions of section 7.3.3 of this Agreement.

7.3.6 Voting Representative

Within thirty (30) Days after the Effective Date of this Agreement or within thirty (30) Days of admission to membership, each Member shall, by written notice to the Program Manager, designate one representative who is authorized to vote and otherwise act in its behalf on matters before the Steering Committee. Each Member may appoint one or more alternates to act as its Voting Representative in the absence of its regular representative.

7.3.7 First Meeting of the Steering Committee and Adoption of By-Laws

The Steering Committee shall convene within sixty (60) Days after the issuance of the Permit. The Program Manager or another representative of Reclamation shall preside over the first meeting of the Steering Committee. At such meeting: 1) the Steering Committee shall elect officers as described in section 7.3.8; and 2) Reclamation shall propose a set of by-laws and/or operating procedures to facilitate execution of this Agreement. Such by-laws and/or operating procedures may only be adopted by a majority vote of the Voting Representatives. Modifications to the by-laws shall be made by majority vote.

7.3.8 Chair and Vice-Chair

At the first meeting of the Steering Committee following the Effective Date of this Agreement, and at its first meeting in each calendar year thereafter, the Steering Committee shall elect from among the Voting Representatives a Chair and a vice-chair who will serve until their successors have been elected and qualified as provided in this section. Any Voting Representative may serve as Chair or vice-chair, but the Chair and the vice-chair must represent Members in different Participant Groups.

7.3.9 Meetings of the Steering Committee

A. The Steering Committee shall meet at least twice in each calendar year and at such other times as called by the Chair or the Program Manager or as otherwise provided in the by-laws.

B. Each meeting of the Steering Committee must be open to the public, and any person attending a Steering Committee meeting may file a written statement, or provide reasonable and timely oral input regarding topics on the meeting agenda. The Steering Committee shall develop appropriate procedures to provide public notice of Steering Committee or subcommittee meetings. Nothing in this Agreement modifies the ability of Parties to this Agreement to conduct confidential discussions subject to applicable provisions of state and Federal law.

C. In order to facilitate the effective work of the Steering Committee, it is anticipated that Members will participate in all Steering Committee meetings in person. In the event that personal participation is not practical for any particular meeting, Voting Representatives of the Steering Committee may participate in a meeting by a telephone conference call at their own expense. A Voting Representative who participates by telephone shall be deemed present for purposes of quorum and voting.

D. The Program Manager shall cause minutes of each meeting of the Steering Committee to be prepared and clearly record each decision of the Steering Committee.

7.3.10 Quorum

A quorum shall be established by the Steering Committee by-laws, but must include Reclamation and at least one Party from the Arizona Participant Group, one Party from the California Participant Group, and one Party from the Nevada Participant Group.

7.3.11 Role of Steering Committee

In addition to those powers and authorities conferred or described elsewhere in this Agreement:

A. The Steering Committee shall work with the Program Manager to coordinate implementation of the LCR MSCP.

B. The Steering Committee may create standing or ad hoc subcommittees or work groups as it deems necessary to carry out its responsibilities under the Program Documents.

C. Except with respect to designating subcommittees and work groups, and except as otherwise provided in this Agreement, the Steering Committee shall have no decision-making authority with respect to the management and administration of the LCR MSCP.

D. As described in section 7.3.12 of this Agreement, the Steering Committee shall review certain matters presented by the Program Manager.

E. The Steering Committee shall appoint one Voting Representative from each of the Arizona, California, and Nevada Participant Groups to represent the interests of Permittees in any relevant consultation, conference, or re-initiation of consultation pursuant to section 7 of the ESA, as provided in sections 8, 9, 15.5 and 15.6 of the IA.

7.3.12 Review by Steering Committee

Prior to taking any action with respect to the following types of matters, the Program Manager shall first present the proposed action to the Steering Committee for its consideration:

A. Annual Implementation Report, Work Plan, and Budget and Contribution payment schedules related to the Program.

B. Additional or modified Conservation Measures proposed pursuant to the Adaptive Management Program.

C. Land and water acquisitions.

D. Reports and responses to Congress and Federal and state regulatory agencies concerning the Program, where practicable.

E. Financial reports and accountings.

7.3.13 Consensus

With respect to those matters that must be presented to the Steering Committee, the Parties intend that every effort should be made to have each such matter approved by a consensus of the Members. Consensus is reached when it becomes evident through deliberation that every Member, at the very least, does not oppose a decision. In its deliberations, the Steering Committee shall use appropriate tools for developing

consensus, and shall seek to exhaust every reasonable and practicable effort to reach consensus.

A. In the absence of a consensus, the Chair shall determine, pursuant to section 7.3.14 of this Agreement, whether there is sufficient opposition to the proposed action to constitute a Dispute. If the Chair determines there is a Dispute, until the dispute resolution process as herein described is completed, or the Dispute is otherwise resolved, the Program Manager shall not implement any action or decision which is the subject of the Dispute.

B. In the absence of a Dispute, the decision of the Program Manager shall be final.

7.3.14 Existence of Dispute

A. A Dispute exists where either, (i) any one of the three State Participant Groups, or (ii) an aggregate of at least six (6) votes, oppose a proposed action of the Program Manager as described in section 7.3.12 of this Agreement. In the event of a Dispute between any of the Federal Parties, representatives of the Federal Parties shall meet to resolve any such difference, as a supplementary approach to the provisions of this Agreement.

B. Each Voting Representative shall have a vote equal to the quotient of a fraction, the denominator of which is the number of Voting Representatives of that Participant Group who are present or participate by telephone and the numerator of which is five (5); provided, however, that no Voting Representative shall have more than one vote.

Voting by proxy is not permitted.

C. A State Participant Group shall be deemed to have opposed a proposed action of the Program Manager as described in section 7.3.12 of this Agreement where a majority of the Voting Representatives within that State Participant Group, present at the meeting, votes against the motion. In addition to the provisions of the preceding sentence, for each such State Participant Group, this method of calculating the dissent of the State Participant Group may be replaced by some other method described in a writing signed by the Voting Representative of each Member within the State

Participant Group and submitted to the Chair and the Program Manager at any time before the vote is taken.

7.3.15 Resolution of Disputes

A. Informal Dispute Process

After a vote of the Steering Committee, the Chair will determine whether a Dispute exists pursuant to the provisions of section 7.3.14 of this Agreement. In the event that a Dispute exists, the informal Dispute process shall be initiated pursuant to this subsection. The dissenting Members, singly or jointly, shall furnish to the Program Manager and each other Member, a written request to initiate the informal Dispute process. This request must, with reasonable specificity, identify the issue(s) in dispute and the relief sought. If such a request is not received by the Program Manager within ten (10) Days after the initial vote that determined the existence of a Dispute, the Dispute shall be deemed to be abandoned.

Any other Member may submit written comments to the Program Manager regarding the Dispute. Once the informal Dispute process is initiated, the Program Manager and the Chair will schedule a Steering Committee meeting to be held no later than thirty (30) Days, after the initial vote, specifically to discuss the issue(s) which are in Dispute. The Program Manager shall work with the Members of the Steering Committee to attempt to resolve the informal Dispute prior to the Steering Committee meeting. In the event that such efforts are not successful, the goal of the Steering Committee meeting is to: (i) resolve the Dispute, or (ii) narrow the issue(s) in dispute so that consensus, as defined in section 7.3.13 of this Agreement, to move forward can be achieved on as many parts as possible of the proposed action under consideration. At this Steering Committee meeting, after an opportunity for full discussion and consideration, the Chair will call for a vote, pursuant to section 7.3.14, to determine if a Dispute still exists. Any continuing Dispute shall be considered a formal Dispute and shall follow procedures of subsection (B) of this section.

B. Formal Dispute Process

Members representing at least six (6) dissenting votes or one (1) dissenting State Participant Group, may appeal the informal Dispute by signing and furnishing to the

Regional Director, the Program Manager, and each other Member, a written request to initiate a formal Dispute. This request must, with reasonable specificity, identify the issue(s) in Dispute, the relief sought, and any supporting documentation. If such a request is not received by the Regional Director within ten (10) Days after the vote that determined the existence of a formal Dispute, the formal Dispute shall be deemed to be abandoned.

Within thirty (30) Days after receiving the request, the Regional Director shall issue a written decision on the Dispute. This decision shall be promptly provided to all Members.

C. Appeal Process

Members representing at least fifteen (15) dissenting votes or one (1) dissenting State Participant Group may appeal the Regional Director's decision, by signing and furnishing to the Secretary, the Regional Director, the Program Manager, and each other Member, a written request. This request must, with reasonable specificity, identify the issue(s) in Dispute, the relief sought, and any supporting documentation. If such a request is not received by the Secretary within fifteen (15) Days after receiving the Regional Director's decision, the Regional Director's decision is final.

The Secretary shall, after appropriate consultation, issue a written determination regarding the Dispute on appeal from the Regional Director. The decision of the Secretary shall be final, subject to consultation with the Administrator of the Western Area Power Administration with respect to a Dispute involving Western.

7.3.16 Reasonable Access

Each Member of the Steering Committee is entitled to monitor the progress and performance of the Program, and shall be allowed reasonable access to data, records, and documents relating to the Program.

7.4 Program Implementation Report, Work Plan, and Budget

7.4.1 Implementation Report, Work Plan, and Budget

Annually, during the term of this Agreement, the Program Manager shall develop and present to the Steering Committee a Program Implementation Report, Work Plan,

and Budget consistent with the Program Documents. The Implementation Report, Work Plan, and Budget shall include:

A. A current financial report as described in section 7.5.4 of this Agreement.

B. A description of all Conservation Measures initiated, continued, or completed during the previous year.

C. A description of all Conservation Measures intended to be initiated or continued during the next three year period.

D. The purpose for, and the cost estimate of, all Conservation Measures intended to be initiated or continued during the next three year period.

E. A running tabulation and description of all Conservation Measures which have been completed from the commencement of the LCR MSCP to the date of the report.

F. A description of any take known to have occurred during the previous budget period.

G. A running tabulation of habitat created or restored by the Plan.

H. A description of all findings, conclusions, and results of monitoring, research, or Conservation Measures previously undertaken.

I. Any recommendation made by the Service or any state wildlife agency regarding the LCR MSCP.

J. Approval or rejection of any minor modification described in sections 14.1 and 14.2 of the IA.

7.4.2 Service Review

After presentation to the Steering Committee the Program Manager shall submit the Implementation Report, Work Plan, and Budget to the Service for its review and determination regarding the consistency of the past, current, and future implementation plans with the terms of the Conservation Plan and Permit. The submittal shall note any matters in Dispute.

