Lower Colorado River
Multi-Species Conservation Program

LOWER COLORADO RIVER
Multi-Species Conservation Program

Final
Biological Assessment

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Contents

Tables

On Page

Figures

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 more than 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 (BCPA),

[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.

the 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 (CRBPA). 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. These activities are described in Chapter 2, "Description of Federal Actions (Covered Actions)" and Appendix J, "Technical Documentation of Ongoing and Future Operations."

The Bureau of Indian Affairs (BIA), National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), and Western Area Power Administration (Western) have their own authorizing legislation and responsibilities for various reaches and resources of the LCR. The BIA, NPS, BLM, Western, and the USFWS have identified actions for coverage pursuant to the LCR MSCP that are discussed in Chapter 2, "Description of Federal Actions (Covered Actions)."

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 USFWS proposed critical habitat for the southwestern willow flycatcher including areas in the 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 Lower Colorado River Multi-Species Conservation Program (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 nongovernmental 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

Lower Colorado River Multi-Species Conservation Program

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

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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.

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 (see LCR MSCP HCP Exhibit A). The LCR MSCP 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 BA and Regulatory Context

1.3.1 Need for the LCR MSCP BA

Section 7(a)(2) of the ESA requires that Federal agencies consult with the USFWS to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To facilitate compliance with section 7(a)(2), Federal agencies prepare a BA, pursuant to section 7(c)(1), that identifies the likely effects of the Federal action on threatened and endangered species. Section 7 and its implementing regulations apply to all Federal agency actions in which there is discretionary Federal involvement or control (50 Code of Federal Regulations [C.F.R.] §402.03) Contents of a BA are at the discretion of the

Federal action agencies (50 C.F.R. §402.12(f)). Under Title 50 C.F.R. Part 402.14(c), a request for formal consultation will include information in these basic areas:

- description of the action undergoing consultation,
- description of the area that may be affected by the action,
- description of ESA-listed species and designated critical habitat,
- description of the manner in which the action may affect (either directly or indirectly) any listed species or designated critical habitat and an analysis of any cumulative effects, and
- relevant reports, including literature and communications with experts.

The LCR MSCP BA is intended to meet all of the regulatory requirements necessary for the USFWS to prepare a BO under section 7(b) of the ESA, including an incidental take statement for threatened and endangered species affected by specified Federal agency actions (covered actions) 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 Federal Actions (Covered Actions)"). The Federal action area is defined as "…all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 C.F.R. §402.02). Based upon the effects analysis presented in Chapter 5 of the LCR MSCP BA, the LCR MSCP planning area is the Federal action area addressed in the LCR MSCP BA. This LCR MSCP BA serves as an assessment of effects for the covered activities taken by Reclamation, Western, the NPS, the BIA, the USFWS, and the BLM as described in Chapter 2. The LCR MSCP BA also provides information that, along with the LCR MSCP HCP and other supporting documents, will be used by USFWS for its intra-Service section 7 consultation on the issuance of a section 10(a)(1)(B) incidental take permit to non-Federal applicants (see Table 1-1) for non-Federal covered activities that are addressed in the LCR MSCP HCP (see Chapter 3).

The LCR MSCP Conservation Plan, as described in Chapter 5 of the companion LCR MSCP HCP, provides measures to avoid, minimize, and mitigate the effects of the potential impacts of the federal covered actions and the non-federal covered activities on listed and other covered species and their habitat and to ensure that incidental take (take) of listed species will not jeopardize their continued existence (i.e., not reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild) or adversely modify designated critical habitat.

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

Permit Applicants[2] 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
Nevada
Basic Water Company
Colorado River Commission of Nevada
Nevada Department of Wildlife
Southern Nevada Water Authority

[2] 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.

1.3.2 Relationship between LCR MSCP BA and LCR MSCP HCP

Reclamation and the non-Federal LCR MSCP Applicants have prepared the LCR MSCP Conservation Plan (see Chapter 5 of the LCR MSCP HCP), which includes conservation measures for species and their habitats designed to achieve specific species goals for minimizing and mitigating impacts on species covered under the LCR MSCP BA. The non-Federal LCR MSCP Applicants have prepared the LCR MSCP HCP as a companion document to the LCR MSCP BA in compliance with section 10(a)(1)(B) of the ESA to cover non-Federal activities that could result in take of listed species.

The LCR MSCP Conservation Plan (see Chapter 5 of the LCR MSCP HCP) provides sufficient conservation of listed and other covered species to address all Federal covered actions described in Chapter 2 and all non-Federal covered activities described in Chapter 3. The LCR MSCP HCP includes the LCR MSCP Conservation Plan, which provides long-term mitigation to offset incidental take of listed threatened and endangered species resulting from actions, projects, or activities of the non-Federal resource users along the LCR (see Chapter 3).

The covered actions addressed in the LCR MSCP BA and covered activities addressed in the LCR MSCP HCP 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 this document, 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 actions and activities.[3] Many of the Federal actions on the LCR are nondiscretionary; see Section 2.1 for a discussion of the relationship between Federal discretionary actions, Federal nondiscretionary actions, and non-Federal covered activities.

The LCR MSCP Conservation Plan (LCR MSCP HCP Chapter 5) includes conservation measures for nonlisted species, thereby providing early protection for species not listed at the time the LCR MSCP BA was developed. In addition to conservation measures to avoid, minimize, and mitigate incidental take of listed species that may result from Federal and non-Federal covered activities, the LCR MSCP Conservation Plan includes conservation measures that will contribute to the recovery of listed species and reduce the likelihood for future listing of nonlisted covered species.

In summary, the LCR MSCP Conservation Plan, described in Chapter 5 of the LCR MSCP HCP, 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 Federal covered actions and non-Federal covered activities described in Chapters 2 and 3 of this LCR MSCP BA and Chapter 2 of the companion LCR MSCP HCP.

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[3] 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 Chapter 2, Table 2-13, and Section 5.2.

1.3.3 Relationship with 1997 and 2002 Biological Opinions

The LCR MSCP Steering Committee has overseen development of the LCR MSCP BA and LCR MSCP HCP to comply with ESA section 7 and section 10(a)(1)(B), 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 for 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 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 af and implementation of specific surplus guidelines through year 2016. The 2001 biological opinion will not be superseded by the LCR MSCP; however, as described in sections 4.3.1 and 5.2, 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 BA 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 of the Interior to complete an environmental impact statement 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 have completed and are presently implementing a regional multiple species habitat conservation plan (MSHCP) 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 BA

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 covered in this LCR MSCP BA are those species for which incidental take authorization may be required under the ESA over the 50-year term of the LCR MSCP. These species were identified based on an initial assessment of how implementing proposed Federal covered actions and conservation measures could affect listed species or species that could become listed during the term of the LCR MSCP.

Species presently listed as threatened or endangered under the ESA are part of the section 7 consultation initiated by this LCR MSCP BA. The Federal agencies request technical assistance from USFWS on species not presently listed under the ESA that are covered under this LCR MSCP BA. The LCR MSCP will implement conservation measures for these nonlisted covered species and thereby support ESA compliance for these species in the event that they become listed. Any nonlisted species that becomes listed during the term of the LCR MSCP and that may be affected by Federal covered activities identified in this LCR MSCP BA would likely require a review of the BO on the LCR MSCP to evaluate the effects of the covered activity on the species and the degree of conservation afforded by the LCR MSCP. Documentation, possibly in the form of an amendment to the BO with an incorporated Incidental Take Statement, would be needed before take could be authorized under section 7.

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 and BA. 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 magnitude sufficient to 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). Of the 27 covered species, six are listed as threatened or endangered under the ESA and are part of the section 7 consultation initiated by this LCR MSCP BA.

In addition to the covered species, the LCR MSCP BA and HCP include 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 affects of covered activities, or to develop specific conservation measures. The LCR MSCP Conservation Plan (LCR MSCP HCP 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.

The LCR MSCP BA, in addition to covered and evaluation species, assesses effects of Federal covered activities on the bald eagle. Because the bald eagle is not a covered species, conservation measures are not included for the bald eagle in the LCR MSCP Conservation Plan. The bald eagle is addressed in the LCR MSCP BA because it winters in the LCR MSCP planning area and individuals may be affected by the Federal covered activities (see Section 5.7). Such effects are not expected to rise to the level of take and are not likely to adversely affect bald eagle as a species.

1.4.3 Covered Federal Actions and Non-Federal Activities[4]

This LCR MSCP BA analyzes the effects to covered species from covered actions conducted by Reclamation, Western, the NPS, the BIA, the USFWS, and the BLM under their authorities and implementation of the LCR MSCP Conservation Plan by Reclamation. The USFWS will use the LCR MSCP BA in the evaluation of the Federal covered actions. There is no requirement for the USFWS to have a BA for issuance of a section 10(a)(1)(B) permit. The LCR MSCP HCP and supporting documents provide information on the extent of take and the proposed mitigation that is used by the USFWS for its intra-Service section 7 consultation on the issuance of a section 10(a)(1)(B) permit for the non-Federal covered activities.

The LCR MSCP BA covers a range of activities that could result in incidental take of listed species by Federal agencies. The LCR MSCP BA covers Reclamation's role in the following actions (see detailed descriptions in Chapter 2):

- ongoing flow-related covered actions, including:
    - flood control,
    - state apportionment and water contracts,

[4] The LCR MSCP documents refer to Federal and non-Federal actions and activities assessed for coverage under the LCR MSCP. Any use of the term "activities" or the phrase "covered activities" in reference to the Federal actions addressed in this BA is synonymous with the term "action" as defined in the ESA and its implementing regulations.

  - annual operations (normal, surplus, shortage, and unused apportionment),
  - daily operation,
  - electric power generation,
  - the Lower Colorado River Water Supply Project—California,
  - Decree accounting, and
  - 1944 Water Treaty deliveries;
- future flow-related covered actions, including:
  - specific surplus and shortage guidelines,
  - flood release contracts, and
  - changes in storage and delivery of state entitlement waters through various administrative actions;
- ongoing non-flow-related covered actions, including:
  - channel and facilities maintenance throughout the LCR MSCP planning area,
  - Operation, maintenance, and replacement (OM&R) of major Federal facilities and miscellaneous operation and maintenance,
  - facilities and other maintenance activities at the SIB,
  - backwater maintenance accomplished under past mitigation requirements and as cooperative conservation efforts with other parties, and
  - Limitrophe Division maintenance activities;
- future non-flow-related covered actions, including:
  - Topock Marsh habitat improvements,
  - Laguna Reservoir restoration and enhancement,
  - maintenance of unprotected banklines,
  - proposed jetties, and
  - proposed stockpiles and access roads; and
- implementation of the LCR MSCP Conservation Plan.

For Western, the LCR MSCP BA covers operations related to electric power generation at Hoover, Davis, and Parker Dams (see detailed descriptions in Chapter 2).

For the NPS, the LCR MSCP BA covers the following actions (see detailed descriptions in Chapter 2):

- riparian habitat restoration,
- fishery management,
- boating access, and
- temporal and spatial diversion of Colorado River water rights.

Table 1-2. Proposed Covered and Evaluation Species under the LCR MSCP BA 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 traillii 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

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.

For the BIA, the LCR MSCP BA covers the following actions (see detailed descriptions in Chapter 2):

- ongoing activities, including:
  - irrigation system operation and maintenance,
  - water conservation practices,
  - riparian habitat rehabilitation and restoration,
  - wildland fire management,
  - woodland and shoreline maintenance project on the Chemehuevi Indian reservation, and
  - temporal and spatial diversion of Colorado River water rights; and
- future projects, including:
  - canal lining,
  - water conservation practices,
  - farmland development (including construction of irrigation systems),
  - riparian habitat rehabilitation and restoration,
  - Headgate Rock Dam O&M, and
  - wildland fire management.

For the USFWS, the BA covers (see detailed descriptions in Chapter 2) temporal and spatial diversion of Colorado River water rights, including surface flows and pumping for the Havasu, Cibola, Imperial, and Bill Williams River National Wildlife Refuges (NWRs).

For the BLM, this BA covers temporal and spatial diversion of Colorado River water rights (see detailed description in Chapter 2).

Detailed descriptions of the covered actions by Federal agencies are provided in Chapter 2 and Appendix J, "Technical Documentation of Ongoing and Future Operations," and major facilities on the LCR are described in Appendix O. Detailed description of non-Federal covered activities conducted by Arizona, Nevada, and California to be authorized under the USFWS section 10(a)(1)(B) incidental take permit are provided in Chapter 3. The descriptions of Federal covered activities in this LCR MSCP BA include both discretionary and nondiscretionary actions. Nondiscretionary actions are those actions for which applicable provisions of the Law of the River and other applicable laws do not allow Federal agencies alternative decision-making authority. In addition to statutory provisions, court orders and injunctions may limit the discretion of Federal agencies. See Section 2.1 for a discussion of how Federal discretionary, Federal nondiscretionary, and non-Federal actions are addressed in this LCR MSCP BA.

The LCR MSCP is intended by its Federal and non-Federal partners to be a robust and comprehensive species conservation program for activities that occur or may occur in the

LCR MSCP planning area (see Section 1.4.1, “Geographic Scope”) for a 50-year period (see Section 1.4.4, “Temporal Scope”). In an effort to make the LCR MSCP Conservation Plan as complete and effective as possible for the benefit of species covered by the LCR MSCP BA (see Section 1.4.2, “Covered and Evaluation Species”), the LCR MSCP partners have analyzed and provided conservation measures to address the effects of all Federal covered actions and non-Federal covered activities, including covered actions that are not within the discretionary control of the Federal participants (see Section 2.1). The LCR MSCP will provide long-term conservation to offset any incidental take of Federally listed threatened and endangered species through the actions and programs of the Federal and non-Federal agencies along the LCR. The LCR MSCP will implement conservation measures for species not presently listed as threatened or endangered under the ESA and thereby support ESA compliance for these species in the event that they become listed. In addition to conservation measures that address impacts on covered species in the LCR MSCP planning area, the LCR MSCP will implement conservation measures that are expected to contribute to the recovery of listed species and reduce the likelihood for future listing of species not presently listed.

1.4.4 Temporal Scope

The goal of the LCR MSCP is to provide long-term ESA compliance for the next 50 years for covered actions and activities conducted by Federal and non-Federal LCR MSCP participants. The Federal lead agencies are requesting a BO from the USFWS with a 50-year term for all covered Federal covered actions and all ESA-listed species addressed in this LCR MSCP BA.

1.5 Overview of LCR MSCP Planning 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 Permit Applicants (Applicants) (see Table 1-1) are those non-Federal entities requesting section 10(a)(1)(B) incidental take permits from USFWS for the species and activities covered in the LCR MSCP HCP. Following completion of the section 7 consultation and issuance of the section 10(a)(1)(B) permit, the Steering Committee will continue to operate, as defined under the FMA (see Exhibit A to the final LCR MSCP HCP) and will coordinate with the LCR MSCP Program Manager (Program Manager). The LCR MSCP Program Manager is the position to be established by Reclamation, as described in the FMA, that will be responsible for implementing the LCR MSCP.

[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).

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

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, HCP, and BA. 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 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 BA and 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:

- 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 the 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 (FR) 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 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 BA and will continue to be key elements in implementation of the LCR MSCP.

1.5.3 Coordination with Science Review Panels

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 8, “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 BA provides all information required by the ESA section 7 and USFWS section 7 regulations (50 C.F.R. Part 402). Below is a summary of the contents of each chapter of this LCR MSCP BA.

- Chapter 2, “Description of Federal Actions (Covered Actions),” describes the Federal actions covered under this consultation.
- Chapter 3, “Non-Federal Covered Activities: Ongoing and Future,” describes the specific non-Federal activities covered under the LCR MSCP.
- Chapter 4, “Environmental Baseline and Resources of the LCR,” describes the environmental baseline, including the historical and existing river ecosystem and vegetation of the LCR relevant to the species covered in the LCR MSCP BA and the approach to assessing habitat for each of the covered species.
- Chapter 5, “Effects of the Covered Activities,” contains the analysis of effects on covered species expected to result from covered actions, including implementation of the LCR MSCP Conservation Plan.
- Chapter 6, “Cumulative Effects,” describes the cumulative effects of non-Federal activities within the LCR MSCP planning area.
- Chapter 7, “Summary of Effects Analysis,” provides a summary of the effects on covered species.
- Chapter 8, “Experts Contacted and Peer Review Process,” provides a list of names of species experts contacted during the development of the LCR MSCP and LCR MSCP BA and a summary of the results of the peer review process.
- Chapter 9, “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		
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

Appendix		Referenced in Volume I, LCR MSCP EIS/EIR	Referenced in Volume II, LCR MSCP HCP	Referenced in Volume III, LCR MSCP BA
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 Federal Actions (Covered Actions)

2.1 Introduction

This chapter describes ongoing and future actions for which Reclamation, Western, the NPS, BIA, USFWS, and BLM are seeking ESA compliance through the LCR MSCP.

Federal action agencies are required to consult with the USFWS only with respect to activities for which the action agency has discretionary involvement or control (50 C.F.R. §402.03 [2001]). This chapter includes descriptions of the river OM&R activities of Reclamation as they relate to its responsibilities for water management on the LCR system. The provisions of law applicable to the LCR include a complex system of compacts, Federal statutes, contracts, decrees, and treaties, collectively known as the *Law of the River* (see listing at Appendix A), which governs the management and delivery of Colorado River water in the Lower Basin of the Colorado River and largely dictates Reclamation's actions, limiting those actions in which Reclamation has discretionary involvement and control. As a result, certain Reclamation actions on the LCR are nondiscretionary and therefore not subject to section 7 consultation, as was recently confirmed by a U.S. District Court in *Defenders of Wildlife v. Norton*, 257 F. Supp.2d 53 (D.D.C. 2003).

In many cases**,** a nondiscretionary Federal action is triggered by a state or other non-Federal action. For example, the normal delivery of 7.5 million acre-feet (maf) annually to water contractors in Arizona, California, and Nevada pursuant to the Decree includes a nondiscretionary Federal component (storage and delivery), a discretionary Federal component (diurnal water releases), and may include a non-Federal component (e.g., the request for and diversion of water by a contractor). Given the combination of Federal actions, both discretionary and non-discretionary, and non-Federal actions carried out in the Lower Division of the Colorado River, it is not clear which parties could have specific responsibility under section 9 of the ESA for any potential take of ESA-listed species. 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 section 7 and section 10(a)(1)(B). The effects of all covered Federal actions and non-Federal activities, whether discretionary or not, have therefore been described and covered in this LCR MSCP BA prepared by Reclamation, as well as in the LCR MSCP HCP. Thus, the LCR

MSCP provides a comprehensive approach to ESA compliance for both Federal and non-Federal covered actions and activities.

This approach is not intended to suggest that any Federal action agency is required to consult with the USFWS regarding the effects of any nondiscretionary Federal action as part of this consultation or any other consultation, or that any nondiscretionary Federal actions could be the cause for reinitiation of this consultation. In addition, this approach is not intended to be, nor should it be construed as, a waiver of any claim by any Federal action agency that a nondiscretionary activity described in this chapter and analyzed, mitigated, and authorized under this LCR MSCP is not subject to sections 7 and 9 of the ESA.

This chapter describes the activities of the six Federal agencies in descriptive categories of actions. With respect to Reclamation activities described in this chapter, each subsection includes a table that lists each discretionary function, each nondiscretionary function, and each function that includes nondiscretionary Federal actions that relate to state or local water agency activities or simply a statement as to the discretionary action of the activity. For purposes of furthering the understanding of water and power operations on the LCR, Appendices A, J, and O–R include descriptions or summaries of the legal and operational background of the LCR. The appendices also include descriptions, in various forms, including narrative, map, and schematic drawings, of features and functions of the major water control facilities on the LCR, as well as historical and projected reservoir and river elevations and flows. In particular, Appendix J provides detailed information concerning ongoing and future operations on the Lower Colorado River related to the covered actions enumerated in this chapter.

For ease of description and general classification, covered actions are listed in the chapter as *ongoing* or *future*. An action is described as a future covered action because it may be proposed and implemented in the future. However, a Federal agency's inclusion of an action in this chapter is not a formal proposal for that action at this time, but simply a proposal for ESA coverage for the covered actions. Moreover, some actions listed in either category may include both ongoing and future aspects. An action described in the ongoing section may include a largely ongoing component and a lesser future component. Inclusion of an activity in one general category is not intended to limit its inclusion in another category. Each Federal action agency intends that its actions be covered and included in this LCR MSCP BA as particularly described in the narrative and tabular portions of this chapter, and ESA compliance is not to be limited based on an activity's inclusion in a particular general category.

None of the Federal agencies covered by the LCR MSCP are seeking ESA compliance through the LCR MSCP for any potential impacts of proposed discretionary actions on species that may be listed pursuant to the ESA in the Republic of Mexico (i.e., outside the borders of the United States). To the extent that any such compliance may be required in the future pursuant to applicable law, the Federal agencies will address such compliance at the time any discretionary Federal actions are actually proposed. This approach does <u>not</u> reflect any conclusion on the part of any of the Federal agencies that any such consultation is required, as a matter of law or regulation, on any possible impact that proposed discretionary actions may have on United States–listed species in the Republic of Mexico.

2.2 Bureau of Reclamation

The principal responsibilities of Reclamation, on behalf of the Secretary, in managing the LCR were established by the BCPA of December 21, 1928 (45 Stat. 1057), and include flood control, improvement of navigation, and river regulation; providing for storage and delivery of Colorado River water for reclamation of lands and municipal, industrial, and other beneficial purposes; and for generation of electrical power. The 1944 Water Treaty quantifies the provisional allotment of Colorado River water to be delivered to Mexico[1].

2.2.1 Ongoing Flow-Related Actions

Reclamation's ongoing flow-related river management operations are discussed below under the following headings: "Flood Control," "State Apportionment and Water Contracts," "Annual Operations—Normal, Surplus, Shortage, and Unused Apportionment," "Daily Operations—Hoover, Davis, Parker, Senator Wash, Imperial, and Laguna Dams," "Electric Power Generation," "Lower Colorado Water Supply Project—California," "1944 Water Treaty Deliveries," "and "Decree Accounting."

2.2.1.1 Flood Control

Under the BCPA, the first priority for the operation of Hoover Dam and Lake Mead is river regulation, improvement of navigation, and flood control. Davis and Parker Dams also provide flood control for tributary and side wash inflow into their reservoirs, Lakes Mohave and Havasu, respectively. Flood control operations at Davis and Parker Dams take into consideration the most likely tributary and side wash inflow from summer and fall rain events and are managed by the Secretary, through Reclamation, as described further in Section J.4.3.2 or in Table 2-1.

Section 2(b) of the BCPA allocated funds for the construction of Hoover Dam, including funding for flood control. Subsequently, section 7 of the Flood Control Act of 1944 established that the Secretary of War (now the U.S. Army Corps of Engineers [Corps]) would prescribe regulations for flood control for projects authorized, wholly or in part, for such purposes. The Corps is responsible for providing these flood control regulations and has authority for final approval. Reclamation has no discretion in making the minimum flood control releases from Lake Mead through Hoover Dam during flood control operations. Any deviations from the minimum flood control operating instructions must be authorized by the Corps. The Secretary, through Reclamation, is responsible for operating Hoover Dam in accordance with these regulations. The Corps is not a participant in the LCR MSCP; any discretionary actions authorized or carried out by the Corps would be the subject of ESA consultations with the USFWS, as appropriate.

[1] The International Boundary and Water Commission (IBWC) is responsible for implementing the terms of the 1944 Water Treaty as well as resolving treaty-related disputes between the United States and Mexico. IBWC coordinates implementation of the 1944 Water Treaty with Reclamation acting for the Secretary as the river manager and operator.

The Secretary's ongoing implementation, through Reclamation, of the flood control regulations is included in this LCR MSCP BA as a covered action. The Corps is responsible for modifying the Water Control Manual for Lake Mead/Hoover Dam, as appropriate.

Any prospective changes to applicable flood control regulations are not addressed by the LCR MSCP. ESA compliance will be addressed by the Corps when revised regulations are proposed.

The Los Angeles District of the Corps published the current flood control regulations in *Water Control Manual for Flood Control, Hoover Dam and Lake Mead Colorado River* dated December 1982 (Water Control Manual). The Field Working Agreement between the Corps and Reclamation for the flood control operations of Hoover Dam and Lake Mead, as prescribed in the Water Control Manual, was signed on February 8, 1984 (Appendix P). The Field Working Agreement is designed to ensure a clear understanding of flood control regulations and to facilitate the exchange of information between the Corps and Reclamation that is required for operation of Hoover Dam and Lake Mead.

The Field Working Agreement specifies that Lake Mead's uppermost 1.5 maf of storage capacity, between elevations 1,219.61 feet mean sea level (msl) and 1,229.0 feet msl, is allocated exclusively as flood control space. The Field Working Agreement further specifies operations for two distinct periods within the year: 1) from August 1 to January 1, certain reservoir space requirements must be met to prepare for the next spring season's runoff, and 2) from January 1 to July 31, the runoff forecasts are applied to determine releases necessary to maintain the exclusive flood control space while minimizing potential damage downstream.

Minimum available system-wide flood control space increases from 1.5 maf on August 1 to 5.35 maf on January 1. In addition to Lake Mead, required flood storage space can be accumulated in certain Upper Basin reservoirs (Powell, Navajo, Blue Mesa, Flaming Gorge, and Fontenelle) within specified constraints. Normal space-building releases from Lake Mead to meet the required August 1 to January 1 flood control space requirements are limited to a maximum of 28,000 cubic feet per second (cfs).

The Secretary may also consider additional space-building releases (described as anticipatory flood control releases) beyond the minimum requirements specified by the Field Working Agreement after consideration of other factors including channel capacity and maintenance downstream, power plant maintenance requirements at Hoover, Davis, and Parker Dams, and hydrologic conditions and forecasts.

Between January 1 and July 31, flood control releases, based on the forecasted inflow, may be required to prevent filling of Lake Mead beyond its 1.5 maf minimum storage space requirement. The required release is determined each month to ensure that the minimum space is maintained while attempting to avoid power plant bypasses and damage downstream due to high flows. If a specific flood control release is required for a month, the required volume of water must be released within the month; however, some discretion exists with regard to the daily releases that are made within the month, considering the need to maintain non-damaging flow levels downstream and other objectives.

Table 2-1 lists Reclamation's discretionary/nondiscretionary actions related to flood control operations. See Appendix J for detailed description of flood control facility operations.

Table 2-1. Actions Relating to Flood Control

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Prescribed flood control releases per Field Working Agreement and *Water Control Manual for Lake Mead/Hoover Dam*	Timing of required releases may be varied within the month	None
	Anticipatory flood control releases	
	Available flood control space in Lake Mead can be reduced to 1.5 maf August 1 to January 1 if prescribed space is available in upstream reservoirs	
	Management of target elevations for Lake Mohave (Davis Dam) and Lake Havasu (Parker Dam)	

2.2.1.2 State Apportionment and Water Contracts

The cumulative LCR water apportionment for the three Lower Division States is 7.5 maf for normal water years. A normal year is defined by the water supply conditions described in Article II(B)(1) of the Decree. The individual state apportionments are 4.4 maf for California, 2.8 maf for Arizona, and 0.3 maf for Nevada. The Secretary has contracted for the delivery of these apportionments pursuant to the BCPA. However, the cumulative annual apportionment can be greater than the 7.5 maf in surplus years and less than 7.5 maf in shortage years. See the annual operations discussion below in Section 2.2.1.3.