7.4.3 Report by Service

Within sixty (60) Days after receipt of the Implementation Report, Work Plan, and Budget, the Service shall submit its written evaluation to the Program Manager. The evaluation shall include the opinion of the Service regarding the consistency of the Implementation Report, Work Plan, and Budget with the requirements of the Conservation Plan and Permit. In the event the opinion of the Service is that the Implementation Report, Work Plan, and Budget demonstrates that Conservation Measures undertaken or proposed do not comply with the LCR MSCP and its Permit, it shall specify, in detail, in what regard the Implementation Report, Work Plan, and Budget is deficient and shall suggest what alternative measures might be undertaken.

7.4.4 Response by Program Manager

In the event the Service is of the opinion that the Implementation Report, Work Plan, and Budget are not consistent with the requirements of the Conservation Plan or the Permit, the Program Manager shall report the response of the Service to the Steering Committee. Implementation of the Work Plan, other than those aspects that the Service believes do not comply with the Conservation Plan or the Permit, shall proceed. The Program Manager shall attempt to promptly resolve concerns raised by the Service.

7.5 Management of Funds

7.5.1 Accounts

7.5.1.1 Escrow Accounts

The Program Manager will cooperate with the State Parties who will establish one or more interest bearing Escrow Accounts for the deposit of funds contributed by the State Parties that shall be available to Reclamation for administration and implementation of the LCR MSCP. Reclamation will draw funds from the Escrow Account(s) based on escrow instructions of the Contributor(s). Withdrawal of funds from the Escrow Account(s) will be limited to the amounts outlined in the annual Implementation Report, Work Plan, and Budget.

7.5.1.2 Program Accounts

The Program Manager shall establish one or more Program Accounts for the deposit of funds appropriated or contributed for the implementation of the LCR MSCP.

7.5.1.3 Habitat Maintenance Account

The Program Manager shall cooperate with the State Parties who will establish an interest bearing habitat maintenance account for the deposit of funds contributed by the State Parties for habitat maintenance pursuant to section 5.4.2 of the HCP. Interest earned on the habitat maintenance account shall be added to the account for the purpose of implementation of the LCR MSCP; any such interest shall not be credited towards the Contribution of any Party.

7.5.2 Rights in Program Account

No Contributor shall have any right to any funds in the Program Account, other than provided in sections 7.5.6-7.5.7 of this Agreement.

7.5.3 The Share of a Permittee

For the purpose of accounting for each of the Permittees, any amount expended from the Program Account(s) shall be deemed to be comprised of each Permittee's respective proportionate share, except where a Permittee has requested that its Contribution is not to be used to fund a specified undertaking. Notwithstanding this accounting practice, each Permittee shall contribute the full amount of its specified share, and the Program Manager may expend money from the Program Accounts for all costs specified in the Implementation Report, Work Plan, and Budget. Funds in the Program Accounts must be disbursed only in accordance with the Implementation Report, Work Plan, and Budget. Contributions credited pursuant to section 8.6 shall be accounted as expended for undertakings that are in furtherance of measures required under the 2001 BO.

7.5.4 Reports to Steering Committee

As identified in section 7.4.1(A) of this Agreement, the Program Manager shall furnish to the Steering Committee an annual financial report. Financial reports shall include financial Contributions, the approved value of in-kind Contributions received and

the Party credited, if any, as well as funding commitments made and expenditures paid out of the Program Accounts and Program Account balances during the period covered by the report.

7.5.5 Right to Inspect and Audit

The Program Manager is responsible for ensuring the accuracy and reasonableness of all LCR MSCP finances and expenditures. Reclamation shall maintain financial records and accounts for the LCR MSCP in accordance with Federal accounting standards. With reasonable notice, any Contributor is entitled to review or audit, during normal business hours, Reclamation's records and books of any Program Account(s) for the LCR MSCP. Reclamation shall cooperate with any audit pursuant to this Agreement, and shall permit access to the books, records, and accounts as may be reasonably necessary to conduct the audit. Any such audit or review shall be at the sole expense of the Contributor requesting the audit or doing the review. If any audit reveals an exception in the LCR MSCP financial records, and unless there is an unresolved exception, an appropriate adjustment shall be made. If an exception, identified in an audit or review, cannot be resolved by discussions between the Program Manager and the Contributor, the Contributor may request a decision by the Regional Director. The Regional Director shall render a decision on the exception within thirty (30) Days after receipt of the request. The Contributor may appeal the Regional Director's decision to the Commissioner. The Commissioner will render a decision on the appeal within thirty (30) Days of receipt of the appeal. The Commissioner's decision shall be final.

7.5.6 Final Accounting

As soon as possible following the termination of this Agreement, the Program Manager shall promptly make an accurate final accounting to the Parties of Contributions received, all costs incurred by the LCR MSCP, and expenditures paid out of the Program Accounts pursuant to this Agreement.

7.5.7 Return of Funds

Unless required to fund the continued maintenance of any conservation areas which have been restored or created pursuant to the LCR MSCP, unexpended funds

contributed by a Permittee or other Contributor, if any, and any interest earned thereon, remaining after the termination of this Agreement and the payment of all outstanding obligations shall be promptly returned to the Permittee, person, or entity which contributed the funds, in proportion to the amount provided by each of them.

8. COST SHARES AND FINANCING

8.1 Total Cost

The total cost of the LCR MSCP over its 50-year term is Six Hundred Twenty-Six Million Dollars ($626,000,000) in 2003 dollars.

8.1.1 Inflation Adjustments

For each year of the LCR MSCP, the funding obligations shall be adjusted in accordance with the Inflation Index, which is the arithmetic average of the PPI Inflation Index and the GDPIP Inflation Index, each of which are defined as follows. The PPI Inflation Index is the ratio of the published value for the last month of each Federal Fiscal Year of the program of the Producer Price Index for the Materials and Components for Construction published by the United States Bureau of Labor Statistics, divided by the published value for September 2003. The GDPIP Inflation Index is the ratio of the published value for the last month of each Federal Fiscal Year of the program of the Gross Domestic Product Implicit Price Deflator published by the Bureau of Economic Analysis of the United States Department of Commerce in the Survey of Current Business, divided by the published value for September 2003.

8.2 Federal Cost Share

The Federal Parties shall bear fifty percent (50%) of the total cost. Western will only make Contributions to the cost of the LCR MSCP to the extent that such Contributions are appropriated and are designated as non-reimbursable by Congress, pursuant to applicable Federal law.

8.3 Non-Federal Cost Share

The State Permittees shall bear fifty percent (50%) of the total cost as follows: the California Permittees shall fund fifty percent (50%) of the non-federal cost share, the Nevada Permittees shall fund twenty-five percent (25%) of the non-federal cost share,

and the Arizona Permittees shall fund twenty-five percent (25%) of the non-federal cost share.

8.4 Payment Mechanisms and Terms

Each year during the term of the LCR MSCP, the Permittees of each state shall provide funding for each State's share of the total cost of the LCR MSCP as set forth in Table 7-1 of the HCP and section 8.3 of this Agreement. Such annual funding will be available no later than the beginning of the Fiscal Year, or such later date as the Work Plan and Budget may specify.

8.5 Cost Share Assurances

The Federal Parties agree that the non-federal costs for the LCR MSCP shall not exceed $313,000,000 in 2003 dollars, and on an annual basis, as set forth in Table 7-1 of the HCP, provided that the non-federal cost share shall be indexed for inflation pursuant to the index formula set forth in section 8.1.1. However, if additional costs of mitigation are incurred as a result of an agreement of the Parties to amend the LCR MSCP to add additional species to the list of Covered Species or to add additional Covered Actions or Covered Activities, such additional costs shall be shared as provided in such amendment.

8.6 2001 Biological Opinion

Reclamation, with support of funding from California agencies, will implement the conservation and mitigation measures identified in the 2001 Biological Opinion for implementing 400,000 acre-feet annually in changes of point of diversion for California's Colorado River Water Use Plan. The LCR MSCP includes the potential extension of the Interim Surplus Guidelines beyond 2016 and the 400,000 acre-feet change in point of diversion as Covered Actions. The implementation of the 2001 Biological Opinion conservation and mitigation measures shall be credited against the requirements of the LCR MSCP in accordance with the HCP, and the budgeted cost of those measures shall be credited to the California Permittees in the amount that each has paid for the cost of implementing these conservation and mitigation measures.

8.7 Additional Cost Sharing Issues

8.7.1 Budget Requests

Each local, state, or Federal entity which has undertaken a responsibility hereunder shall seek adequate funding to allow it to fulfill its responsibility hereunder and pursuant to the terms of the LCR MSCP, to fulfill its obligations to protect habitats and species consistent with statutory obligations imposed by law, to actively participate on the Steering Committee.

8.7.2 Contributions to Non-Federal Cost Share

The Parties recognize that other persons or entities may contribute money to the LCR MSCP on behalf of a Permittee(s) including, but not limited to competitive grants, donations, and matching funds. Such Contributions on behalf of a Permittee will be deposited in an Escrow Account(s), as appropriate, and will be subject to the Permittee's applicable escrow instructions. Upon transfer to the Program Account(s), such funds shall be credited to the share of the relevant Permittee for the purposes of the non-federal cost share.

8.7.3 Other Contributors

The Parties recognize that other persons or entities may contribute money to the LCR MSCP in the form of, for example, competitive grants, donations, and matching funds. Such supplemental Contributions must be deposited in a Program Account, as appropriate, but must be accounted for separately from the Permittee Contributions and must not be credited to the share of any Party pursuant to sections 8.2 and 8.3 of this Agreement. The acceptance of any gift, grant, or matching funds is subject to the approval of the Program Manager. Any gift, grant, or matching funds that are approved as a Contribution to the LCR MSCP may be designated for any specific purpose, and shall be used or expended only for the specific purposes for which the gift, grant, or matching funds were contributed.

8.7.4 In-Kind Goods and Services

The value and credit of in-kind goods and services shall be credited to a Party only to the extent approved by the Program Manager and the Steering Committee.

9. ASSURANCES AND COMMITTMENTS

9.1 In General

Each of the Parties affirms, acknowledges, and confirms each of its covenants, representations, agreements, undertakings, commitments, or assurances contained herein, or in the IA, or the Permit and, in addition, makes the following commitments and assurances.

9.2 Implementation Assistance

Each Permittee shall, to the greatest extent practicable, cooperate with Reclamation to ensure that actions required for Conservation Measures including, but not limited to, the purchase, acquisition, or lease of land and water are accomplished. Permittees shall not unreasonably withhold any necessary approvals to accomplish the above listed actions.

9.3 Participation on LCR MSCP Committees

Each of the Parties shall provide staff to serve on LCR MSCP committees, as appropriate, and shall ensure, to the extent possible, staff participation in discussions and meetings with the other Parties to ensure that the implementation of the LCR MSCP is consistent with any findings upon which the Permit is based.