Reclamation delivers all Colorado River water within each state's apportionment to individual entitlement holders in that state pursuant to water delivery contracts or other delivery obligations. Reclamation delivers Colorado River water to approximately 170 entities pursuant to water delivery contracts, miscellaneous present perfected rights (PPRs), and Federal or Secretarial reservations of water. See Appendix G for list of water delivery contracts. Some entitlement holders further allocate the water they receive from Reclamation and convey it pursuant to contractual arrangements. For example, Central Arizona Water Conservation District (CAWCD) conveys water to 57 non-Indian Central Arizona Project (CAP) subcontractors for municipal and industrial use, 10 non-Indian subcontractors for agricultural use, and 10 Indian entities. In California, Metropolitan conveys this water to 26 member agencies. Reclamation delivers this water, ordered by contract holders, to designated diversion facilities, which are described in Appendix O. An example of Reclamation's water deliveries to facilities and water contractors is presented in Appendix Q (Article V Decree Accounting Report for 2000). It is these water contractors (contract/entitlement holders) to which Reclamation makes nondiscretionary delivery of each state's water apportionment on a yearly basis.

When a State's Colorado River water apportionment is not consumptively used in any year by a higher priority entitlement holder, the unused water within that State is made available on a annual basis, to lower priority entitlement holders in that State that could put the water to beneficial use within their contractual limits. Delivery of a State's unused entitlement to a junior entitlement holder in that State is nondiscretionary. If a State's entitlement holders cannot beneficially use the entire State's allocation, the State has unused apportionment available. Release of a State's unused apportionment to a user in another State pursuant to Article (B)(6) of the Decree may be discretionary subject to existing provisions of section 1 of the Interim Surplus Guidelines Record of Decision. (See Section 2.2.1.3 for further details.)

Table 2-2 lists the discretionary/nondiscretionary activities for the State Apportionment and Water Contracts activities.

Table 2-2. State Apportionment and Water Contracts Activities

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water to water users in the United States pursuant to applicable Federal law, including the Boulder Canyon Project Act (BCPA); the Supreme Court Decree of March 9, 1964, 376 U.S. 340, as amended (Decree) Delivery of a State's unused entitlement to a junior entitlement holder within that State on a annual basis	Determinations and delivery of post-2016 unused apportionment water from one State to another within the Lower Basin on a annual basis	Delivery of water to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree

2.2.1.3 Annual Operations—Normal, Surplus, Shortage, and Unused Apportionment

The CRBPA required the Secretary to adopt long-range operating criteria for the Colorado River by January 1, 1970. The *Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs pursuant to the Colorado River Basin Project Act of September 30, 1968* (LROC) adopted in 1970 directs the operation of the Colorado River reservoirs in compliance with requirements set forth in the Colorado River Compact, the Colorado River Storage Project Act, the BCPA, the 1944 Water Treaty, and other applicable Federal decrees and laws. Further information on the Law of the River is presented in Appendix A. The LROC are implemented by the Secretary through decisions described in an annual operating plan (AOP). Issuance of an AOP is a nondiscretionary function because it is required by section 602(b) of the CRBPA. In addition, the Secretary periodically reviews the LROC through a public review process.

The AOP is prepared annually by Reclamation in consultation with the Basin States, other Federal agencies, Indian Tribes, state and local agencies, and the general public.

The AOP describes how Reclamation will manage the reservoirs over the next year,[2] consistent with the LROC and the Decree. Information is gathered to develop an AOP, as required by the CRBPA, after taking into consideration probable runoff, depletions, and consumptive uses. The major components of the AOP include the projected operation of the system reservoirs under varying hydrologic conditions, determination of storage requirements in the Upper Basin as required by the CRBPA, the amount of Colorado River water available pursuant to the 1944 Water Treaty delivery, the amount of Colorado River water available to the Lower Division States, and the availability of any Lower Division State's unused apportionment. Annual determinations are developed based on projected requirements, existing storage conditions, and probable inflows.

Prior to the beginning of the calendar year, diversion schedules are requested from water contractors in the Lower Division States entitled to Colorado River water and are approved by Reclamation pursuant to applicable Federal law and regulations (e.g., section 5 of the BCPA, 43 C.F.R. Part 417, Colorado River Compact, and the Decree). These approved schedules, along with a forecast of water supply, are input to Reclamation's monthly operational model (the "24-month Study"). As the year progresses, the model is updated each month to reflect reported and projected water use for the year and to incorporate updates to the inflow forecast. The model is then re-run to produce an updated plan of operations for the mainstem reservoirs. Appendix J presents additional information concerning annual and monthly operations.

Pursuant to LROC, the Secretary may revise the annual determinations of the AOP within the year to reflect current hydrologic conditions, with appropriate consultation with the Basin states and other parties, as required by law.

As mentioned above, the Secretary, through Reclamation, is required to determine the amount of Colorado River water available to the Lower Division States for the year. In a normal year, sufficient Colorado River water is available for release, as determined by the Secretary, to satisfy up to 7.5 maf of annual consumptive use in the Lower Division States. The typical distribution of water in a normal year is illustrated in Figure 2-1.

In a "surplus" year, sufficient Colorado River water is available for release, as determined by the Secretary, to satisfy annual consumptive use in the Lower Division States in excess of 7.5 maf. The Secretary adopted a Record of Decision (ROD) incorporating final Interim Surplus Guidelines (ISG) on January 16, 2001[3]. The ISG supplement the more general factors provided in the LROC and are to be applied by the Secretary in the development of the AOP for the 15-year period beginning in the 2002 AOP and through preparation of the 2016 AOP. See the *Record of Decision, Colorado River Interim Surplus Guidelines: Final Environmental Impact Statement*, January 16, 2001, *Record of Decision* (66 FR 7772), and Appendix J, for further detail.

[2] Within the Lower Basin, pursuant to the Decree, the determinations of unused apportionment, normal, surplus, and shortage deliveries are made annually on a calendar year basis. Pursuant to the LROC, hydrologic determinations in the Upper Basin, such as reservoir equalization, are based on the water year (October–September). In the AOP, which addresses both Upper and Lower Basin operations, references to *year* are expressly named *calendar* or *water*. Reclamation finalizes the AOP each year as close as possible to October 1, but the AOP is generally in effect through the following calendar year (i.e., a 15-month period). For example, the 2005 AOP would be in effect from October 2004 through December 2005.

[3] The ISG were the subject of a previously completed ESA consultation. See also Section 2.2.2.1 of this chapter.

The Secretary has delivered surplus water to Lower Division water entitlement holders with permanent contracts for delivery of surplus water and to other water contractors using temporary letter agreements.

In addition to the BCPA, Reclamation is subject to two different laws to commit this surplus water: the Reclamation Reform Act of October 12, 1982, Public Law 97-293 (RRA) and the Reclamation Project Act of 1939 (1939 Act) (53 Stat. 1187). Under section 215 of the RRA, water contractors who receive a temporary supply of water (not to exceed 1 year) that is not otherwise storable for project purposes are not subject to the ownership limitations of RRA or the full-cost pricing limitations of Federal Reclamation law. The existence of such surplus water allows the Secretary to make temporary supplies of water available pursuant to sections 9(c)(2) or 9(e) of the 1939 Act. Surplus water was delivered to water contractors under 1-year letter agreements each year from 1996 through 2000.

Water can also be provided under the authority of Reclamation States Emergency Drought Relief Act of 1991 (DRA), enacted March 5, 1992 (Public Law 102-250). Reclamation provided water to users in 1997, 2001, and 2002 pursuant to this authority. In Arizona, the CAWCD, operator of the CAP, entered into separate agreements for delivery of this water to each water contractor that needed it for drought relief. Each agreement had a 2-year term, which is the maximum term permitted under the act. The source of water for emergency drought assistance can come from project and nonproject sources, and the supply of water under this authority is only a temporary supply. All water that has been provided pursuant to this authority within the Lower Diversion has been delivered to Arizona water contractors and has been accounted for within Arizona's 2.8-maf annual apportionment.

In a shortage year, insufficient Colorado River water is available for release, as determined by the Secretary, to satisfy the annual consumptive use of 7.5 maf in the Lower Division States. There are no established shortage guidelines that define when Lower Basin users would receive shortage condition deliveries or the precise volume of the shortage restriction. The establishment of shortage guidelines is not formally being proposed at this time. In the event that Reclamation proposes to adopt shortage criteria in the future and such criteria are consistent with the information presented in Appendix J, and analyzed in this BA, the LCR MSCP will provide ESA compliance for those criteria. See also Section 2.2.2.1 of this chapter.

Article II(B)(6) of the Decree provides that the Secretary may, in any year, release water for consumptive use in one Lower Division State that is apportioned to but unused by another Lower Division State. The Decree provides that a state to which this "unused apportionment" water is delivered accrues no right to the recurrent use of that water. The Secretary has made available, and Reclamation has delivered, unused apportionment water for use in another Lower Division State. In the ISG ROD, the Secretary determined the method to distribute unused apportionment that may be available during the 15-year period in which the ISG are in effect.

Table 2-3 lists the discretionary/nondiscretionary actions relating to annual operations. Annual water deliveries to entitlement holders are nondiscretionary because such deliveries are required by the Decree and water contracts when water is available. Reclamation makes such deliveries in response to orders made by state and local water

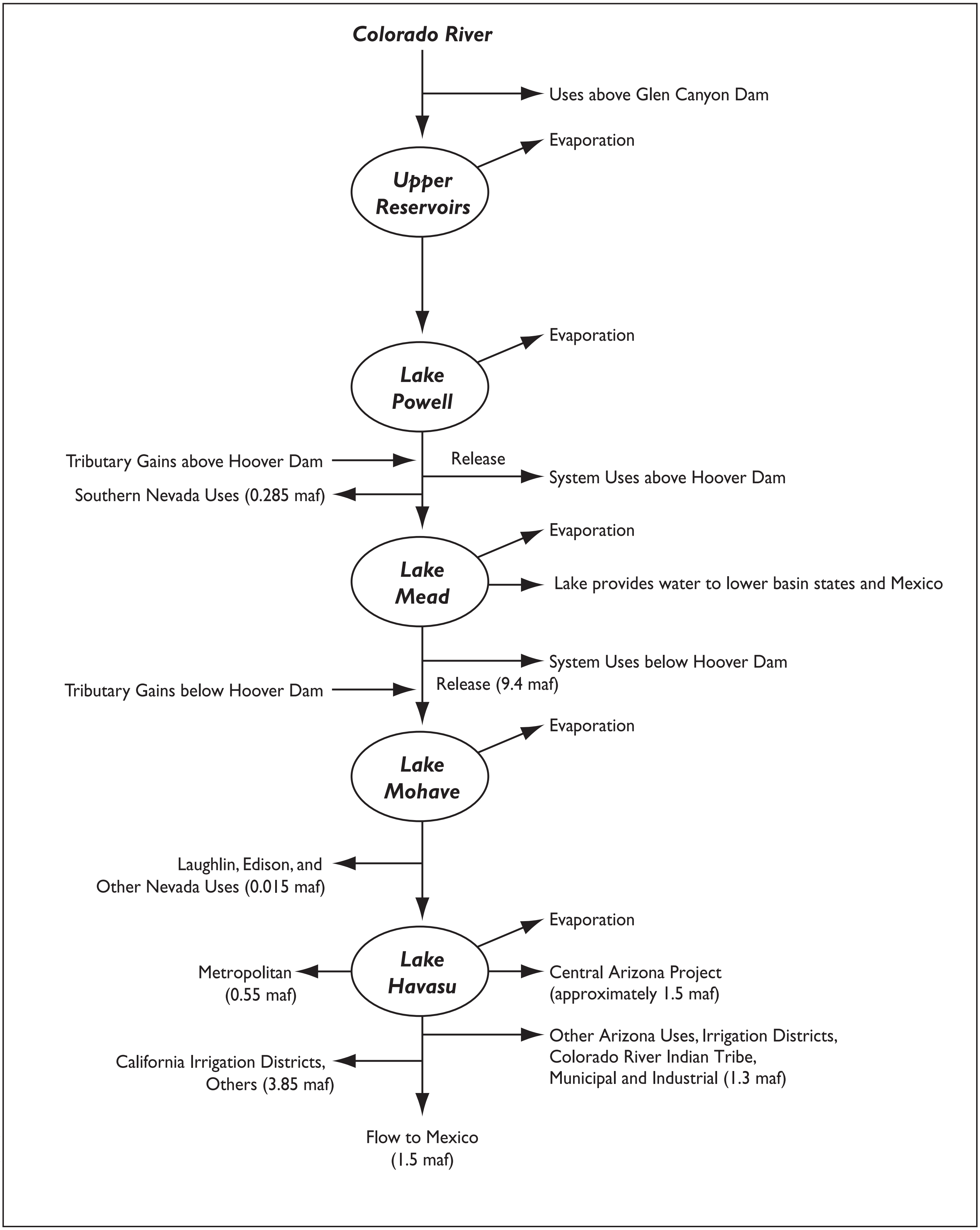

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Figure 2-1
Representative Distribution of LCR Water During a Normal Year (Article II (B)(I) Condition)

users, making such deliveries a nondiscretionary Federal action related to non-Federal actions. Reclamation also delivers water to Federal establishment water users, primarily for five LCR Indian Tribes, Lake Mead National Recreation Area (NRA), and NWRs in response to orders from those establishments.

Table 2-3. Actions Relating to the Annual Operations

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Issuance of an annual operating plan Delivery of water to water users in the United States pursuant to applicable Federal law, including the Boulder Canyon Project Act (BCPA); the Supreme Court Decree of March 9, 1964, 376 U.S. 340, as amended (Decree) Delivery of water to Mexico pursuant to the 1944 Water Treaty	Determination of shortage conditions absent specific guidelines Determinations of surplus conditions absent specific guidelines Revision of annual operations through the Annual Operating Plan (AOP), pursuant to the long-range operating criteria) within the year to reflect current hydrologic conditions Determinations and delivery of post-2016 unused apportionment water from one State to another within the Lower Basin on a annual basis Execution of agreements and the delivery of surplus water pursuant to the Reclamation Reform Act and the Reclamation States Emergency Drought Relief Act Periodic review of the Long Range Operation of Colorado (LROC)	Delivery of water to water users in the United States pursuant to applicable Federal law, including the BCPA and the Decree

2.2.1.4 Daily Operations—Hoover, Davis, Parker, Senator Wash, Imperial, and Laguna Dams

Other than during flood control operations (as described in Section 2.2.1.1), water is released from the major storage dams on the LCR (Hoover, Davis, and Parker Dams) primarily to satisfy the beneficial use requirements of entitlement holders in the United States pursuant to approved water orders (see process for water ordering and approval in 43 C.F.R. Part 417) and to deliver water in accordance with the 1944 Water Treaty. Although hydroelectric power is produced at each facility, water is not released solely to produce power and power contracts do not determine power generation.

Ongoing operations and activities on the LCR for the generation of hydroelectric power at Hoover, Davis, and Parker Dams are conducted pursuant to the Joint Operating Agreement (JOA) between Western and Bureau of Reclamation dated February 8, 1980, which was developed to implement section 302(a)(1)(E) of Public Law 95-91. See Appendix S for relevant excerpts of the JOA. The JOA recognizes the requirement to maximize the economic value of such power generation within the constraints of the water release schedules. Appendix J contains detailed information regarding the daily and hourly scheduling of power and associated timing, duration, and flow impacts.

Water ordered on a daily basis by downstream water contractors is the driving force for the releases from Davis and Parker Dams. Other operating constraints (such as the fish recovery program at Lake Mohave) may affect the releases on any given day. The daily releases are scheduled hourly, to the extent possible, to maximize power generation. Hoover Dam, however, is not restricted to meet a daily release target. Rather, prior to the first day of the month, a monthly energy target is determined based on the monthly water release requirements. Hoover generators are controlled on a real-time basis (within the monthly target) to meet power needs. A detailed description of daily operations at Hoover, Davis, and Parker Dams is described in Section J.4.1.

Imperial Dam is operated primarily as a diversion dam, providing water to the All American and the Gila Gravity Main Canals to meet the beneficial use requirements of entitlement holders in California and Arizona. Occasionally (2–3 times per month), water is released through the sluice gates at Imperial Dam to move accumulated sediment to the Laguna Desilting Basin located about 2 miles downstream from Imperial Dam. Releases may also be made to meet a portion of the 1944 Water Treaty deliveries to Mexico.

Laguna Dam is operated to capture water used in sluicing sediment at Imperial Dam, and at times it can function as a small regulating reservoir to capture excess flows. Releases may be made to meet a portion of the 1944 Water Treaty deliveries to Mexico.

Senator Wash is an off-stream storage facility that is used to capture excess flows arriving at Imperial Dam or to provide extra water in cases when there is not enough water at Imperial to meet the daily water orders. Water is pumped into Senator Wash Reservoir and hydropower is normally generated when the water is subsequently released.

Additional information on daily operations at Hoover, Davis, Parker, Imperial, Laguna, and Senator Wash Dams is presented in Appendix J. Tables 2-4–2-7 list the discretionary/nondiscretionary actions for the ongoing operational activities at each of these facilities.

Table 2-4. Hoover Dam Operations

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver 1944 Water Treaty water, and generate hydropower with these water releases	Monthly energy targets are set prior to each month, based on the best information available with respect to downstream water demands and lake elevation targets at Lakes Mohave and Havasu; energy targets may be revised during the month to meet changing water demands and other constraints (e.g., to benefit native fish in Lake Mohave)	Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States and generate hydropower with these water releases

Table 2-5. Davis Dam Operations

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States, deliver 1944 Water Treaty water, and generate hydropower with these water releases	Timing of releases, to a limited degree, may be varied by a few days, based on available downstream storage, Lake Mohave and Lake Havasu operational constraints, downstream water requirements, and hydropower needs	Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States and generate hydropower with these water releases

Table 2-6. Parker Dam Operations

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Water releases are made to satisfy beneficial use requirements of entitlement holders in the U.S., deliver 1944 Water Treaty water, and generate hydropower with these water releases	Timing of releases, to a limited degree, may be varied by the hour based on hydropower needs, water requirements, or other operational constraints immediately downstream of the dam	Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States and generate hydropower with these water releases

Table 2-7. Senator Wash, Imperial Dam, and Laguna Dam Reservoir Operations

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Water releases are made to satisfy beneficial use requirements of entitlement holders in the U.S., deliver 1944 Water Treaty water, and generate hydropower with water releases from Senator Wash.	Senator Wash, Imperial Dam, and Laguna Dam operations to prevent overdeliveries, to release water to entitlement holders, for sluicing operations, to deliver a portion of the 1944 Water Treaty deliveries to Mexico, and for flood control purposes.	Water releases are made to satisfy beneficial use requirements of entitlement holders in the United States

2.2.1.5 Electric Power Generation

Under the BCPA, power is the third priority in regard to river operations, as stated in project-specific legislation and as referred to under the Law of the River (Appendix A). Reclamation is the Federal agency authorized to generate power at Hoover, Davis, and Parker Power Plants. Water released from Hoover Dam generates power through 17 turbines and flows downstream into Lake Mohave above Davis Dam. Water released from Davis Dam generates power through five turbines and flows downstream into Lake Havasu. South of Lake Havasu, Parker Dam generates power through four turbines. Parker Dam is the last major United States–owned, Reclamation-administered hydroelectric facility on the Colorado River within the Lower Basin. All releases scheduled from Parker Dam are in response to downstream water orders or river regulation requirements. In 1954, Parker and Davis Dams were consolidated into a single project, the Parker-Davis Project (P-DP).

Once daily water orders have been placed by downstream water contractors, the releases are scheduled to the extent possible to maximize power generation at Davis and Parker Dams. Western takes power customers' individual schedules and formulates a combined power schedule. Generation is shaped to fit the power schedule within the constraints posed by the water orders, native fish recovery programs (see Section J.4.3.3), and other operational factors. After daily water orders have been received from the downstream water contractors, Reclamation, in consultation with Western, schedules water releases from Davis and Parker Dams on an hourly basis to meet power generation schedules, while continuing to satisfy the downstream water delivery orders and other requirements. Water is not released into the lower portion of the Colorado River solely to produce power, and power contracts do not determine power generation.

Lake Havasu is the southernmost downstream reservoir in the Colorado River system with any significant storage. To the degree storage is available, Lake Mohave and Lake Havasu reservoirs are used to store flows released from Hoover and Davis Dams, respectively, for power generation purposes until water is required to be released downstream to meet scheduled water deliveries to the downstream water users in the United States and Mexico. There is no discretion in delivering annual Decree water allocations. There is limited discretion for hourly timing of daily releases of water to maximize power benefits as discussed in Section 2.2.1.4.

The U.S. Department of Energy was created under Public Law 95-91, dated August 4, 1977. Section 302 of this law is entitled "Transfers from the Department of the Interior." Section 302(a)(1)(E) transferred from the Secretary to the Secretary of Energy the following functions:

> (E) the power marketing functions of the Bureau of Reclamation, including the construction, OM&R of transmission lines and attendant facilities;

This statute provides the legislative authority for the creation of Western. Once Western was created, Reclamation's Lower Colorado Region and Western entered into a JOA dated February 8, 1980, to implement section 302(a)(1)(E) of Public Law 95-91. At the time, Reclamation was known as the Water and Power Resources Service (cited as "Service" in the original JOA). The "System Operations" section of the JOA states in pertinent part:

> "Western will adhere to [Reclamation's] water release schedules and cooperate with [Reclamation] in operations and maintenance of Federal power facilities, unless prevented by Uncontrollable Forces."

> "[Reclamation] will adhere to Western's generation schedules and cooperate with Western in operations and maintenance of Federal power facilities, unless prevented by Uncontrollable Forces."

Reclamation and Western entered into a master agreement dated March 26, 1980, to implement section 302(a)(1)(E) of Public Law 95-91, the principles agreed to by the Commissioner of Reclamation and the Administrator of Western, and to memorialize the intent to optimize power benefits while preserving other project benefits. At the time, Reclamation was known as the Water and Power Resources Service (cited as "Service" in the original master agreement). The master agreement states in pertinent part:

> "[Reclamation] also has responsibility for water release scheduling, and for operational control of all generator units. However, [Reclamation] will provide opportunity for Western input to water release decisions, and to the extent practicable, provide to Western generator operative parameters so as to allow Western to optimize the utilization of the power resources.
>
> Western will provide transmission, switching, necessary wheeling arrangements, and substation service for [Reclamation] projects for all power including project use power, except at some isolated locations and in special circumstances as agreed to by both parties. Western will deliver project power as required by [Reclamation].
>
> [Reclamation] shall operate the generating plants so as to schedule and to make available electric power and energy as requested by Western, provided that compliance with such request and the operation of the generating plants ….would not conflict with requirements for the operation of said generating plants with regard to flood control, navigation, irrigation, or with other such purposes as associated [Reclamation] projects are to serve."

Reclamation's water release schedules have priority under law, and Western's power schedules are accommodated within the relevant water release schedule. Power scheduling is a Federal obligation, as provided for in section 5 of the BCPA (45 Stat. 1060; 43 U.S.C. 617d) and section 9c of the Reclamation Projects Act of 1939 (53 Stat. 1194; 43 U.S.C. 485h (c)). Accordingly, Reclamation must release water, subject to availability pursuant to the priorities established by the BCPA and downstream water orders, in accordance with Western's power schedules. If Reclamation is unable to meet Western's power schedules, Western makes power purchases to satisfy the requested power schedule.

Hoover Dam (Boulder Canyon Project)

Each electric service contract for Hoover Power Plant electric service was executed on behalf of the United States by Western. Reclamation has signed in concurrence for portions of those contracts.

Subparagraph 5.1.2.2 in each contract states in part:

> "Western shall be obligated to provide regulation, ramping and spinning reserves to the Contractor in quantities that can be provided by Hoover Power Plant, except as provided in paragraph 5.6.2; <u>Provided</u>, That Western may provide regulation, ramping and spinning reserves from other Federal Projects on the Colorado River if such regulation, ramping and spinning reserves can be made available from such other projects in the same quantity and quality as if such regulation, ramping and spinning reserves were provided by Hoover Power Plant, subject to the limitations of paragraph 5.6.2."

The limitation referenced to paragraph 5.6.2 deals with power plant equipment emergencies. Reclamation has concurred with this subparagraph.

Each contractor's power entitlement is set prior to the beginning of each month, based on the most current information available on downstream water demands and lake elevation targets at Lakes Mohave and Havasu. Monthly targets for Hoover contractors may be revised during the month to meet changing water demands and other constraints (e.g., to benefit native fish in Lake Mohave).

On a real-time basis, the use of a "dynamic signal" means that each contractor can request its contractual power entitlement on a 4-second interval, which is the industry standard time-step required by the Western Electricity Coordinating Council (WECC). Reclamation and Western are fully participatory WECC members and follow the mandatory industry standards declared by the WECC.

43 C.F.R. Part 431

The "General Regulations for Power Generation, Operation, Maintenance, and Replacement at the Boulder Canyon Project, Arizona/Nevada," are provided in 43 C.F.R. Part 431. The operational requirements needed to satisfy 43 C.F.R. Part 431 are nondiscretionary. The C.F.R. is subject to change, however, through rule-making processes.

Power generation responsibilities are discussed in 43 C.F.R. §431.4, which states in pertinent part:

> (b) Subject to the statutory requirement that Hoover Dam and Lake Mead shall be used: First, for river regulation, improvement of navigation and flood control; second, for irrigation and domestic uses and satisfaction of present perfected rights mentioned in section 6 of the Project Act; and third, for power, Reclamation shall release water, make available generating capacity, and generate energy, in such quantities, and at such times as are necessary for the delivery of the capacity and energy to which Contractors are entitled.

Operational requirements to satisfy 43 C.F.R. Part 431 requirements are nondiscretionary activities.

Hoover Power Plant Act of 1984

Section 106 of the Hoover Power Plant Act of 1984 authorized the reimbursement of funds advanced by non-Federal purchasers for the uprating program as a repayment requirement of the Boulder Canyon Project. The non-Federal entities provided the United States with $153 million in up-front funding to implement a major construction program to increase generation capacity at Hoover Power Plant. The methodology for the repayment of the funds is described in 10 C.F.R. §904.12, which reads:

> (a) Funds advanced to the Secretary of the Interior for the Uprating Program and costs reasonably incurred by the Contractor in advancing such funds, as approved by Western, shall be returned to the Contractor advancing the funds during the Contract period through credits on the Contractor's power bills. Appropriate credits will be developed and applied pursuant to the terms and conditions agreed to by contract or agreement.

(b) All other obligations of the United States to return funds to a Contractor shall be repaid to such Contractor through credits on power bills, with or without interest, pursuant to terms and conditions agreed to by contract or agreement.