9.4 Each Party Responsible

The financial and other obligations undertaken by each of the Parties shall be severable and the breach or failure to perform of one Party shall not be attributable to any other Party.

9.5 Authority

Each Party represents and warrants for the benefit of every other Party hereto that: (i) the execution of this Agreement has been duly authorized; (ii) no other authorization or approval, whether of governmental bodies or otherwise, will be necessary in order to enable that Party to enter into and comply with the terms of this Agreement; and (iii) the person executing this Agreement on behalf of each Party has the authority to bind that Party.

9.6 Proper Implementation

Each Permittee shall be deemed to be properly implementing the terms of the Permit and this Agreement if it has made its Contributions in accordance with section 8 of this Agreement and is performing those avoidance and minimization measures identified in Chapter 5 of the HCP that are applicable to Covered Activities undertaken by the Permittee.

9.7 Coordination Requirements for Potential Changes in Operations

In the unlikely event that Reclamation or the Service believe that modifications in anticipated water deliveries or modified operating criteria may be necessary to comply with the provisions of the ESA, Reclamation shall as early as practicable, and absent extraordinary conditions, prior to undertaking such modification, notify the Steering Committee in writing of such potential modifications. The Steering Committee shall have the opportunity to consider any such potential modifications and provide input to Reclamation and the Service on the proposed modifications.

9.8 No Costs Passed Through

This Agreement establishes the share of the costs of implementation of the LCR MSCP to be paid by the Permittees. Therefore, no Federal Party may pass through any Federal portion of the cost of the LCR MSCP, nor shall any such Federal cost be treated as a "reimbursable expense" and passed through to the Permittees as a water charge, power charge, or in any other form. Further, Reclamation shall not designate any portion of the Federal cost share as a reimbursable expense to be recovered by Western from the non-Federal Parties to this Agreement, in the form of a power charge or in any other form.

9.9 Potential Increased Cost of Implementation of the LCR MSCP

To the extent that the cost of implementing the LCR MSCP exceeds $626,000,000 in total, or on an annual basis in excess of the amounts provided in Table 7-1 of the HCP, adjusted for inflation as provided in section 8.1.1, such additional costs shall not cause the non-federal share of the LCR MSCP costs to exceed $313,000,000, adjusted for inflation, as set forth in section 8.5 of this Agreement. However, if additional costs of

mitigation are incurred as a result of an agreement of the Parties to amend the LCR MSCP to add additional species to the list of Covered Species or to add additional Covered Actions or Covered Activities, such additional costs shall be shared as provided in such amendment.

10. REMEDIES AND ENFORCEMENT

10.1 In General

The Parties agree to work together in good faith to resolve disagreements using informal meetings and conferences to reach mutually satisfactory conclusions to matters in dispute.

10.2 Enforcement of Agreement and Remedies for Breach

Except as provided in section 10.2 of this Agreement, each Party shall be entitled to pursue legal action, including the filing of a suit for specific performance, declaratory relief, or injunctive relief to enforce and seek remedies for any breach of applicable provisions of the Program Documents, including access to Federal courts under the Administrative Procedure Act (5 U.S.C. § 702 *et seq*.).

10.3 No Monetary Damages, Effect of Agreement on Pre-Existing Liabilities, and Enforcement Authority of the Service

10.3.1 No Monetary Damages

No Party shall be liable in monetary damages to any other Party or other person for any breach of this Agreement or the IA, any performance or failure to perform a mandatory or discretionary obligation imposed by this Agreement, or any other cause of action arising under this Agreement.

10.3.2 Retention of Liability

Each Party shall retain whatever liability it would otherwise possess for its present or future acts or failure to act in the absence of this Agreement.

10.3.3 Landowner Liability

All Parties shall retain whatever liability they would possess as an owner of interests in land in the absence of this Agreement.

10.3.4 Enforcement Authority of the Service

Nothing contained in this Agreement is intended to limit the authority of the Service to seek civil or criminal penalties or otherwise fulfill its enforcement responsibilities under the ESA and other applicable laws. However, as long as the HCP is being properly implemented in accordance with the Program Documents, the Service shall not seek civil or criminal penalties or otherwise enforce the take prohibitions of the ESA and other applicable laws for incidental take of Covered Species that is in accordance with the terms of the Incidental Take Authorization.

11. MISCELLANEOUS PROVISIONS

11.1 Response Times

The Parties agree that time is of the essence in performance of the obligations of this Agreement. Except as otherwise set forth herein or as required by applicable laws or regulations, the Parties shall use reasonable efforts to respond to written requests within forty-five (45) Days.

11.2 No Partnership

Except as otherwise expressly set forth herein, neither this Agreement, nor any other Program Document shall make, or be deemed to make, any Party to this Agreement the agent for, or the partner or joint venture of, any other Party.

11.3 Nullification of Agreement

In the event that the Permit is revoked, or substantially modified without the consent of the Parties, this Agreement shall be null and void and, in such event, no Party shall be bound by its terms.

11.4 Notices

Any notice required by this Agreement shall be in writing, and either delivered personally, or by United States mail, postage prepaid, or by facsimile or other electronic

means to the addresses on file with the Program Manager.

11.5 Preparation By All Parties

This Agreement shall not be construed as if it had been prepared by any one Party, but rather as if all Parties had prepared the Agreement.

11.6 Applicable Law

With respect to ESA, other environmental laws, and other applicable Federal laws, the laws of the United States shall govern the construction and interpretation of this Agreement. With respect to state laws pertaining to the State Parties, the laws of their respective States shall govern the construction and interpretation of this Agreement. Further, nothing in this Agreement shall require any Party to: 1) violate any Federal statute or regulation, or 2) exceed its legal authority, as defined by applicable statute, regulation, rule, or order lawfully promulgated.

11.7 Assignment or Transfer

This Agreement shall be binding on and inure to the benefit of the Parties, the Permittees and their respective successors and assigns, including Third Parties Authorized to Take as defined in the Implementing Agreement. Assignment or other transfer of the Permit or any rights or authorities granted thereunder shall be governed by ESA permit regulations.

11.8 Attorneys' Fees

If any action at law or equity, including any action for declaratory relief is brought to enforce or interpret the provisions of this Agreement, each Party to the litigation shall bear its own attorneys' fees and costs, provided that attorneys' fees and costs recoverable by or against the United States shall be governed by applicable Federal law.

11.9 Elected Officials Not to Benefit

No member of, or delegate to, the United States Congress or the governing body of any of the Permittees shall be entitled to any share or part of this Agreement or to any benefit that may arise from it, except as a holder of an Incidental Take Authorization.

11.10 Availability of Funds

Implementation of this Agreement and the LCR MSCP by the Parties is subject to the requirements of the Anti-Deficiency Act, the laws of the States of Arizona, California, and Nevada, respectively, and the availability of appropriated funds.

11.11 Duplicate Originals

This Agreement may be executed in any number of duplicate originals. A complete original of this Agreement shall be maintained in the official records of each of the Parties hereto.

11.12 No Third Party Beneficiaries

Without limiting the applicability of rights granted to the public pursuant to the ESA or other applicable law, and except as specifically provided in section 16.1 of the IA with respect to Third Parties Authorized to Take, this Agreement shall not create any right or interest in the public, or any member thereof, as a third party beneficiary hereof, nor shall it authorize anyone not a Party to this Agreement to maintain a suit under the provisions of this Agreement. The duties, obligations, and responsibilities of the Parties to this Agreement with respect to third party beneficiaries shall remain as imposed under applicable provisions of state and Federal law.

11.13 Severability

If any part or provision of this Agreement shall be held invalid or unenforceable by a court having jurisdiction under applicable law, said part or provision shall be ineffective only to the extent of such invalidity without in any way affecting the remaining parts of said part or provision or the remaining provisions of the Agreement. Not withstanding the foregoing, in the event such invalidity or any rescission pursuant to this section alters the relative balance of benefits of the Parties to the significant disadvantage of a Party, the Parties shall attempt to negotiate a modification of the terms of the Agreement in order to reestablish the original balance of benefits, and if such agreement is not reached, the disadvantaged Party may rescind the Agreement.

11.14 Headings

The section headings used in this Agreement are for the convenience of the Parties and are not intended to be used as an aid to interpretation.

11.15 Further Instruments

Each of the Parties shall, promptly upon the request of another Party, execute, acknowledge, and deliver to the other any and all further instruments as are reasonably requested or appropriate to evidence or give effect to the provisions of this Agreement.

11.16 Force Majeure

If the Permittees are wholly or partially prevented from performing obligations under this Agreement because of unforeseeable causes beyond the reasonable control of and without the fault or negligence of the Permittees (Force Majeure), including, but not limited to, acts of God, labor disputes, sudden actions of the elements, or actions of non-participating Federal or state agencies or local jurisdictions, the Permittees shall be excused from whatever performance is affected by such unforeseeable cause to the extent so affected, and such failure to perform shall not be considered a material violation or breach, provided that nothing in this section 11.16 shall be deemed to authorize any Party to violate the ESA and provided further that: (i) the suspension of performance is of no greater scope and no longer duration than is required by the Force Majeure; (ii) within fifteen (15) Days after the occurrence of the Force Majeure, affected Permittees shall give the Service written notice describing the particulars of the occurrence; and (iii) Permittees use their best efforts to remedy their inability to perform (however, this section shall not require the settlement of any strike, walk-out, lock-out, or other labor dispute on terms which in the sole judgment of the Permittees are contrary to their interest).

11.17 No Waiver

Neither approval of the LCR MSCP nor execution of this Agreement by a Party shall be construed, considered, or deemed to be a waiver of the right to any action, claim, cause of action or defense available to that Party prior to the execution hereof.

11.18 No Admission

Neither the application for the Permit nor the execution of this Agreement or any other Program Document by the Permittees shall be construed, considered, or deemed to be an admission by the Permittees that any take of any listed species has occurred or will occur.

11.19 Faxed Signatures

Any Party may deliver its signed duplicate of this Agreement to any other Party by facsimile transmission, and such delivery shall be deemed made and completed upon receipt of such facsimile transmission by the other Party. Any Party delivering a signed duplicate by facsimile transmission shall promptly send the duplicate original bearing its original signature to the other Party, provided that a delay or failure to do so shall not negate the effectiveness of the delivery made by the facsimile transmission.

11.20 Amendment to Funding and Management Agreement

This Agreement may be amended only by a writing executed by each of the Parties.

THIS AGREEMENT HAS BEEN EXECUTED ON THE DATE(S) SET FORTH NEXT TO EACH SIGNATURE AND SHALL BECOME EFFECTIVE ON THE EFFECTIVE DATE AS DEFINED HEREIN.

Signature pages to follow when this Agreement is finalized.