The United States will use electric service credits, paid over a 30-year maximum period, to repay the $153 million in up-front funds provided by the power contractors. The monthly power bills for the additional generating capacity provided by these funds are used to fulfill the United States obligation.

Parker and Davis Dams and Power Plants

The authorizing legislation of these facilities authorized the generation of power for project repayment and OM&R purposes, and granted beneficial rights of the facility capacity and energy to priority-use power customers concurrent with water contracts "in perpetuity." *Capacity* in this usage means the electrical generating capacity of the generator units, whether or not they are actually producing power at any specific time. The capacity and energy in excess of the needs of priority use power customers is marketed by Western.

At any hour, if Western schedules capacity to fulfill its contractual commitments and water is on order to supply that capacity, Reclamation is obliged to make the power resource available (i.e., put generator units online and release the water through them). If Western requests power when water is not on order, Western is obligated to purchase power from other sources to satisfy the contractual agreements.

Approximately half of the Parker Dam Power Plant's output is reserved in perpetuity by Metropolitan for pumping water along the Colorado River Aqueduct to the Southern California Coastal area.

2.2.1.6 Lower Colorado Water Supply Project—California

The Lower Colorado River Water Supply Act passed by Congress on November 14, 1986, authorized and appropriated funding for the Lower Colorado Water Supply Project (Water Supply Project) as part of a water supply exchange program. This program was designed to help meet the domestic, municipal, industrial, and recreational water needs of persons or entities whose lands are located adjacent to the Colorado River in California. The exchange water supply program is intended for those whose use or proposed use of water from the Colorado River is either not covered by a contract or in excess of their present or anticipated future needs. Water for agricultural uses is not allowed under the Lower Colorado River Water Supply Act.

The Water Supply Project currently consists of two wells located along the unlined portion of the AAC in Imperial County. Water has entered the aquifer as a result of extensive seepage near the wells since the early 1940s. Imperial Irrigation District (IID) has the OM&R responsibility for the well field. The OM&R for these wells is not a covered activity for the LCR MSCP. These wells provide the groundwater used for the exchanges described below, which are a covered activity.

Water Supply Project contracts for exchange water were executed on behalf of the Secretary by Reclamation. The Colorado River Board of California acts in an advisory capacity to, and in cooperation with, Reclamation in evaluating each Water Supply Project applicant. Reclamation has executed two Water Supply Project contracts–one with the City of Needles, California, and the other with BLM.

The City of Needles, located upstream from Parker Dam, entered into a Water Supply Project contract for 3,500 af of water for itself and other non-Federal Water Supply Project users. As a result, the City of Needles may use up to 3,500 af of river water in exchange for groundwater pumped from the well field described above. The City of Needles has a PPR to consumptively use 950 afy, with a maximum cap on its annual diversion of 1,500 af. The City of Needles has also purchased a PPR to the annual consumptive use of 273 af of Colorado River water with a maximum annual diversion cap of 1,260 af. These rights do not provide enough water to meet the City of Needles future needs, so the Water Supply Project contract helps the City of Needles meet those anticipated needs.

Reclamation also has executed a Water Supply Project contract with the BLM. The BLM is authorized to consumptively use up to 1,150 af of water from the river in exchange for groundwater from the Water Supply Project well field. BLM may divert this water at any of several diversion points on the Colorado River in California between RMs 50.0 and 198.0.

Water may be diverted for Water Supply Project purposes by users at any approved location along the California border adjoining the Colorado River once a contract is executed. A total of no more than 10,000 af may be consumptively used and exchanged for groundwater under the Water Supply Project. Reclamation may contract for the consumptive use of an additional 5,350 af of water under the Water Supply Project. Reclamation's execution and administration of individual Water Supply Project contracts is a discretionary action. Reclamation's delivery of water pursuant to the executed contracts is a nondiscretionary action.

Table 2-8 lists the discretionary/nondiscretionary activities for the Lower Colorado Water Supply Project.

Table 2-8. Activities for the Lower Colorado Water Supply Project

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water under executed Water Supply Project contracts	Reclamation's execution and administration of individual Water Supply Project contracts	Participate in the development of and consult in the execution of individual contracts under the Water Supply Project

2.2.1.7 1944 Water Treaty Deliveries

On February 3, 1944, the United States and Mexico executed the 1944 Water Treaty, which addressed, among other things, the Mexican allotment of Colorado River water. The International Boundary and Water Commission is primarily responsible for implementing its terms and resolving disputes. The United States Section of the International Boundary and Water Commission (USIBWC) coordinates 1944 Water Treaty implementation with Reclamation acting for the Secretary as the river manager and operator. Delivery of Mexico's water is a nondiscretionary Federal action as provided by international treaty.

The 1944 Water Treaty allocates 1.5 maf of Colorado River water to Mexico annually and provides that additional waters up to 1.7 maf will be delivered in any year that the USIBWC determines that there is a surplus of water in excess of the amount necessary to supply uses in the United States and the allotted quantity of 1.5 maf. The 1944 Water Treaty also provided that in the event of "an extraordinary drought" or "serious accident" to the delivery system, deliveries to Mexico will be "reduced in the same proportion as consumptive uses in the U.S. are reduced." To date, the drought provisions of the 1944 Water Treaty have not been invoked.

Minute No. 242 of the 1944 Water Treaty, concluded on August 30, 1973, provides that of the 1.5 maf annual allocation, the United States will continue to deliver approximately 140,000 af at the SIB with salinity "substantially the same as that of the waters customarily delivered there." Minute No. 242 also provides that the approximately 1.36 maf delivered to Mexico at the NIB (which is 1.0 mile above the Morelos Diversion Dam) upstream of Morelos Diversion Dam at the NIB have an annual average salinity of no more that 115 parts per million (ppm) plus or minus 30 ppm as measured by the U.S. (121 ppm plus or minus 30 as measured by Mexico) over the annual average salinity of water arriving at Imperial Dam. Other provisions of Minute No. 242 include the agreement to construct the bypass canal for Wellton-Mohawk return flows and the agreement to limit groundwater pumping in each country to 160,000 af annually within five miles of the SIB near San Luis (often referred to as the "Five-Mile Zone").

Minute 310, concluded on July 28, 2003, entitled "Emergency Delivery of Colorado River Water for Use in Tijuana, Baja California," provides for the delivery of approximately 1,200 af per month of Colorado River water for use in Tijuana, Baja California. The volume of water delivered and the system conveyance losses are accounted against Mexico's 1.5 maf allotment. The emergency deliveries are diverted at Lake Havasu and transported to Tijuana through the distribution system facilities of several California agencies. Although the delivery of Mexico's allotted water is a nondiscretionary Federal action, there is some discretion in the quantities delivered at each delivery point, as well as in how water is conveyed to the delivery points.

1944 Water Treaty Deliveries at the Northerly International Boundary

Water scheduled and delivered to Mexico at the NIB is typically comprised of a combination of water from Imperial Dam and drainage return flows within the Yuma

Division. When releases from Painted Rock Dam occur on the Gila River system, these flows are used to satisfy a portion of Mexico's delivery, depending on the amount of flow from the Gila River that enters the Colorado River upstream of the NIB. Water diverted from Imperial Dam for delivery to Mexico at NIB is conveyed to the NIB via one or a combination of the following three routes:

- Water is diverted from above Imperial Dam into the All-American Canal and conveyed through the All-American Canal to the Pilot Knob Check, where the water is diverted back to the Colorado River through the Pilot Knob Power Plant and Wasteway, approximately 2 miles upstream of NIB.
- Water is diverted from above Imperial Dam into the All-American Canal and conveyed through the All-American Canal to the Siphon Drop Powerplant, where it is diverted into the Yuma Main Canal. The water is conveyed approximately 3.5 miles within the Yuma Main Canal and then is diverted back to the Colorado River via the Yuma Main Canal Wasteway. The Yuma Main Canal Wasteway discharges to the Colorado River at a point located approximately 7.6 miles upstream of NIB.
- Water is released from Imperial and Laguna Dams and is conveyed to NIB via the river channel. These flows are in addition to the base flows in the river downstream of Laguna Dam. The base flows are generally consistent throughout the year and result from gate leakage at Imperial Dam, sluicing flows from Imperial Dam, returns to the river below Imperial Dam from the All-American Canal Desilting Basin and gate leakage, and drainage flows from downstream sources. These base flows normally range from 600 cfs to 800 cfs.

A diagram of the water routing described above is presented in Figure 2-2. More detailed operational information is presented in Section J.4.3.2.

Under flood control conditions (due to excessive flows from the Colorado River main stem or the Gila River, or both), water may also be routed as described above to avoid flood damage in the Yuma Division. Although flood control at Hoover Dam is a nondiscretionary action as described in Section 2.2.1.1, specific routing of these and other flood flows through the Yuma Division is discretionary. Section J.4.3.2 describes flood control routing in more detail.

Reclamation and the various irrigation districts that operate in Yuma Mesa, Yuma Valley and the Wellton-Mohawk area have constructed, over the years, various drainage systems that are used today to facilitate the drainage of agricultural lands in these areas. These drainage systems include several well fields that are used to manage and conserve the underlying groundwater and to provide obligated water deliveries to Mexico.

Drainage return flows that contribute to deliveries at NIB are comprised of flows that return to the river by gravity as well as flows that are pumped from near-surface groundwater and then are conveyed to the river channel. Drainage pumping in the Yuma area is necessary to maintain groundwater levels that are compatible with farming and urban infrastructure including homes, businesses, streets, septic tanks, and underground utilities such as sewer and water facilities and power lines.

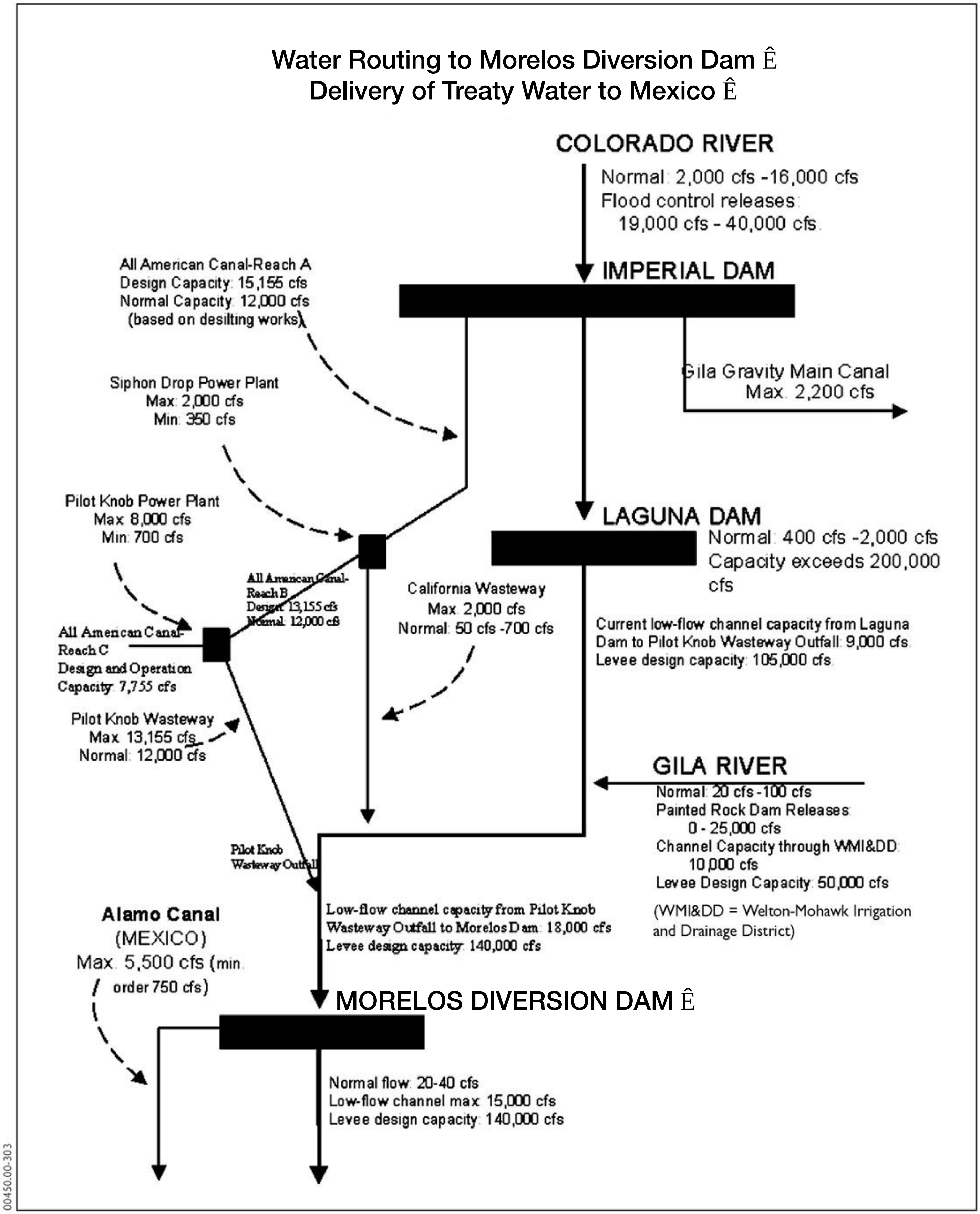

Figure 2-2
Water Delivery at the Northerly International Boundary Pursuant to the 1944 Water Treaty

Drainage pumping is carefully balanced to maintain satisfactory groundwater levels while meeting the water quantity and water quality (salinity) requirements of the deliveries to Mexico at the NIB. Some drainage return flows (both gravity flows and pumped flows) are also delivered to Mexico at SIB and are discussed in the following section concerning deliveries at SIB.