Exhibit B

Draft Final Implementation Agreement

Draft Final
11/22/04

LOWER COLORADO RIVER MULTI-SPECIES CONSERVATION PROGRAM

IMPLEMENTING AGREEMENT

(date to be inserted)

LOWER COLORADO RIVER
MULTI-SPECIES CONSERVATION PROGRAM

IMPLEMENTING AGREEMENT

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LOWER COLORADO RIVER
MULTI-SPECIES CONSERVATION PROGRAM

IMPLEMENTING AGREEMENT

1. PARTIES

This Lower Colorado River Multi-Species Conservation Program (LCR MSCP) Implementing Agreement (Agreement) is made and entered into by and among the following Parties:

Arizona Parties: The Arizona Department of Water Resources, the Arizona Game and Fish Commission, the Arizona Power Authority, the Central Arizona Water Conservation District, the Yuma Mesa Irrigation and Drainage District, the Yuma Irrigation District, the North Gila Valley Irrigation and Drainage District, the Wellton-Mohawk Irrigation and Drainage District, the Yuma County Water Users Association, the Salt River Project Agricultural Improvement and Power District, and the Mohave County Water Authority;

California Parties: The Coachella Valley Water District, the Colorado River Board of California, the Imperial Irrigation District, the Palo Verde Irrigation District, the San Diego County Water Authority, the Southern California Public Power Authority, Bard Irrigation District, Department of California Fish and Game, and The Metropolitan Water District of Southern California;

Federal Parties: The Bureau of Reclamation (Reclamation), the United States Fish and Wildlife Service (Service), the National Park Service (NPS), the Bureau of Indian Affairs (BIA), and the Bureau of Land Management (BLM); and, the Western Area Power Administration (Western).

Nevada Parties: The Colorado River Commission of Nevada, the Nevada Department of Wildlife, Basic Water Company, and the Southern Nevada Water Authority.

Other Parties: Any person or entity added as a Third Party Authorized to Take pursuant to section 16 of this Agreement.

2. RECITALS AND PURPOSES

A. The Arizona, California, and Nevada Parties, in partnership with the Federal Parties, have developed the Lower Colorado River Multi-Species Conservation Program to provide the basis for compliance with section 10(a)(1)(B) of the Federal Endangered Species Act (ESA) by the State Parties and section 7 of the ESA by the Federal Parties.

B. The Planning Area for the LCR MSCP, as depicted on Figures 1-1 in the HCP and BA and described in sections 1.4.1 of the HCP and BA, is defined as areas up to and including the full-pool elevations of Lakes Mead, Mohave, and Havasu and the historical floodplain of the Colorado River from Lake Mead downstream to the Southerly International Boundary with Mexico. The historical floodplain includes all those lands that are or have been affected by the meandering or regulated flows of the Colorado River, which are delineated by significant changes in elevation between the floodplain and the adjacent uplands.

C. The Planning Area provides habitat for the following Covered Species which are listed as endangered or threatened under the ESA as of the Effective Date:

Bonytail
Humpback chub
Razorback sucker
Desert tortoise
Southwestern willow flycatcher
Yuma clapper rail

D. The Planning Area also provides habitat for the following Covered Species which are not listed as endangered or threatened under ESA as of the Effective Date:

Threecorner milkvetch

Sticky buckwheat

MacNeill's sootywing skipper

Flannelmouth sucker

Relict leopard frog

Flat-tailed horned lizard

Western least bittern

California black rail

Yellow-billed cuckoo

Elf owl

Gilded flicker

Gila woodpecker

Vermilion flycatcher

Arizona Bell's vireo

Sonoran yellow warbler

Summer tanager

Western red bat

Western yellow bat

Desert pocket mouse

Colorado River cotton rat

Yuma hispid cotton rat

E. The Planning Area also provides habitat for the following species (evaluation) that are not listed as endangered or threatened under the ESA as of the Effective Date, and for which coverage under the section 10(a)(1)(B) permit is not sought at this time:

Sonoran Desert toad (Colorado River toad)

Lowland leopard frog

California leaf-nosed bat

Pale Townsend's big-eared bat

F. The Conservation Measures described in Chapter 5 of the HCP will fully mitigate the effects of incidental take of Covered Species resulting from the Covered Actions and Covered Activities and will, to the maximum extent practicable, minimize,

and mitigate the effects of incidental take of Covered Species resulting from the Covered Actions and Covered Activities. In addition, special management considerations for species and Critical Habitat were developed and incorporated in the Conservation Plan which contribute to conservation goals for the Covered Species.

G. The Service has found, following opportunity for public comment, that: 1) any taking of Covered Species within the LCR MSCP planning area as a result of Covered Actions and Covered Activities in accordance with the LCR MSCP as implemented will be incidental to the carrying out of otherwise lawful activities; 2) the LCR MSCP as implemented will, to the maximum extent practicable, minimize, and mitigate the impacts of such incidental taking; 3) the Parties identified and provided for in the FMA will ensure that adequate funding for the LCR MSCP will be provided; 4) the requested taking of Covered Species as a result of Covered Actions and Covered Activities will not appreciably reduce the likelihood of survival and recovery of such species in the wild; and 5) the LCR MSCP, as implemented, will satisfy and fulfill all measures agreed upon by the Parties for the purposes of the LCR MSCP (including procedures determined by the Service to be necessary to address Unforeseen Circumstances).

H. This Agreement:

- Ensures implementation of each of the terms of the HCP by the Non-Federal and Federal Parties;

- Describes remedies and recourse should any Party fail to perform its obligations as set forth in this Agreement;

- Provides assurances to Permittees that, to the extent authorized by law, as long as the terms of the HCP, the Incidental Take Authorization, and this Agreement are properly implemented, no additional mitigation will be required of Permittees with respect to the Covered Actions and Covered Activities for the Covered Species except as provided for in this Agreement;

- Assures Permittees that compliance with the terms of the HCP and this Agreement is sufficient for Permittees to obtain and retain the Permit and adequately

provides for the mitigation of the effects of the incidental take of the Covered Species resulting from the Covered Actions and Covered Activities; and

- Anticipates that the Federal Parties will fulfill their obligations under the ESA, the Funding and Management Agreement (FMA), and this Implementing Agreement (IA).

3. DEFINITIONS

The capitalized terms used in this Agreement shall have the meaning ascribed to them in this section. To the extent that the definitions incorporate covenants and agreements, such covenants and agreements shall bind the Parties. Terms used in this Agreement and specifically defined in the ESA or in regulations adopted by the Service under the ESA have the same meaning as in the ESA and those implementing regulations, unless this Agreement expressly provides otherwise.

1. **"2001 Biological Opinion"** means that biological opinion issued by the Service on January 12, 2001 entitled "Biological Opinion for Interim Surplus Criteria, Secretarial Implementation Agreements, and Conservation Measures on the Lower Colorado River, Lake Mead to the Southerly International Boundary, Arizona, California, and Nevada."

2. **"Adaptive Management"** means an iterative program designed to review and use the results of information gathered through monitoring and research to adjust Conservations Measures, management strategies, and practices where appropriate in implementing the Conservation Plan.

3. **"Adaptive Management Program" or "AMP"** means the program of Adaptive Management that will be undertaken by the Parties as part of the Conservation Plan as described in section 11 of this Agreement and section 5.12 of the HCP.

4. **"Agreement" or "IA"** means this Implementing Agreement.

5. **"BA"** means that biological assessment for the specified Covered Actions prepared for the LCR MSCP by the Federal Parties and transmitted to the Service on *(date to be inserted)* in accordance with section 7 of the ESA.

6. **"Biological Opinion" or "BO"** means the section 7 biological opinion issued by the Service for the LCR MSCP.

7. **"Certificate of Inclusion"** means a certificate issued by a Permittee to a non-federal person, firm, or entity that has agreed to be bound by the terms of the HCP and the Permit pursuant to section 16.1 of this Agreement.

8. **"Conservation Measure"** means measures identified in Chapter 5 of the HCP for the benefit of the Covered Species or developed pursuant to the Adaptive Management Program including specific activities implemented on an annual basis by the Program Manager or, in appropriate circumstances, other Parties to this Agreement.

9. **"Conservation Plan"** means the habitat conservation plan described in section 11 of this Agreement.

10. **"Covered Actions"** means those actions described in Chapter 2 of the BA, for which Incidental Take Authorization for Covered Species is sought pursuant to the LCR MSCP.

11. **"Covered Activities"** means those activities described in Chapter 2 of the HCP, for which Incidental Take Authorization for Covered Species is sought pursuant to the LCR MSCP.

12. **"Covered Species"** means those twenty-seven (27) species listed in Table 1-2 of the HCP and in sections 2(C) and 2(D) of this Agreement for which Incidental Take Authorization for Covered Actions and Covered Activities is sought pursuant to the LCR MSCP.

13. **"Critical Habitat"** means those areas within the Planning Area that have been designated by the Secretary of the Interior to be essential for the continued existence of certain of the Covered Species in accordance with the ESA.

14. **"Days"** means calendar days unless otherwise specified. If the date of performance is on a Saturday, Sunday, or observed state or Federal holiday, the date of performance shall be construed to be the next business day subsequent to the calculated date of performance.

15. **"Effective Date"** means the date on which this Agreement takes effect, as provided in section 6.1 of this Agreement.

16. **"EIS/EIR"** means the joint environmental impact statement and environmental impact report issued pursuant to National Environmental Policy Act (NEPA) and the California Environmental Quality Act for the LCR MSCP.

17. **"Environmental Laws"** means Federal laws and regulations governing or regulating the impact of Covered Actions and Covered Activities on land, water, or biological resources as they relate to Covered Species, including, but not limited to the ESA, the NEPA, the Migratory Bird Treaty Act (MBTA), the Fish and Wildlife Coordination Act, the Fish and Wildlife Act of 1956, and the Clean Water Act (Title 33, United States Code sections 1251 *et seq.*).

18. **"ESA"** means the Federal Endangered Species Act of 1973, as amended.

19. **"Funding and Management Agreement"** or **"FMA"** means that agreement which provides for the administration, financing, and implementation of the LCR MSCP.

20. **"Habitat Conservation Plan" or "HCP"** means the habitat conservation plan prepared by the State Parties pursuant to section 10(a)(1)(B) of the ESA for purposes of the LCR MSCP.

21. **"Incidental Take Authorization" or "ITA"** means, collectively, (i) the LCR MSCP section 10(a)(1)(B) incidental take permit and (ii) any incidental take statement issued by the Service as part of a Biological Opinion which authorizes take by Federal agencies pursuant to the LCR MSCP.

22. **"LCR MSCP**" means the Lower Colorado River Multi-Species Conservation Program.

23. **"Listed Species"** means those Covered Species that are listed by the Service as endangered or threatened on the Effective Date as shown in Table 1-2 of the HCP and BA and as listed in section 2(C) of this Agreement.

24. **"Lower Colorado River"** means the Colorado River within the Planning Area as provided in section 2(B) of this Agreement.

25. **"Minor Modification"** means a clarification or minor change to the LCR MSCP as defined in section 14.1 of this Agreement.

26. **"Participant Group"** means a group of organizations participating in the Program as described in section 7.3.1 of the FMA.

27. **"Party"** means an entity that is a signatory to this Agreement. Such entities may be referred to individually as "Party" or collectively as "Parties."

28. **"Permit"** means the section 10(a)(1)(B) incidental take permit issued by the Service pursuant to the HCP for the LCR MSCP.

29. **"Permittee"** means a non-federal person, firm, or entity that has been authorized to take Covered Species pursuant to this Agreement and the Permit.

30. **"Program Documents"** means the HCP, BA, EIS/EIR, FMA, IA, BO, and the Permit.

31. **"Program Manager"** means an employee of Reclamation whose responsibility it is to plan for and take such actions as may be required to implement the LCR MSCP pursuant to the provisions of this Agreement and the FMA.

32. **"Reclamation"** means the United States Bureau of Reclamation.

33. **"Secretary"** means the Secretary of the Interior and/or his/her designee.

34. **"Service"** means the United States Fish and Wildlife Service.

35. **"State Party"** means an entity described as an Arizona Party, a California Party, or a Nevada Party.

36. **"Steering Committee"** means the body established by section 7.3 of the FMA.

37. **"Third Party Authorized to Take"** means any person, firm, or entity that receives an ITA pursuant to section 16 of this Agreement.

38. **"Unlisted Species"** means a species that is not listed as endangered or threatened under the ESA as of the Effective Date.

4. PRIORITY OF PROGRAM DOCUMENTS

4.1 Program Documents

The terms of this Agreement and the terms of the other Program Documents are intended by the Parties, and shall be interpreted, to be complementary. In the event of any conflict between the terms of this Agreement and the HCP, BA, or EIS/EIR, the terms of this Agreement will control. In the event of a conflict between the FMA and this Agreement, the terms of the FMA will control.

4.2 Permit Controls

The terms of the Permit and the terms of the other Program Documents are intended by the Parties, and shall be interpreted, to be complementary. In the event of any conflict among the terms of the Permit and other Program Documents, the terms of the Permit will control.

5. PREVIOUS AGREEMENTS SUPERCEDED

This Agreement and the FMA are intended to be final and binding agreements among the Parties regarding the LCR MSCP. All other agreements and understandings, written or oral, which have previously been entered into or agreed to by and among the Parties prior hereto regarding the LCR MSCP are superceded by this Agreement and the FMA. Notwithstanding the foregoing, nothing in this Agreement or the other Program Documents shall be deemed to supercede any agreement related to the 2001 Biological Opinion and the implementation of the reasonable and prudent measures set forth in the 2001 Biological Opinion.

6. EFFECTIVE DATE AND TERM

6.1 Effective Date

This Agreement shall become effective as of the date the Permit is issued by the Service.

6.2 Term of Agreement

This Agreement shall remain in effect for a term of fifty (50) years from the Effective Date, unless terminated or extended prior to that date.

6.3 Extension of the Permit

The Service may, with the agreement of the Parties, from time to time extend the Permit beyond its current term in compliance with the applicable law and regulations in force on the date of any such extension.

6.4 Permit suspension

The Service may suspend the Permit if the Permittees are not in compliance with the conditions of the Permit, this Agreement, the FMA, or any applicable Federal laws and regulations. For the purposes of the LCR MSCP, the procedures applicable to any suspension shall be in accordance with the Federal regulations in effect at the time of the suspension; provided however, that at a minimum the Permittee shall be afforded the procedural rights set forth in section 50 C.F.R. section 13.27 in existence on the Effective Date. The suspension shall remain in effect until the Service determines that the Permittees have corrected the deficiencies. The Permit may be partially suspended with respect to specified Covered Species, or to a portion of the Planning Area or Covered Activities, or in relation to a specific Permittee or specific Permittees. In the event of a partial suspension, the portion of the Permit not subject to suspension shall remain in full force and effect. Permit suspension as a result of Changed Circumstances shall be in accordance with the applicable terms of this section 6.4 and section 13 of this Agreement.

6.5 Permit revocation

This section is not intended to be applied before December 12, 2004 or applicable date pursuant to Spirit of Sage litigation in U.S. District Court.

The Service shall not revoke this Permit for any reason except those listed in applicable regulations, or unless the Covered Activities would be inconsistent with the criteria set forth in 16 U.S.C. 1539 (a)(2)(B)(iv) and this inconsistency has not been remedied in a timely fashion. Notwithstanding the foregoing, this Permit will only be

revoked if the Service, the Permittees, and other interested parties have not been successful in remedying any such inconsistency through other means. The Permit may be partially revoked with respect to specified Covered Species, or to a portion of the Planning Area or Covered Activities, or in relation to a specific Permitee or specific Permittees. In the event of a partial revocation, the portion of the Permit not subject to the revocation shall remain in full force and effect. All Conservation Measures in the HCP that are continued in effect after any Permit revocation shall be taken into account by the Service and credited toward any future efforts by the Permittees and other Parties to ensure that any Covered Actions or Covered Activities are in compliance with requirements of the ESA. This provision shall survive any revocation of the Permit and shall remain in full force and effect thereafter.

7. INTEGRATION OF BA AND HCP

7.1 Comprehensive Plan

The LCR MSCP is a comprehensive plan. It addresses the effects of all Federal Covered Actions and non-federal Covered Activities on Covered Species and their habitats. The LCR MSCP is intended to secure ITAs to authorize incidental take of Covered Species, that are now or hereafter listed as endangered or threatened pursuant to the ESA, that may occur as a result of the Covered Actions and Covered Activities.

7.2 Legal Uncertainty Regarding Non-Discretionary Federal Actions

Take that occurs as the incidental result of Covered Actions undertaken by Reclamation, Western, and the other Federal agencies identified in the BA (i.e., NPS, BIA, the Service, and BLM) may only be authorized by the Service pursuant to the provisions of section 7 of the ESA. However, certain Covered Actions that are undertaken by Reclamation and Western are nondiscretionary in nature (e.g., delivery of water to Mexico pursuant to the 1944 Water Treaty, delivery of water to parties holding permanent water delivery contracts with the Secretary). Non-discretionary actions of the Federal Parties are not subject to the consultation and/or conference requirements of section 7 of the ESA. In addition, many of Reclamation's non-discretionary Covered Actions occur as the result of contracts with non-federal Parties and, arguably, might be

included as part of the section 10(a)(1)(B) Permit (e.g., water is delivered by Reclamation as the result of water orders by non-federal entities pursuant to water delivery contracts). In order to make the LCR MSCP as comprehensive as possible, while avoiding arguments and challenges about whether any particular Federal action is discretionary or non-discretionary, and whether incidental take authority should be granted pursuant to section 7 or section 10: (i) the effects of all Covered Actions, both discretionary and non-discretionary and Covered Activities have been described and analyzed in both the BA and the HCP; and (ii) the Permittees are seeking an incidental take permit for their Covered Activities pursuant to section 10 of the ESA; and (iii) Reclamation and the other Federal Parties are seeking incidental take authorization for their Covered Actions pursuant to section 7 of the ESA.

7.3 No Obligation to Consult on Non-Discretionary Actions or Actions that Do Not Affect Listed Species

Notwithstanding the inclusion of Federal non-discretionary actions within the identified Covered Actions, this Agreement shall not be interpreted to require consultation and/or conference pursuant to section 7 of the ESA with respect to Federal non-discretionary actions for the purpose of compliance with the provisions of the ESA on the Lower Colorado River or for any other purpose or in any other case or circumstance. The approach taken in this regard for the LCR MSCP is undertaken for the specific purposes and as identified in sections 7.1 and 7.2 of this Agreement. Nor shall anything in this Agreement be interpreted to require consultation and/or conference pursuant to section 7 of the ESA with respect to Federal actions that do not affect Listed Species.

7.4 Compliance with Provisions of Biological Opinion

The Federal Parties and the Permittees agree that they shall comply with all applicable reasonable and prudent measures and terms and conditions within the Biological Opinion, notwithstanding the fact that such reasonable and prudent measures and terms and conditions may arise out of, or be connected with, incidental take resulting from Covered Actions that are non-discretionary or do not affect Listed Species.

7.5 No Allocation of Individual Responsibility to Mitigate for Effects of Covered Actions and Covered Activities

The Parties have quantified the effects of the Covered Actions and Covered Activities for development of a comprehensive conservation plan. The Parties have not identified specific impacts that individual Covered Actions and Covered Activities have had or will have upon the Covered Species and their habitats because the decline of species and habitats along the Lower Colorado River has been caused by many factors, including but not limited to: (i) introduction of non-native species; (ii) permanent facilities constructed prior to enactment of the Environmental Laws; (iii) stochastic events, both within and beyond the Planning Area, that are beyond the control of any of the Parties; and, (iv) development and other activities undertaken within and adjacent to the Lower Colorado River.

8. FUTURE SECTION 7 CONSULTATIONS – COVERED ACTIONS AND COVERED ACTIVITIES

In the event that, despite implementation of the LCR MSCP and cooperative efforts among the Service, the Program Manager, and the Steering Committee, any Federal Party determines that a section 7 consultation or re-initiation of consultation is required pursuant to applicable Federal law for any Covered Action, the Federal Party shall give notice thereof to the Program Manager, the Steering Committee and the Permittees, and such Permittees shall be treated as Applicants in any such section 7 consultation, and be entitled to fully and completely participate in all matters involved in such consultation or re-initiation of consultation. Costs associated with modifications to the Conservation Plan resulting from any such consultation shall be dealt with in accordance with section 9.9 of the FMA.

The Service has evaluated the direct, indirect, and cumulative effects of the Covered Actions and Covered Activities in its Biological Opinion issued in connection with the LCR MSCP and issuance of the Permit. As a result, and to the maximum extent allowable, in any consultation under section 7 of ESA subsequent to the Effective Date with regard to the Covered Actions or Covered Activities, including consultations

involving the Permittee(s) or entity with Third Party Take Authorization with regard to Covered Species, the Service shall ensure that the biological opinion issued in connection with the proposed action or project that is the subject of the future consultation is consistent with the Biological Opinion.

9. FUTURE SECTION 7 CONSULTATIONS – OTHER ACTIONS AND ACTIVITIES

9.1 Notice

In any section 7 consultation subsequent to the Effective Date involving activities, other than Covered Actions or Covered Activities, undertaken by any person, firm, or entity that could have an effect upon Covered Species and their habitats within the Planning Area, the Service shall, to the maximum extent allowed by Federal statutes and regulations, give notice thereof to the Program Manager, the Steering Committee, and the Permittees.