The different well fields generally include the South Gila Valley Well Field, the Yuma Mesa Well Field, the Yuma County Wells, the Yuma Valley Drainage Well Field, the Yuma County Water Users' Drainage Wells, and the Yuma Area Water Resource Management Group (YAWRMG) Wells. Each well field is comprised of numerous wells that are operated either by Reclamation or by other entities. For the wells owned by others, Reclamation is involved in the coordination of their operations. In most cases, the discharge from each of the wells is conveyed to one or more drain systems for subsequent conveyance and discharge to the Colorado River. Section J.4.3.3 provides more details regarding the Yuma area well and drainage operations and related systems.

1944 Water Treaty Deliveries at the Southerly International Boundary and Tijuana

Water delivered to Mexico at the SIB consists primarily of drainage return flows intermingled with spills from the irrigation delivery system. These return flows are comprised of flows that return either to the river by gravity primarily from spills from the irrigation delivery system, or to the Sanchez-Mejorada Canal, which crosses the SIB into Mexico. The majority of flows credited as delivery to Mexico enter the Sanchez-Mejorada Canal from the Boundary Pumping Plant located on the Yuma Valley Main Drain, the East and West Main Canal Wasteways, and the 242 Well Field.

The 242 Well Field was named for Minute No. 242 of the 1944 Water Treaty and is located east of San Luis, Arizona, in the Five-Mile Zone as defined above. The well field was authorized under Minute No. 242 of the 1944 Water Treaty and Public Law 93-320 to pump groundwater that flows from the United States into Mexico. Water from this well field makes up a portion of the flows delivered to Mexico at the SIB. The well field consists of 21 wells, with a total capacity of 152 cfs. The well field is operated over a range of 8,000 to 40,000 afy, depending on the amount of Yuma Valley Drainage arriving at the SIB. Over a long period of time the entire pumping capacity may be used to maintain 140,000 af of drainage water deliveries at the SIB per year.

In late 1990s, as a matter of international comity, Reclamation agreed to address Mexico's concerns with short-term fluctuations in the quantity and quality (salinity) of water deliveries at SIB. A variable-speed motor controller was installed in 2003 on one of the four pumps at the Yuma Valley Boundary Pumping Plant to reduce variations in flows and peaks in salinity of those flows. A diversion channel from the Boundary Pumping Plant to the U.S Bypass Drain was also constructed in 2002 to discharge a portion of the highly saline Yuma Valley drainage to the Wellton-Mohawk Bypass Drain or to the Colorado River. It was agreed that the variable-speed pump would be operated throughout each year and that no more than 8,000 af of drainage water would be diverted over a 4-month period (as prescribed by Mexico) within each year to reduce salinity levels delivered to Mexico at the SIB to approximately 1,200 ppm. A firm commitment on the salinity level to be achieved was not made because of the variability in conditions occurring at the SIB.

Under the *Temporary Emergency Delivery of a Portion of the Mexican Treaty Waters of the Colorado River to the International Boundary in the Vicinity of Tijuana, Baja California, Mexico, and for Operation of Facilities in the United States Contract,* as amended (a contract amended in 2003 between several California water agencies, Mexico, the USIBWC, and Reclamation), a portion of the 1944 Water Treaty waters from the Colorado River have been delivered to the City of Tijuana, Mexico, and its surrounding area. This water is diverted at Lake Havasu by Metropolitan and is conveyed to Tijuana using various agencies distribution facilities.

Deliveries to the City of Tijuana have been intermittent over the years. Although the recently completed contract amendment allows for emergency water deliveries of up to 1,200 af per month and a maximum annual volume of 14,400 afy, the initial request from Mexico for emergency deliveries to Tijuana under the amended contract was for approximately 326 af monthly during July and August 2004. Table 2-9 describes the discretionary/nondiscretionary actions for 1944 Water Treaty deliveries.

Table 2-9. 1944 Water Treaty Deliveries

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of Mexico allotment (1.5 million acre-feet [maf]) pursuant to the 1944 Water Treaty and related Minutes	Routing of water through the Yuma Division for delivery to Northern International Boundary (NIB)	Delivery of emergency water to Tijuana pursuant to Minute No. 310 of the 1944 Water Treaty and contract
Delivery of Mexico allotment (up to 1.7 maf) when surplus water is determined by the United States Section of the International Boundary and Water Commission (USIBWC) to be available beyond the needs of U.S. users	Determination of quantity of water delivered at SIB up to 140,000 afy	Retention of a portion of Metropolitan's entitlement in Lake Mead to accommodate delivery of water pursuant to Minute No. 310 of the 1944 Water Treaty
	Drainage pumping and delivery of drainage return flows at NIB and Southerly International Boundary (SIB)	
Delivery of Mexico allotment pursuant to the 1944 Water Treaty and related Minutes under extraordinary drought conditions.	Operation of variable-speed pumps and diversion canal at SIB to reduce salinity	
Compliance with the salinity requirements of Minute No. 242 of the 1944 Water Treaty	Execution of contracts to deliver a portion of Mexico's allotment to Tijuana pursuant to Minute No. 310 of the 1944 Water Treaty	
Delivery of emergency water to Tijuana pursuant to Minute No. 310 of the 1944 Water Treaty and contract	Routing of water through the Yuma Division during flood control conditions	

2.2.1.8 Decree Accounting

Reclamation is responsible for ensuring that "complete, detailed, and accurate records" of the diversion and use of Colorado River water, as well as some other reports of operational parameters, are made, maintained, and available for inspection by the public. These reports are required by Article V of the Supreme Court Decree in *Arizona v. California* (March 9, 1964, 376 U.S. 340) and are commonly referred to as the Decree accounting reports. Reclamation's preparation and maintenance of these Decree accounting reports are nondiscretionary Federal actions.

The Decree accounting reports present quantified releases, diversions, return flows, and consumptive uses of water along the LCR and report diversions, return flows, and consumptive uses of individual diverters and of the Lower Division States as a whole.

Diversions of water from the mainstem include surface diversions through structures such as diversion dams and large pumping plants, small pumps that pump directly from the surface stream and lakes on the mainstem, and water drawn from the mainstem by underground pumping through the use of wells. Diversions of water from the mainstem are generally measured by the U.S. Geological Survey (USGS), Reclamation or the diverter, or both. Diversions through pumps and water drawn from the mainstem through wells are measured by the diverter or estimated by the USGS and reported to Reclamation. The USGS has the primary responsibility for reporting flows through structures controlled by the United States or its agencies, in addition to diversions from and return flows back to the river.

Return flow refers to water once diverted from the mainstem and returned back to the mainstem for consumptive use by other U.S. entitlement holders or to satisfy 1944 Water Treaty obligations. Return flow is either measured or unmeasured. Measured return flow is flow that originated as a diversion of mainstem water that returns to the mainstem through a surface conveyance, like a drain or spillway that can be measured using standard water measurement techniques. Unmeasured return flow is the return of water diverted from the mainstem that returns to the mainstem through groundwater flows.

Consumptive use, as defined by the Decree, is diversions from the stream less such return flow thereto as is available for consumptive use in the United States or in satisfaction of the 1944 Water Treaty obligation. Consumptive use from the mainstream within a state includes all consumptive uses of water of the mainstream, including water drawn from the mainstream by underground pumping.

Initially, the method developed by Reclamation calculated consumptive use as the difference between measured diversions and measured return flow, and no attempt was made to quantify unmeasured return flow. In 1990, Reclamation developed a set of unmeasured return flow factors (coefficients) that would be used to estimate unmeasured return flow. These coefficients have been in use since that time.

The current Decree accounting methodology uses measured diversions, measured return flows, and unmeasured return flow factors, as described above, to calculate the consumptive use of Colorado River water. The reported consumptive use of a diverter is the measured diversion minus the measured return flow of water reaching the Colorado

River. Unmeasured return flows are calculated as measured diversions multiplied by coefficients, described previously.

The entitlement status of reported diverters and their right to divert and use Colorado River water is not addressed by the Decree accounting reports. All values are reported as monthly and annual volumes in acre-feet.

Reclamation has annually prepared and maintained Decree accounting reports and made them available for public inspection for each calendar year since 1964. Final Decree accounting reports are generally available by the second quarter of each year. The annual Decree accounting reports represent the Secretary's determination of, and are the official record of annual water use on the LCR.

Table 2-10 lists the discretionary/nondiscretionary activities for Decree Accounting.

Table 2-10. Activities for Decree Accounting

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Annual preparation of official records of the diversion, return flow, and consumptive use of Colorado River water pursuant to Article V of the Supreme Court Decree in *Arizona v. California*	None	Report data for Decree Accounting records

2.2.2 Future Flow-Related Actions

Over the next 50 years, Reclamation may authorize or carry out actions that would result in changes in river flows. These actions, as described in this section, include the adoption and application of specific surplus and shortage guidelines that would allow for the release of water (excluding 1944 Water Treaty water) in excess of the 7.5 maf of entitlement waters in surplus years or less than the 7.5 maf in shortage years. Additionally, Reclamation may approve various administrative actions that could result in changes in the storage and delivery of Lower Division State entitlement waters at different points on the river. As these future flow-related actions are described in this section, they should be assumed to be discretionary approaches to river management actions to meet nondiscretionary water deliveries. Specific compliance actions will be undertaken, as appropriate, at the time any specific flow-related actions are proposed for Secretarial approval. Any such compliance and analysis will be consistent with, and be incorporated into, the LCR MSCP Conservation Plan, as appropriate.

2.2.2.1 Specific Surplus and Shortage Guidelines

The ISG became effective on February 26, 2001. The ISG are used annually to determine the conditions under which the Secretary declares the availability of surplus water for use in the Lower Division States. The ISG provide that these guidelines will remain in effect for determinations made through 2015 regarding the availability of surplus water through 2016. The ISG may be subject to 5-year reviews conducted concurrently with LROC reviews. The ISG are applied each year as part of the AOP process unless extraordinary circumstances arise. Such circumstances could include operations necessary for dam safety, other emergency situations, or other unanticipated or unforeseen activities arising from actual operating experiences.

A previous ESA section 7 consultation was conducted to address adoption of the ISG and their application through 2016. The modeling for this LCR MSCP BA assumes the continuation of the ISG beyond 2016 as described in Appendix J. In the event that Reclamation adopts or extends specific surplus guidelines beyond 2016, and such guidelines are consistent with the information presented in Appendix J and the river corridor analysis described below, the LCR MSCP will provide ESA compliance for those guidelines. The historical and projected operations and reservoir elevation ranges are described in Appendix J.

As of the preparation of this BA, there are no established shortage criteria for the operation of Lake Mead. At some point during the 50-year period of the LCR MSCP Conservation Plan, it is anticipated that the Secretary may develop specific shortage guidelines pursuant to Article III(3)(c) of the LROC and Article II(b)(3) of the Decree. Preliminary discussions between the Department and interested stakeholders regarding potential approaches to shortage guidelines for the operation of Lake Mead have not produced any reasonably certain approaches to analyze in this document nor has the Secretary initiated any action to formally adopt shortage guidelines. In the event that Reclamation adopts specific shortage criteria in the future, and such criteria are consistent with the information presented in Appendix J and the river corridor analysis described below, the LCR MSCP will provide ESA compliance for those criteria.

For the purpose of analysis of potential impacts associated with shortage guidelines, it was necessary to assume some shortage guidelines in the modeling analysis to identify potential impacts related to Lake Mead elevations. Reclamation has assumed in its modeling efforts that shortages would be imposed to maintain Lake Mead at or above elevation 1050 feet msl approximately 80 percent of the time in the future, and additional shortages would be imposed if needed to protect elevation 950 feet msl all of the time. The historical and projected operations and reservoir elevation ranges are described in Appendix J.

It is presumed some reductions in river flow will occur in the event that the determination is made to release less than 7.5 mafy to the entitlement holders in the Lower Division States. LCR MSCP covered activities include changes in points of diversion that could result in reduced flows in amounts up to 0.845 mafy in the reach below Hoover Dam to Davis Dam, up to 0.860 mafy in the river below Davis Dam to Parker Dam, and up to 1.574 mafy below Parker Dam to Imperial Dam. The quantity of any future flow reduction due to shortage determinations will be added to the level of flow reductions from changes in points of diversion ongoing at that point in time to see if the combined reductions in flow are still within the ranges listed above and described for the covered activities in Tables 2-14, 2-15 and 2-16. If the combined flow reductions are still within the ranges described for the covered activities, it is anticipated that no additional ESA coverage for adoption and implementation of shortage guidelines is needed. If the combined flow reductions are greater than the ranges described in this BA, additional

ESA compliance activities would be undertaken as appropriate. Under this circumstance, additional analysis may be required to evaluate the combined effect of changes in point of diversion and shortage conditions. The flow reductions associated with changes in points of diversion will be imposed during years of surplus, normal, and shortage conditions. While both shortage determinations and changes in points of diversion will have the effect of reducing river flow, the resulting effects may not be directly additive. For example the effects of shortage reductions would be only in the years(s) of declared shortage, whereas the effects of changed points of diversion are considered to occur for the full-term of years in which the change in point of diversion continues..

Table 2-11 lists the discretionary/nondiscretionary activities for specific surplus and shortage guidelines.