9.2 Contents of Biological Opinion

The Service agrees that the terms of any biological opinion issued in connection with projects that are independent of the Covered Actions and the Covered Activities shall not impose or result in any additional obligation, cost, or expense to the LCR MSCP.

10. SPECIES

10.1 Covered but Currently Unlisted Species – Section 10 Permit

Covered Species that are not listed on the Effective Date as endangered or threatened under the ESA have been treated in the LCR MSCP as if they are Listed Species. In the event an unlisted Covered Species becomes a Listed Species in the future, incidental take of that species shall, without any further action on the part of the Permittees, be immediately authorized pursuant to the terms of the Permit.

10.1.1 Savings Provision

If it is judicially determined that the Service was not authorized to cause the Permit to become effective automatically as to Covered Species not listed as of the Effective Date, the Service shall accept the minimization and mitigation measures in the LCR MSCP as the basis for an application for an amendment to or separate Permits, MBTA Permits, and/or other Incidental Take Authorizations. The Service shall use reasonable efforts to review and process the application expeditiously so as to ensure, provided the Permit amendment or application meets the requirements of ESA and other applicable Federal laws, that the Incidental Take Authorization is effective concurrently with the listing of the Covered Species under ESA. In issuing such Permits, amendments, and/or Incidental Take Authorizations, and to the extent that such judicial determination creating the circumstances requiring such additional review and processing allows, the Service shall not request, impose, recommend, or require further mitigation, conservation, compensation, enhancement, or other protection for such Covered Species except as expressly provided in the Permit, this Agreement, and the FMA.

10.2 Covered but Currently Unlisted Species – Section 7

Pursuant to the provisions of section 7 of the ESA and its implementing regulations, incidental take statements contained in Biological Opinions apply only to species listed as endangered or threatened under the ESA. In the event an unlisted Covered Species becomes listed in the future, the Service shall give due consideration to, and full credit for, those Conservation Measures provided in the Conservation Plan that benefit such species as part of any section 7 consultation regarding the Covered Actions.

10.3 Additions to the Covered Species List

In the event the Permittees desire to add additional species to the list of Covered Species, the Permittees shall propose an amendment of the HCP and request an amendment to the Permit. Such request shall be supported by sufficient evidence to meet the requirements of the ESA. The Service shall give due consideration to, and full credit for, Conservation Measures previously implemented as part of the Conservation Plan that benefit such species.

10.4 Future Listings of Other Species

To the extent allowed by applicable law, in evaluating whether to list a species that is not a Covered Species, but which may, from time to time, be present in the Planning Area, the Service shall: (i) provide advance notice to the Program Manager who shall then inform the Steering Committee and Permittees of the potential listing, (ii) consider the conservation benefits already provided to the species by the LCR MSCP; and (iii) coordinate with the Program Manager and the Steering Committee to identify what changes to the Conservation Plan, if any, would be sufficient to avoid listing within the Planning Area. In the event that any such species is listed within the Planning Area, the Service shall give due consideration to, and full credit for, Conservation Measures previously implemented as part of the Conservation Plan that benefit such species in any proposed amendment to the HCP and the Permit or in any section 7 consultation regarding the Covered Actions.

11. THE CONSERVATION PLAN AND ADAPTIVE MANAGEMENT

11.1 The LCR MSCP Conservation Plan

11.1.1 Content

The Conservation Plan consists of: (i) those measures described in Section 1.1 of the HCP that are required to be performed by Reclamation pursuant to the 2001 Biological Opinion; (ii) those measures described in Section 1.1 of the HCP that are required to be performed by Reclamation pursuant to the April 30, 1997 and April 30, 2002 Biological Opinions (Lower Colorado River Operations and Maintenance); (iii) those Conservation Measures described in Chapter 5 of the HCP; and (iv) those Conservation Measures that are developed after the Effective Date pursuant to the AMP. Implementation of the Conservation Plan will occur pursuant to the Program Documents.

11.2 Goals of the Conservation Plan

As more particularly described in section 5.2.1 of the HCP, the goals of the Conservation Plan with respect to Covered Species are:

- To avoid, minimize, and fully mitigate adverse effects of Covered Actions and Covered Activities and LCR MSCP implementation on Covered Species and their habitat;
- To contribute to the recovery of listed species; and
- To reduce the likelihood of future listing of Unlisted Species.

11.3 Measurement of Biological Goals and Objectives-Importance of Habitat

The Covered Species could be affected by actions, both natural and man-made, within and outside the Planning Area, which are beyond the control of the Parties and unrelated to the Covered Actions and Covered Activities. Therefore, the effectiveness of the Conservation Plan in minimizing and mitigating the effects of the Covered Actions and Covered Activities on the Covered Species will be considered on the basis of the implementation of the Conservation Measures set forth in the HCP or as modified through the AMP.

11.4 Importance of Adaptive Management

The initial Conservation Measures proposed to be funded by the Parties are sufficient to meet the incidental take requirements of the ESA. However, the number of Covered Species, the paucity of data and information regarding some species, the variety of habitats found within the Planning Area, the likelihood of new environmental challenges, and the budget of the LCR MSCP, make implementation of a science-based AMP that relies on the best available scientific information and knowledge an essential component of the LCR MSCP. The AMP will provide guidance to all Parties regarding monitoring, research, and management practices to benefit the Covered Species. Each Party shall, to the maximum extent practicable, fully cooperate with the AMP.

11.4.1 Adaptive Management Program

As more particularly illustrated in Figure 5-4 and described in section 5.12 of the HCP, Reclamation shall implement an iterative Adaptive Management Program for the LCR MSCP that utilizes the best scientific information and knowledge, together with the results of monitoring and research, to evaluate the successes and failures of the

Conservation Plan. Because changes over time and adaptive responses are contemplated by the LCR MSCP, changes proposed as the result of the AMP or as a result of changed circumstances will not require an Amendment to the LCR MSCP, the Permit, or this Agreement. If unforeseen circumstances occur as provided in section 13 of this Agreement, they will be resolved through internal changes in the Conservation Plan through Adaptive Management. Changes proposed as a result of unforeseen circumstances should not require an Amendment to the LCR MSCP, the Permit, or this Agreement.

11.4.2 Changes Resulting From Adaptive Management Program

All proposed changes as a result of the Adaptive Management Program shall be identified in the annual implementation report, work plan, and budget submitted to the Steering Committee and thereafter communicated to the Service for review, comment, and approval as provided in section 7.4 of the FMA.

12. FUNDING AND MANAGEMENT AGREEMENT

The Parties have entered into a FMA that provides for the sharing of the costs of the LCR MSCP. A Party's share of the annual LCR MSCP costs shall be determined and paid in accordance with section 8 of the FMA. In addition, the FMA provides the terms and conditions agreed upon between the Permittees and the Federal Parties regarding the financing, implementation, and administration of the LCR MSCP. Execution of this Agreement and the FMA constitutes each Party's commitment to the Service to meet their funding obligations in accordance with the FMA and to implement those applicable conservation, avoidance, minimization, and mitigation measures set forth in the Conservation Plan.

13. CHANGED CIRCUMSTANCES AND UNFORESEEN CIRCUMSTANCES

13.1 Changed Circumstances In General

Section 5.12.3 and Table 5-13 of the HCP identify certain changed circumstances affecting Covered Species or their habitats that have been reasonably anticipated and

planned for in the LCR MSCP and describes the remedial measures that will be implemented in the event that such changed circumstances occur.

13.1.1 Specific Changed Circumstances

The following have been identified as changed circumstances for purposes of the LCR MSCP:

- Unsuccessful creation of habitat, including failure that is caused by drought or insufficiency of water, regardless of cause;
- Destruction or loss, in whole or in part, by flooding and/or sedimentation of backwaters and marshes that have been created or restored;
- Created cottonwood-willow and honey mesquite land cover that provide habitat for Covered Species in conservation areas are lost as a result of floods;
- Fish in rearing facilities or in the stocking process are lost for any reason;
- Rearing facilities or aquaculture techniques are not capable, or fail for any reason, to provide sufficient numbers or sizes of fish to meet augmentation goals;
- A toxic or hazardous material spill or deposit occurs which impacts areas that have been created or restored; or
- Future listing of a Covered Species that is not listed on the Effective Date.

13.1.2 Remedial Measures

If any Party discovers that a changed circumstance has occurred, it will give notice to the Program Manager who will then give notice to the other Parties as soon as practicable after learning of the changed circumstance. In the event any changed circumstance occurs, the Program Manager shall implement the remedial measures, or cause those measures to be implemented, as specified in Table 5-13 of the HCP.

13.2 Unforeseen Circumstances in General

Any change in circumstances not identified as a changed circumstance in section 5.12.3 and Table 5-13 of the HCP shall be considered an unforeseen circumstance. The

obligations of the Service in regard to unforeseen circumstances are set forth in 50 C.F.R. 17.22.

13.2.1 Response to Unforeseen Circumstances

Upon a determination that an unforeseen circumstance has occurred and that additional Conservation Measures are required to address the unforeseen circumstance that were neither identified in the Conservation Plan nor capable of implementation within the budget set forth in Chapter 7 of the HCP, and provided that the Permittees are in compliance with any applicable terms of the LCR MSCP, the cost of any additional Conservation Measures will be borne by the Federal government, other governmental agencies, private conservation organizations, or other private entities who are not part of the LCR MSCP. Costs associated with modifications to the Conservation Plan resulting from any such Conservation Measures shall be dealt with in accordance with section 9.9 of the FMA.

13.2.2 Avoidance of Effect on Permittees

If additional actions are required for the benefit of Covered Species as the result of an unforeseen circumstance, the Federal Parties shall adopt measures that address the effect of the unforeseen circumstance on the relevant species and its habitat. The Federal Parties shall endeavor to adopt those actions or measures that will have the least effect upon the Permittees and the respective constituents served by the Permittees. Prior to undertaking or attempting to impose any such additional action, including limitations on the use of land or water for the benefit of Covered Species, the Federal Parties shall consider all practical alternatives, including but not limited to land purchase and exchange programs, additional public education, translocation programs, propagation programs, and acquisition of conservation easements.

13.2.3 Cooperation of Permittees

If an unforeseen circumstance should occur, the Permittees shall cooperate with and assist the Federal Parties, to address the unforeseen circumstance.

14. MODIFICATIONS TO THE LCR MSCP AND AMENDMENTS TO THE PERMIT

14.1 Minor Modifications

Minor Modifications are changes to the LCR MSCP of a minor or technical nature where the effect on Covered Species, levels of take, and the Permittees' ability to implement the LCR MSCP, are either beneficial or are not significantly different than those described in the LCR MSCP as originally adopted. Minor Modifications to the LCR MSCP shall not require amendments to this Agreement or the Permits. Minor Modifications may include changes to the Conservation Measures pursuant to the AMP.