Table 2-11. Activities for Specific Surplus and Shortage Guidelines

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of surplus water pursuant to the Article II(B)(2) of the Supreme Court Decree of March 9, 1964, 376 U.S. 340, as amended (Decree) Delivery of water pursuant to the Article II(B)(3) of the Decree (shortage)	Adoption of specific post-2016 surplus guidelines Adoption of specific shortage guidelines	Consult with States on development of specific post-2016 surplus guidelines or development of specific shortage guidelines Delivery of water to water users in the United States pursuant to applicable Federal law, including the Boulder Canyon Project Act (BCPA) and the Decree

2.2.2.2 Flood Release Contracts

U.S. entitlement holders may be permitted to divert and beneficially use water released for flood control purposes in excess of downstream demand. Total diversions by U.S. entitlement holders would be limited to the maximum amount of, and only for the duration of, the specific flood control release. Consumptive use of water released for flood control by U.S. entitlement holders would be accounted for in Reclamation's Decree Accounting records, as described above. Such excess water also may be released to the NIB, where Mexico controls diversions at Morelos Diversion Dam. Typically, Reclamation has not received requests for diversion and use of water released for flood control purposes. However, contracts for this water may be issued in the future to authorize its diversion and use for beneficial purposes in accordance with section 5 of the BCPA. Several proposed projects include water released for flood control purposes as a source of water. Reclamation has modeled certain diversions of the water released under flood control regulated operations (see Section J.4.3.2). To the extent that execution of any future flood control release contracts is within the modeling assumptions for diversion of water released for flood control purposes, such contracts are within the ESA coverage sought by Reclamation through the LCR MSCP. Appropriate analysis and impacts of implementing any such actions will be commenced as any specific proposals for execution of new flood control release contracts are developed.

Table 2-12 lists the discretionary/nondiscretionary activities for flood release contracts.

Table 2-12. Activities for Flood Release Contracts

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water under executed flood release contracts	Execution of contracts for water released during flood control operations	Participate in the development of and consult in the execution of flood release contracts

2.2.2.3 Changes in the Storage and Delivery of State Entitlement Waters through Various Administrative Actions

The Secretary may propose to carry out specific administrative actions related to the delivery and use of Colorado River water in the Lower Division States. Each of these types of actions is described below and each is intended to be a Reclamation covered activity resulting in changes in water deliveries up to the total amounts and over the time periods indicated in Table 2-13. Reclamation has included these potential administrative actions among the covered activities in this LCR MSCP BA for purposes of analyzing the potential effects of such water delivery changes on the action areas, as reflected in Table 2-13. The changes described in this section and summarized in Table 2-13 could result from a combination of any of the various potential administrative actions. Where possible, a described administrative action includes an estimate regarding the amount of water that may be delivered to a different entitlement holder; for many of the administrative actions, it is not possible to estimate such an amount of water. In either case, Reclamation's overall ESA coverage in this LCR MSCP BA is summarized in Table 2-13, with year-by-year analysis reflected in Tables 2-14–2-16. The timing of any future changes in flow from Secretarial administrative actions is unknown. For purposes of analyzing impacts to Lake Mead, the schedule shown in Table 2-13 was incorporated into the computer modeling used to develop projections of future Colorado River reservoir surface elevations. However, for purposes of analyzing hydrologic changes to the river corridor, the full amount of future changes in flow were assumed to occur in every year during the term of the LCR MSCP. Reclamation intends that the overall effects of the potential actions summarized in Table 2-13 be covered by this LCR MSCP BA, including effects of actions within that scope, whether or not the administrative details (e.g., the parties to a transfer) are known at this time and specifically listed and described in this chapter. At the time of any specific proposed action, a review of changes in flow below each identified dam in Table 2-13 will be undertaken to ensure coverage under the LCR MSCP.

Table 2-13. Potential Change in Annual Water Releases (acre-feet) from Three Lower Colorado River (LCR) Mainstem Dams: 2003–2050

Year	Change in Releases below Hoover Dam	Change in Releases below Davis Dam	Change in Releases below Parker Dam
2003	-95,000	-95,000	–736,000
2010	-222,000	-222,000	–863,000
2020	-439,000	-454,000	–1,080,000
2030	-763,000	-778,000	–1,492,000
2040	-805,000	-820,000	–1,534,000
2050	-845,000	-860,000	–1,574,000[a]

[a] The total change in releases below Parker Dam during the 50-year period of the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is expected to be –1.574 million acre-feet (maf) annually and Reclamation is seeking coverage through the LCR MSCP for this amount of potential change in annual water releases from the above-referenced facilities. This potential change (reduction) could occur as a result of a number of administrative actions, including for example, shortage reductions and changes in point of diversion.

Within the referenced change in release of –1.574 million acre-feet per year (mafy), Reclamation completed consultation with the U.S. Fish and Wildlife Service in 2001 on the change in releases below Parker Dam of -400,000 acre-feet (af) for four of the covered species (southwestern willow flycatcher, Yuma clapper rail, razorback sucker, and bonytail). Through the LCR MSCP, Reclamation is extending the coverage obtained in 2001 to twenty-three (23) additional covered species. Reclamation is also seeking coverage for an additional change in release of –1.174 mafy for all covered species.

The non-federal applicants are seeking coverage through the LCR MSCP Habitat Conservation Plan (HCP) under Endangered Species Act (ESA) section 10(a)(1)(B) for the change in diversions below Parker Dam of the entire amount of –1.574 mafy.

Thus, both this BA and the LCR MSCP HCP use the –1.574 mafy total volume for coverage under the LCR MSCP. See for example, Section J.6.1 of Appendix J, Section 5.2 of this BA, and Chapter 2 of the LCR MSCP HCP.

The administrative actions described below may result in the potential flow change of a maximum of 845,000 afy in 2050 below Hoover Dam, 860,000 afy in 2050 below Davis Dam, and 1.574 mafy in 2050 below Parker Dam to Imperial Dam. For the 50-year period of the LCR MSCP Conservation Plan, Reclamation can estimate specific quantities of water for some actions, but the quantities of water for many actions cannot presently be identified. In any one year, the aggregate actions are expected to be within the total amount listed for a given reach in Table 2-13.

The long-term analysis, which projects the potential water delivery changes, was based on the unrestricted maximum needs of Nevada and Metropolitan through existing diversion facilities. Arizona water transfers are based on both specific projects and estimated need, as identified by the Arizona Department of Water Resources (ADWR). Reclamation assumptions were based on expected future actions by Reclamation projects, as described in this chapter, such as water conservation actions, forbearance actions or reductions in flow due to shortage determinations that would result in changes in river flows. An estimated need for potential future water conservation actions or reductions in

Table 2-14. Flow Changes below Hoover Dam to Davis Dam

Calendar Year	SNWS Needs[a]	SNWS Entitlement[b]	SNWS Transfer[c]	Arizona Transfer[d]	Reclamation Actions[e]	Other Actions[f]	Total Flow Changes[g]
							-95
2004	343	300	43	5	50	0	-98
2005	344	300	44	5	60	0	-109
2006	349	300	49	5	70	0	-124
2007	354	300	54	5	80	0	-139
2008	359	300	59	5	90	0	-154
2009	363	300	63	5	100	0	-168
							-222
2011	371	280	91	5	120	30	-246
2012	374	280	94	5	120	30	-249
2013	378	280	98	5	120	30	-253
2014	382	280	102	5	120	30	-257
2015	386	280	106	5	120	80	-311
2016	390	280	110	5	120	80	-315
2017	394	280	114	12	120	80	-326
2018	398	280	118	12	120	80	-330
2019	402	280	122	12	120	80	-334
2020	407	280	127	12	120	180	-439
2021	411	280	131	12	120	180	-443
2022	416	280	136	12	120	180	-448
2023	420	280	140	12	120	180	-452
2024	424	280	144	12	120	280	-556
2025	429	280	149	12	120	280	-561
2026	425	280	145	12	120	280	-557
2027	421	280	141	12	120	280	-553
2028	425	280	145	12	120	280	-557
2029	428	280	148	12	120	480	-760
2030	431	280	151	12	120	480	-763
2031	436	280	156	12	120	480	-768
2032	440	280	160	12	120	480	-772
2033	444	280	164	12	120	480	-776

Table 2-14. Continued

Calendar Year	SNWS Needs[a]	SNWS Entitlement[b]	SNWS Transfer[c]	Arizona Transfer[d]	Reclamation Actions[e]	Other Actions[f]	Total Flow Changes[g]
2034	448	280	168	12	120	480	-780
2035	452	280	172	12	120	480	-784
2036	456	280	176	12	120	480	-788
2037	461	280	181	12	120	480	-793
2038	465	280	185	12	120	480	-797
2039	469	280	189	12	120	480	-801
2040	473	280	193	12	120	480	-805
2041	477	280	197	12	120	480	-809
2042	481	280	201	12	120	480	-813
2043	485	280	205	12	120	480	-817
2044	489	280	209	12	120	480	-821
2045	493	280	213	12	120	480	-825
2046	498	280	218	12	120	480	-830
2047	502	280	222	12	120	480	-834
2048	506	280	226	12	120	480	-838
2049	510	280	230	12	120	480	-842
2050	513	280	233	12	120	480	-845

SNWS = Southern Nevada Water System

[a] SNWS Needs = the full surplus schedule submitted by Nevada for the Colorado River Interim Surplus Criteria Final Environmental Impact Statement.

[b] SNWS Entitlement = available SNWS normal entitlement (300,000 acre-feet) or estimated shortage entitlement (280,000 acre-feet).

[c] SNWS Transfer = difference between SNWS Needs column and SNWS Entitlement column. Amount of water required from flow reductions in the river to meet Nevada's future needs.

[d] Arizona Transfer = amount of flow reductions for Arizona needs, based on March 6, 2001 letter from the Arizona Department of Water Resources to the LCR MSCP Steering Committee.

[e] Reclamation Actions = Bureau of Reclamation's future flow reduction needs such as water conservation, forbearance actions, or reductions in flow due to shortage determinations.

[f] Other Actions = estimated need for future actions that are not currently attributable to any one entitlement holder or Reclamation, such as water conservation activities or reductions in flow due to shortage determinations.

[g] Total Flow Changes = SNWS Transfer + Arizona Transfer + Reclamation Actions + Other Actions columns.

Table 2-15. Flow Changes below Davis Dam to Parker Dam

Calendar Year	SNWS Needs[a]	SNWS Entitlement[b]	SNWS Transfer[c]	Arizona Transfer[d]	Arizona-Mohave Transfer[e]	Reclamation Actions[f]	Other Actions[g]	Total Flow Changes[h]
2003	340	300	40	5	0	50	0	-95
2004	343	300	43	5	0	50	0	-98
2005	344	300	44	5	0	60	0	-109
2006	349	300	49	5	0	70	0	-124
2007	354	300	54	5	0	80	0	-139
2008	359	300	59	5	0	90	0	-154
2009	363	300	63	5	0	100	0	-168
2010	367	300	67	5	0	120	30	-222
2011	371	280	91	5	0	120	30	-246
2012	374	280	94	5	0	120	30	-249
2013	378	280	98	5	0	120	30	-253
2014	382	280	102	5	0	120	30	-257
2015	386	280	106	5	0	120	80	-311
2016	390	280	110	5	0	120	80	-315
2017	394	280	114	12	15	120	80	-341
2018	398	280	118	12	15	120	80	-345
2019	402	280	122	12	15	120	80	-349
2020	407	280	127	12	15	120	180	-454
2021	411	280	131	12	15	120	180	-458
2022	416	280	136	12	15	120	180	-463
2023	420	280	140	12	15	120	180	-467
2024	424	280	144	12	15	120	280	-571
2025	429	280	149	12	15	120	280	-576
2026	425	280	145	12	15	120	280	-572
2027	421	280	141	12	15	120	280	-568
2028	425	280	145	12	15	120	280	-572
2029	428	280	148	12	15	120	480	-775
2030	431	280	151	12	15	120	480	-778
2031	436	280	156	12	15	120	480	-783
2032	440	280	160	12	15	120	480	-787
2033	444	280	164	12	15	120	480	-791

Calendar Year	SNWS Needs[a]	SNWS Entitlement[b]	SNWS Transfer[c]	Arizona Transfer[d]	Arizona-Mohave Transfer[e]	Reclamation Actions[f]	Other Actions[g]	Total Flow Changes[h]
2034	448	280	168	12	15	120	480	-795
2035	452	280	172	12	15	120	480	-799
2036	456	280	176	12	15	120	480	-803
2037	461	280	181	12	15	120	480	-808
2038	465	280	185	12	15	120	480	-812
2039	469	280	189	12	15	120	480	-816
2040	473	280	193	12	15	120	480	-820
2041	477	280	197	12	15	120	480	-824
2042	481	280	201	12	15	120	480	-828
2043	485	280	205	12	15	120	480	-832
2044	489	280	209	12	15	120	480	-836
2045	493	280	213	12	15	120	480	-840
2046	498	280	218	12	15	120	480	-845
2047	502	280	222	12	15	120	480	-849
2048	506	280	226	12	15	120	480	-853
2049	510	280	230	12	15	120	480	-857
2050	513	280	233	12	15	120	480	-860

SNWS = Southern Nevada Water System

[a] SNWS Needs = the full surplus schedule submitted by Nevada for the Colorado River Interim Surplus Criteria Final Environmental Impact Statement.

[b] SNWS Entitlement = available SNWS normal entitlement (300,000 acre-feet) or estimated shortage entitlement (280,000 acre-feet).

[c] SNWS Transfer = difference between SNWS Needs column and SNWS Entitlement column. Amount of water required from flow reductions in the river to meet Nevada's future needs.

[d] Arizona Transfer = amount of flow reductions for Arizona needs, based on March 6, 2001 letter from the Arizona Department of Water Resources to the LCR MSCP Steering Committee.

[e] Arizona-Mohave Transfer = amount of flow reductions for Arizona needs, based on March 6, 2001 letter from ADWR to the LCR MSCP Steering Committee.

[f] Reclamation Actions = Bureau of Reclamation's future flow reduction needs such as water conservation , forbearance actions, or reductions in flow due to shortage determinations.