Any Party may propose a Minor Modification to the Conservation Plan by providing notice including a statement of the reason for the proposed modification and an analysis of its environmental effects, if any, to the Project Manager. The Project Manager shall present the Minor Modification to the Steering Committee for its approval and if it is approved by the Steering Committee the Project Manager shall forward the proposal, along with the analysis, to the Service for its approval. A Minor Modification shall become effective on a date set by the Project Manager after he/she has received written notice from the Service of its approval of the Minor Modification. If the Service rejects the Minor Modification, the Service shall notify the Project Manager in writing of the reason for its rejection. In either event, the Project Manager shall inform the Steering Committee of the Service's action in the matter.

14.2 Amendment of the Permit

The Permit may be amended only with the agreement of all the Parties. Any amendment must be in accordance with the ESA, the Service's permit regulations, and any other applicable law. Any party proposing an amendment to the Permit shall provide a statement of the reason for the amendment and an analysis of the environmental effects including its effects on the Parties, the Conservation Plan, and on Covered Species.

14.3 Annual Report

The Program Manager shall include the adoption of any Minor Modification or Amendment as part of the annual report required pursuant to section 7.4.1(J) of the FMA.

15. ASSURANCES AND COMMITMENTS

Each of the Parties affirms, acknowledges, and confirms each of its covenants, representations, agreements, undertakings, commitments, or assurances contained herein in the FMA, in the Permit and, in addition, makes the following commitments and assurances.

15.1 Implementation Assistance

Each Permittee shall, to the maximum extent practicable, cooperate with Reclamation to ensure that actions required for Conservation Measures are accomplished including, but not limited to, the purchase, acquisition, or lease of land and water. Permittees shall not unreasonably withhold any necessary approvals to accomplish the above listed actions.

15.2 Participation on LCR MSCP Committees

Each of the Parties shall provide staff to serve on LCR MSCP committees, as appropriate, and shall ensure, to the extent possible, staff participation in discussions and meetings with the other Parties to ensure that the implementation of the LCR MSCP is consistent with any findings upon which the Permit is based.

15.3 Assurances Regarding LCR MSCP

After opportunity for public review and comment, based on the best available current scientific and commercial data, the Service has found that the LCR MSCP, as implemented by this Agreement: (i) is consistent with and will complement other applicable conservation planning and regulatory programs and efforts addressing wildlife within the region; (ii) minimizes and mitigates, to the maximum extent practicable, the effects of the Covered Actions and Covered Activities on the Covered Species; (iii) will ensure that the measures agreed upon by the Permittees and the Service will be met; and (iv) will be implemented. The Service shall not take a position inconsistent with the

acknowledgments set forth in this section, including, without limitation, in the form of comments offered by the Service in the context of any process associated with approvals for Covered Actions and Covered Activities with regard to effects on Covered Species.

15.4 "No Surprises" Assurances

This is not intended to be applied before December 12, 2004 or applicable date pursuant to Spirit of Sage litigation in any U.S. District Court.

Provided that Permittees have complied with their obligations under the HCP, this Agreement, the FMA, and the Permit, the Service can require Permittees to provide mitigation only in accordance with applicable Federal law and regulations, including the "No Surprises" regulations published as of the Effective Date at 50 C.F.R. 17.22(b)(5), 17.32(b)(5), and subject to the funding requirements set forth in sections 8.5 and 9.9 of the FMA.

15.4.1 "Spirit of the Sage" Decision

This is not intended to be applied before December 12, 2004 or applicable date pursuant to Spirit of Sage litigation in any U.S. District Court.

On June 10, 2004, the court in *Spirit of the Sage Council v. Norton,* Civil Action No. 98-1873 (D.D.C.) ordered that until the Service completes a rulemaking on revocation standards for incidental take permits, the Service may not approve new incidental take permits or related documents containing "No Surprises" assurances. The order specifically allows for the Service to issue incidental take permits that do not contain "No Surprises" assurances. Therefore, the "No Surprises" assurances contained in the Program Documents are currently unenforceable and ineffective with respect to this Permit. The remainder of the Permit, this Agreement, and the HCP shall remain in full force and effect to the maximum extent permitted by law. In addition in the event that any future judicial decision or determination holds that the "No Surprises" assurances rule (or similar successive rule) is vacated, held unenforceable or enjoined for any reason or to any extent, subject to the provisions of section 18.13 of this Agreement, the Program Documents shall be enforceable only to the degree allowed by any such decision or determination; provided that the remainder of the Permit, this Agreement, and the HCP

shall remain in full force and effect to the maximum extent permitted by law. In the event that the "No Surprises" assurances rule is vacated, held unenforceable or enjoined by a judicial decision or determination, including the June 10, 2004, order described above, but is later reinstated to otherwise authorized, the assurances provided under the revised rule shall automatically apply to the HCP, this Agreement, and Permit in place of the "No Surprises" assurances provisions in the Program Documents. If, in response to any judicial decision or determination the "No Surprises" assurances rule is revised, the "No Surprises" assurances provisions in the Program Documents shall be automatically amended in a manner consistent with the revised rule so as to afford the maximum protection to the Permittees consistent with the revised rule. Pursuant to the June 10, 2004, order in *Spirit of the Sage Council v. Norton*, Civil Action No. 98-1873 (D.D.C), until the Service adopts new revocation rules specifically applicable to incidental take Permits, all incidental take Permits issued by the Service shall be subject to a general revocation standard in 50 C.F.R. & 13.28(a)(5). Additionally, notwithstanding anything to the contrary in this Agreement and the HCP, the Service retains statutory authority, under both sections 7 and 10 of the ESA, to revoke incidental take Permits that are found likely to jeopardize the continued existence of a listed species.

15.5 Future Recovery Plans

Each group of State Parties identified in section 1 of this Agreement shall be entitled to have a representative included on any recovery team designated to prepare a recovery plan for any Covered Species.

15.6 Future Designations of Critical Habitat

To the maximum extent allowed by applicable law, the Service shall give the Parties written notice of its intention to propose the designation of any Critical Habitat within the Planning Area. Any such notice shall be given to the Parties as early as possible in any Critical Habitat designation proceeding. The Federal Parties, as well as any group of State Parties, may designate a representative to represent it and may actively participate in discussions regarding the proposed designation. In its implementation of this section 15.6, the Service shall: (i) confer with the Program Manager and the Steering

Committee to identify what changes to the Conservation Plan, if any, would be sufficient to avoid such designation; and (ii) shall consider the conservation benefits to that species already provided by the LCR MSCP.

15.7 Revision of Critical Habitat Designation for Covered Species

The Service agrees, to the maximum extent allowable by law and regulation and Federal appropriations, and after public review and comment, to reassess and, if appropriate, revise the boundaries of existing designated critical habitat of Covered Species taking into consideration the impacts of critical habitat designation on the Parties.

15.8 No Further Mitigation

Consistent with 50 C.F.R. § 424.12, the LCR MSCP incorporates special management considerations necessary to conservation of Covered Species. If, notwithstanding the foregoing, Critical Habitat is designated or revised within the LCR MSCP Planning Area, no mitigation, compensation, conservation enhancement, or other protective measures other than those set forth in the Program Documents will be required of any Permittee in connection with Covered Activities.

15.9 Notification

If the Service is of the opinion that the LCR MSCP may not be fulfilling the conservation goals and objectives for any Covered Species it shall immediately report its concerns to the Program Manager and the Steering Committee, and work with the Program Manager and the Steering Committee to develop modified Conservation Measures, within the framework of the Conservation Plan and this Agreement, that are more likely to fulfill the conservation goals and objectives of the LCR MSCP.

15.10 Authority to Issue Permit

The Service, is fully authorized to, and concurrent with the execution of this Agreement and the FMA, shall issue the Permit pursuant to section 10(a)(1)(B) of the ESA as requested in the HCP filed by the Permittees to allow the incidental take of Covered Species as a result of Covered Activities occurring within the Planning Area during the term of this Agreement and the Permit.

15.11 General Obligations of Parties

Each Party shall fully and faithfully perform all obligations undertaken or assigned to them pursuant to the Program Documents.

15.12 Authority

Each Party represents and warrants for the benefit of every other Party hereto that: (i) the execution of this Agreement has been duly authorized; (ii) no other authorization or approval, whether of governmental bodies or otherwise, will be necessary in order to enable that Party to enter into and comply with the terms of this Agreement; and (iii) the person executing this Agreement on behalf of each Party has the authority to bind that Party.

16. THIRD PARTY TAKE AUTHORIZATION

16.1 Authorization

Incidental take of Covered Species by landowners, water rights owners, developers, farmers, and other private and public entities undertaking Covered Activities who are: (i) under the direct control of a Permittee in conformance with approvals granted by that Permittee and in compliance with the Permit, and this Agreement and the HCP; or (ii) subject to a Certificate of Inclusion authorized by the Participant Group for the State within which the activity is to occur, shall be considered authorized to take Covered Species pursuant to the Permit. A Certificate of Inclusion, approved by the Service, shall authorize the person, firm, or entity to take Covered Species as an incidental result of Covered Activities within the Planning Area pursuant to the terms of the Permit and this Agreement. Any such landowner, water rights owner, developer, farmer, or other private or public entity shall be a Third Party Authorized to Take. Permittees shall include as a part of any Certificate of Inclusion a condition requiring compliance with the Permit, the HCP, and this Agreement, describe the Covered Activity for which the Incidental Take Authorization was granted, and report the identity of such entity to the Program Manager in writing. The Third Party Authorized to Take shall receive an Incidental Take Authorization only if it is in full compliance with all requirements of this Agreement, the HCP, the Permit, any issued entitlements, and all

other applicable requirements. Any Third Party Authorized to Take may carry out the Covered Activity authorized by the Permit and shall have the same rights and obligations under this Agreement as the Permittees.

17. REMEDIES AND ENFORCEMENT

17.1 In General

The Parties agree to work together in good faith to resolve disagreements using informal meetings and conferences to reach mutually satisfactory conclusions to matters in dispute.

17.2 Alleged Default

In the event any Party fails or refuses to undertake or complete any obligation required by the Program Documents, the entity alleging such default shall notify the Party alleged to be in default, the Service, the Program Manager, and the Chair, who shall promptly notify all Members of the Steering Committee of the alleged default. The Party alleged to be in default shall be given reasonable opportunity to cure the alleged default.

17.3 Loss of ITA Benefits

Any Party who believes that a Permittee has failed or refused to undertake or complete any obligation required by the Program Documents or by any funding agreement entered into by such Permittee to provide for funding for the LCR MSCP, may request that the Service suspend or revoke that defaulting Permittee's ITA coverage unless and until the alleged default is cured or until it has been determined by the Service that the Permittee is not in default. The Service shall review any alleged default of any such Permittee pursuant to sections 6.4 and 6.5 of this Agreement.

17.4 Enforcement of Agreement and Remedies for Breach

Except as provided in section 17.5 of this Agreement, each Party shall be entitled to pursue legal action, including the filing of a suit for specific performance, declaratory relief, or injunctive relief to enforce and seek remedies for any breach of applicable

provisions of the Program Documents, including access to Federal courts under the Administrative Procedure Act (5 U.S.C. § 702 *et seq*.).

17.5 No Monetary Damages, Effect of Agreement on Pre-Existing Liabilities, and Enforcement Authority of the Service

17.5.1 No Monetary Damages

No Party shall be liable in monetary damages to any other Party or other person for any breach of this Agreement or the FMA, any performance or failure to perform a mandatory or discretionary obligation imposed by this Agreement, or any other cause of action arising under this Agreement.

17.5.2 Retention of Liability

Each Party shall retain whatever liability it would otherwise possess for its present or future acts or failure to act in the absence of this Agreement.

17.5.3 Landowner Liability

All Parties shall retain whatever liability they would possess as an owner of interests in land in the absence of this Agreement.

17.5.4 Enforcement Authority of the Service

Nothing contained in this Agreement is intended to limit the authority of the Service to seek civil or criminal penalties or otherwise fulfill its enforcement responsibilities under the ESA and other applicable laws. However, as long as the HCP is being properly implemented in accordance with the Program Documents, the Service shall not seek civil or criminal penalties or otherwise enforce the take prohibitions of the ESA and other applicable laws for incidental take of Covered Species that is in accordance with the terms of the Incidental Take Authorization.

17.6 Effect of Federal Default

The Service agrees that a failure to comply with the applicable requirements of the LCR MSCP on the part of a Federal Party shall not result in the suspension or

revocation of the Permit as to those Permittees that are complying with the requirements of the LCR MSCP and the Permit.

18. MISCELLANEOUS PROVISIONS

18.1 Response Times

The Parties agree that time is of the essence in performance of the obligations of this Agreement. Except as otherwise set forth herein or as required by applicable laws or regulations, the Parties shall use reasonable efforts to respond to written requests within forty-five (45) Days.

18.2 No Partnership

Except as otherwise expressly set forth herein, neither this Agreement, nor any other Program Document shall make, or be deemed to make, any Party to this Agreement the agent for, or the partner or joint venture of, any other Party.

18.3 Nullification of Agreement

In the event that the Permit is revoked or substantially modified without the consent of the Parties, this Agreement shall be null and void and, in such event, no Party shall be bound by its terms.

18.4 Notices

18.4.1 Notice of Default, Suspension, or Revocation

Notices of default, suspension, or revocation shall be in writing, and either delivered personally, or by United States mail, certified and postage prepaid, return receipt requested to the addresses on file with the Program Manager. Notwithstanding the foregoing, notices may be delivered by facsimile or other electronic means, provided that they are also delivered personally or by overnight or certified mail. Notices shall be transmitted so that they are received within the specified deadlines. Notice delivered via certified mail, return receipt requested, shall be deemed received 5 business days after deposit in the United States mail. Notices delivered personally shall be deemed received

on the date they are delivered. Notices delivered via overnight delivery shall be deemed received on the next business day after deposit with the overnight mail delivery service.

18.4.2 Other Notices

All other notices required by this Agreement shall be in writing, and either delivered personally, or by United States mail, postage prepaid, or by facsimile or other electronic means to the addresses on file with the Program Manager.

18.5 Preparation by All Parties

This Agreement shall not be construed as if it had been prepared by any one Party, but rather as if all the Parties had prepared the Agreement.

18.6 Assignment or Transfer

This Agreement shall be binding on and inure to the benefit of the Parties, the Permittees, and their respective successors and assigns, including Third Parties Authorized to Take. Assignment or other transfer of the Permit or any rights or authorities granted thereunder shall be governed by ESA permit regulations.

18.7 Attorneys' Fees

If any action at law or equity, including any action for declaratory relief, is brought to enforce or interpret the provisions of this Agreement, each Party to the litigation shall bear its own attorneys' fees and costs, provided that attorneys' fees and costs recoverable by or against the United States shall be governed by applicable Federal law.

18.8 Elected Officials Not to Benefit

No member of, or delegate to, the United States Congress or the governing body of any of the Permittees shall be entitled to any share or part of this Agreement or to any benefit that may arise from it, except as a holder of an Incidental Take Authorization.

18.9 Availability of Funds

Implementation of this Agreement and the LCR MSCP by the Parties is subject to the requirements of the Anti-Deficiency Act, the laws of the States of Arizona, California, and Nevada, respectively, and the availability of appropriated funds.

18.10 Duplicate Originals

This Agreement may be executed in any number of duplicate originals. A complete original of this Agreement shall be maintained in the official records of each of the Parties hereto.

18.11 No Third Party Beneficiaries

Without limiting the applicability of rights granted to the public pursuant to the ESA or other applicable law, and except as specifically provided with respect to Third Parties Authorized to Take, this Agreement shall not create any right or interest in the public, or any member thereof, as a third party beneficiary hereof, nor shall it authorize anyone not a Party to this Agreement to maintain a suit under the provisions of this Agreement. The duties, obligations, and responsibilities of the Parties to this Agreement with respect to third party beneficiaries shall remain as imposed under applicable provisions of state and Federal law.

18.12 References to Regulations

Except as specifically provided in section 6.1 of this Agreement, any reference in this Agreement, the HCP, the BA, or the Permit to any regulation or rule of the Service shall be deemed to be a reference to such regulation or rule in existence at the time an action is taken.

18.13 Changes in the Environmental Laws

It is acknowledged and agreed by the Service that the Permittees are agreeing to perform substantial avoidance, minimization, mitigation, Conservation Measures, and management measures as set forth in the HCP, the Permit, and this Agreement. If a change in, or an addition to, any Federal law governing or regulating the impacts of Covered Actions or Covered Activities occurs as they relate to Covered Species,

including, but not limited to, ESA and NEPA, the Service shall give due consideration to the measures required under the LCR MSCP in applying the new laws and regulations to the Permittees.

18.14 Severability

If any part or provision of this Agreement shall be held invalid or unenforceable by a court having jurisdiction under applicable law, said part or provision shall be ineffective only to the extent of such invalidity without in any way affecting the remaining parts of said part or provision or the remaining provisions of the Agreement. Not withstanding the foregoing, in the event such invalidity or any rescission pursuant to this section alters the relative balance of benefits of the Parties to the significant disadvantage of a Party, the Parties shall attempt to negotiate a modification of the terms of the Agreement in order to reestablish the original balance of benefits, and if such agreement is not reached, the disadvantaged Party may rescind the Agreement.

18.15 Headings

The section headings used in this Agreement are for the convenience of the Parties and are not intended to be used as an aid to interpretation.

18.16 Faxed Signatures

Any Party may deliver its signed duplicate of this Agreement to any other Party by facsimile transmission, and such delivery shall be deemed made and completed upon receipt of such facsimile transmission by the other Party. Any Party delivering a signed duplicate by facsimile transmission shall promptly send the duplicate original bearing its original signature to the other Party, provided that a delay or failure to do so shall not negate the effectiveness of the delivery made by the facsimile transmission.

18.17 Further Instruments

Each of the Parties shall, promptly upon the request of another Party, execute, acknowledge, and deliver to the other any and all further instruments as are reasonably requested or appropriate to evidence or give effect to the provisions of this Agreement.

18.18 Force Majeure

If the Permittees are wholly or partially prevented from performing obligations under this Agreement because of unforeseeable causes beyond the reasonable control of and without the fault or negligence of the Permittees (Force Majeure), including, but not limited to, acts of God, labor disputes, sudden actions of the elements, or actions of non-participating Federal or state agencies or local jurisdictions, the Permittees shall be excused from whatever performance is affected by such unforeseeable cause to the extent so affected, and such failure to perform shall not be considered a material violation or breach, provided that nothing in this section 18.18 shall be deemed to authorize any Party to violate the ESA and provided further that: (i) the suspension of performance is of no greater scope and no longer duration than is required by the Force Majeure; (ii) within fifteen (15) Days after the occurrence of the Force Majeure, affected Permittees shall give the Service written notice describing the particulars of the occurrence; and (iii) Permittees use their best efforts to remedy their inability to perform (however, this section shall not require the settlement of any strike, walk-out, lock-out, or other labor dispute on terms which in the sole judgment of the Permittees are contrary to their interest).

18.19 Applicable Law

With respect to ESA, other Environmental Laws, and other applicable Federal laws, the laws of the United States shall govern the construction and interpretation of this Agreement. With respect to the state laws pertaining to the State Parties, the laws of their respective States shall govern the construction and interpretation of this Agreement. Further, nothing in this Agreement shall require any Party to: 1) violate any Federal statute or regulation, or 2) exceed its legal authority, as defined by applicable statute, regulation, rule, or order lawfully promulgated.

18.20 No Waiver

Neither approval of the LCR MSCP nor execution of this Agreement by a Party shall be construed, considered, or deemed to be a waiver of the right to any action, claim, cause of action or defense available to that Party prior to the execution hereof.

18.21 Migratory Bird Treaty Act Special Purpose Permit

The Permit issued pursuant to the LCR MSCP and this Agreement which allows the incidental take of any listed Covered Species shall, when such permit is effective as to such species, also constitute a special purpose permit pursuant to 50 C.F.R. § 21.27 to allow the take of species covered by such special purpose permit. Any such take shall not be in violation of the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-12). The special purpose permit shall be valid for a period of three years from its effective date, provided the Permit remains in effect for that period and for the species covered by such special purpose permit, subject to renewal as follows:

18.21.1 Automatic Renewal

Any special purpose permit as described in section 18.21 shall be automatically renewed, provided that the Permittees remain in compliance with the terms of the Permit and this Agreement. Each such renewal shall be valid for a period of three (3) years, provided the Permit remains in effect for such period and for such species.

18.22 Amendment to Implementing Agreement

This Agreement may be amended only by a writing executed by each of the Parties.

18.23 No Admission

Neither the application for the Permit nor the execution of this Agreement or any other Program Document by the Permittees shall be construed, considered, or deemed to be an admission by the Permittees that any take of any listed species has occurred or will occur.

THIS AGREEMENT HAS BEEN EXECUTED ON THE DATE(S) SET FORTH NEXT TO EACH SIGNATURE AND SHALL BECOME EFFECTIVE AS OF THE DATE THAT THE SERVICE ISSUES THE PERMIT.

Signature pages to follow when this Agreement is finalized.