[g] Other Actions = estimated need for future actions that are not currently attributable to any one entitlement holder or Reclamation, such as water conservation activities or reductions in flow due to shortage determinations.

[h] Total Flow Changes = total of SNWS Transfer + Arizona Transfer + Arizona-Mohave Transfer + Reclamation Actions + Other Actions columns.

Table 2-16. Flow Changes below Parker Dam to Imperial Dam

Calendar Year	MWD Needs[a]	MWD Entitlement[b]	MWD Conservation Agreement[c]	MWD Transfer[d]	ESA Compliance Complete[e]	SNWS Needs[f]	SNWS Entitlement[g]	SNWS Transfer[h]	Arizona Transfer[i]	Reclamation Actions[j]	Other Actions[k]	LCR MSCP Federal Total Flow Changes[l]	Cumulative Federal Total Flow Changes[m]
2003	1300	550	108	641	400	340	300	40	5	50	0	-336	-736
2004	1300	550	108	641	400	343	300	43	5	50	0	-339	-739
2005	1300	550	108	641	400	344	300	44	5	60	0	-350	-750
2006	1300	550	108	641	400	349	300	49	5	70	0	-365	-765
2007	1300	550	108	641	400	354	300	54	5	80	0	-380	-780
2008	1300	550	108	641	400	359	300	59	5	90	0	-395	-795
2009	1300	550	108	641	400	363	300	63	5	100	0	-409	-809
2010	1300	550	108	654	400	367	300	67	5	120	17	-463	-863
2011	1300	550	108	654	400	371	280	91	5	120	17	-487	-887
2012	1300	550	108	654	400	374	280	94	5	120	17	-490	-890
2013	1300	550	108	654	400	378	280	98	5	120	17	-494	-894
2014	1300	550	108	654	400	382	280	102	5	120	17	-498	-898
2015	1300	550	108	674	400	386	280	106	5	120	47	-552	-952
2016	1300	550	108	674	400	390	280	110	5	120	47	-556	-956
2017	1300	550	108	674	400	394	280	114	12	120	47	-567	-967
2018	1300	550	108	674	400	398	280	118	12	120	47	-571	-971
2019	1300	550	108	674	400	402	280	122	12	120	47	-575	-975
2020	1300	550	108	716	400	407	280	127	12	120	105	-680	-1080
2021	1300	550	108	716	400	411	280	131	12	120	105	-684	-1084
2022	1300	550	108	716	400	416	280	136	12	120	105	-689	-1089
2023	1300	550	108	716	400	420	280	140	12	120	105	-693	-1093
2024	1300	550	108	716	400	424	280	144	200	120	105	-885	-1285
2025	1300	550	108	716	400	429	280	149	200	120	105	-890	-1290
2026	1300	550	108	716	400	425	280	145	200	120	105	-886	-1286
2027	1300	550	108	716	400	421	280	141	200	120	105	-882	-1282
2028	1300	550	108	716	400	425	280	145	200	120	105	-886	-1286
2029	1300	550	108	800	400	428	280	148	200	120	221	-1089	-1489
2030	1300	550	108	800	400	431	280	151	200	120	221	-1092	-1492
2031	1300	550	108	800	400	436	280	156	200	120	221	-1097	-1497

Calendar Year	MWD Needs[a]	MWD Entitlement[b]	MWD Conservation Agreement[c]	MWD Transfer[d]	ESA Compliance Complete[e]	SNWS Needs[f]	SNWS Entitlement[g]	SNWS Transfer[h]	Arizona Transfer[i]	Reclamation Actions[j]	Other Actions[k]	LCR MSCP Federal Total Flow Changes[l]	Cumulative Federal Total Flow Changes[m]
2032	1300	550	108	800	400	440	280	160	200	120	221	-1101	-1501
2033	1300	550	108	800	400	444	280	164	200	120	221	-1105	-1505
2034	1300	550	108	800	400	448	280	168	200	120	221	-1109	-1509
2035	1300	550	108	800	400	452	280	172	200	120	221	-1113	-1513
2036	1300	550	108	800	400	456	280	176	200	120	221	-1117	-1517
2037	1300	550	108	800	400	461	280	181	200	120	221	-1122	-1522
2038	1300	550	108	800	400	465	280	185	200	120	221	-1126	-1526
2039	1300	550	108	800	400	469	280	189	200	120	221	-1130	-1530
2040	1300	550	108	800	400	473	280	193	200	120	221	-1134	-1534
2041	1300	550	108	800	400	477	280	197	200	120	221	-1138	-1538
2042	1300	550	108	800	400	481	280	201	200	120	221	-1142	-1542
2043	1300	550	108	800	400	485	280	205	200	120	221	-1146	-1546
2044	1300	550	108	800	400	489	280	209	200	120	221	-1150	-1550
2045	1300	550	108	800	400	493	280	213	200	120	221	-1154	-1554
2046	1300	550	108	800	400	498	280	218	200	120	221	-1159	-1559
2047	1300	550	108	800	400	502	280	222	200	120	221	-1163	-1563
2048	1300	550	108	800	400	506	280	226	200	120	221	-1167	-1567
2049	1300	550	108	800	400	510	280	230	200	120	221	-1171	-1571
2050	1300	550	108	800	400	513	280	233	200	120	221	-1174	-1574

MWD = Metropolitan Water District of Southern California.

SNWS = Southern Nevada Water System.

[a] MWD Needs = requested coverage from California.

[b] MWD Entitlement = maximum available MWD entitlement within California normal apportionment.

[c] MWD Conservation Agreement = 1988 Imperial Irrigation District/MWD conservation agreement that is currently in place.

[d] MWD Transfer = maximum transfer need for MWD.

[e] ESA Compliance Complete = amount of federal Endangered Species Act compliance completed for this reach of the river.

[f] SNWS Needs = the full surplus schedule submitted by Nevada for the Colorado River Interim Surplus Criteria Final Environmental Impact Statement.

[g] SNWS Entitlement = available SNWS normal entitlement (300,000 acre-feet) or estimated shortage entitlement (280,000 acre-feet)

[h] SNWS Transfer = difference between SNWS Needs column and SNWS Entitlement column. Amount of water required from flow reductions in the river to meet Nevada's future needs.

Calendar Year	MWD Needs[a]	MWD Entitlement[b]	MWD Conservation Agreement[c]	MWD Transfer[d]	ESA Compliance Complete[e]	SNWS Needs[f]	SNWS Entitlement[g]	SNWS Transfer[h]	Arizona Transfer[i]	Reclamation Actions[j]	Other Actions[k]	LCR MSCP Federal Total Flow Changes[l]	Cumulative Federal Total Flow Changes[m]

[i] Arizona Transfer = amount of flow reductions for Arizona needs, based on March 6, 2001 letter from the Arizona Department of Water Resources to LCR MSCP Steering Committee.

[j] Reclamation Actions = Bureau of Reclamation's future flow reduction needs such as water conservation , forbearance actions, or reductions in flow due to shortage determinations.

[k] Other Actions = estimated need for future actions that are not currently attributable to any one entitlement holder or Reclamation, such as water conservation activities or reductions in flow due to shortage determinations.

Column 5, "MWD Transfers", and Column 12, "Other Actions", of this table have been modified since the issuance of the LCR MSCP draft BA to reflect a maximum transfer of 800,000 acre-feet for MWD consistent with the Habitat Conservation Plan. This modification consists of a reassignment of water from the "Other" column to the "MWD" column. This modification does not affect the total amount of transfers reflected in the Column 14, "Cumulative Federal Total Flow Change", and therefore would not affect the hydrologic/hydraulic modeling and subsequent impact analysis in the reach below Parker Dam.

[l] LCR MSCP Federal Total Flow Changes = total of MWD Transfer + SNWS Transfer + Arizona Transfer + Reclamation Actions + Other Actions columns less ESA Complete (400 thousand acre-feet).

[m] Cumulative Federal Total Flow Changes = total of MWD Transfer + SNWS Transfer + Arizona Transfer + Reclamation Actions + Other Actions columns.

flow due to shortage determinations that are not currently attributable to any one entitlement holder or Reclamation was identified and included as other actions. No additional diversion facilities are assumed. The values in Table 2-13 do not identify the source (i.e., what combination of the described administrative actions) of water associated with the reduction in releases. Identification of individual entitlement holders that may participate in future administrative actions is not necessary for an accurate resource effects analysis in this BA because the affected portions of the river are identified in Table 2-13. The analysis assumes that most municipal and industrial needs for Arizona and California will primarily be met by diversions from Lake Havasu.

In summary, there are various combinations of proposed Federal actions that may result in the aggregate potential flow reduction of a maximum of 845,000 afy below Hoover Dam, 860,000 afy below Davis Dam, and 1.574 mafy below Parker Dam. In order to undertake a thorough analysis of potential impacts, the general assumption is made that a flow reduction in one part of the reach would affect the entire reach. As specific projects are determined, this assumption may not be true. Reclamation will monitor and calculate the flow reductions by reach, as specific projects are proposed for implementation. The maximum transfer amount per reach, for which coverage is sought under the LCR MSCP BA, is shown in Table 2-13. For some potential actions, it is too speculative at this time to determine an amount of water delivery reduction associated with the action. Some actions may even result in an increase in flows in certain reaches.

The type of administrative actions that could affect the amounts in Table 2-13 include:

- water conservation field services program;
- unauthorized use;
- unallocated or noncontracted water in Arizona, exclusive of the CAP;
- CAP contract actions;
- changes in delivery related to water transfers;
- change in delivery related to off-stream storage;
- changes in amount of delivery;
- changes in type of water use;
- inclusions and exclusions of lands to service areas; and
- contract terminations.

Each of these potential actions is described below.

Water Conservation Field Services Program

The Water Conservation Field Services Program (Field Services) is designed to fulfill Reclamation's responsibility under section 210(a) of the RRA to encourage water conservation by:

- actively reaching out to districts to assist in the development of water conservation plans,
- demonstrating innovative conservation technologies, and
- Implementing effective water efficiency measures.

The Secretary has authority to encourage full consideration and cooperation of prudent water conservation measures by non-Federal recipients of Federal project water, including the ability to issue regulations.

Water conservation activities under the Field Services Program have the potential to change future flows in the lower Colorado River. Actual conservation of water will depend on such factors as technology improvements, climate conditions, agricultural practices, crop mix and planting schedule, and market conditions for agricultural production. Any change in future flows from implementation of the Field Services Program over the next 50 years cannot be estimated at this time, but any future reductions within the LCR MSCP would be within the amounts quantified in Table 2-13. Generally, however, any conserved water not ordered for diversion is available for use by junior entitlement holders within the state apportionments.

The development of a program to encourage water conservation pursuant to section 210(b) of the RRA is nondiscretionary. Development of the Field Services Program is discretionary.

Table 2-17 lists the discretionary/nondiscretionary activities for the Water Conservation Field Services Program.

Table 2-17. Activities for the Water Conservation Field Services Program

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Develop water conservation program pursuant to RRA section 210(a)	Implementation of the Field Services Program	Consult in the development of conservation plans pursuant to RRA section 210(a)

Unauthorized Use

No person is entitled to divert or use Colorado River water, including water withdrawn through pumping of groundwater that would be replaced by Colorado River water, without a contract with the Secretary pursuant to section 5 of the BCPA. Except for those Federal establishments named in Article II(D) of the Decree that are not required to have a contract with the Secretary, a person or entity's only legal basis for diversion and use Colorado River water is its section 5 contract. Unauthorized use of Colorado River water could include any of the following categories:

- noncontract use,

- use in excess of an entitlement,
- use outside an approved contract service area, or
- use for a purpose not authorized by the entitlement.

Reclamation believes that, currently, most unauthorized uses are by noncontract river diverters, specifically well users within the floodplain of the LCR or well users within an accounting surface that is hydraulically connected to the river.

The USGS, under contract with Reclamation, performed two separate studies to determine whether water pumped from wells in the floodplain or on alluvial slopes outside the floodplain is presumed to be Colorado River water (Wilson and Owen-Joyce 1994; Owen-Joyce 2000). The reports from these two studies define the river aquifer from an area surrounding Lake Mead to the southernmost parts of Arizona and California at the international boundary with Mexico south of Yuma, Arizona. In conjunction with the reports, Reclamation and the USGS are conducting an inventory of wells along the LCR to identify wells that pump Colorado River water. Reclamation is also identifying pumps from the river used by diverters who do not have a contract for Colorado River water use. The quantity of water diverted by unauthorized users is not known at this time, but any changes in water on the LCR caused by an action regarding noncontract users are included in the quantified amounts in Table 2-13.

Colorado River water users who do not have contracts with the Secretary or who do have contracts but whose diversions are not currently included in the Decree accounting report will be identified. Reclamation is required by the Decree to include each identified water user in the Decree accounting report, whether or not that user has a legal entitlement. It is Reclamation's goal to assist unauthorized water users to legitimize their current uses of LCR water. There are mechanisms by which Reclamation is attempting to make water available to bring these uses under a legal contract. In dealing with the largest number of unauthorized uses, Reclamation will work cooperatively to account for these diversions under existing water delivery contracts within each of the three states. Within Arizona, there is a small amount of unallocated water remaining within its 2.8 maf state apportionment. It is believed that the amount of unallocated water available is sufficient to cover the contracting needs for these small uses that cannot be covered under an existing contract. Within California, a cooperative water exchange has been developed to provide a source of water that is sufficient to meet the contracting needs of unauthorized users. At the end of this process, the majority of unauthorized users within California will be covered by a contract. If it is not possible to cover these uses by contract, Reclamation intends to take appropriate and necessary action to eliminate the unauthorized uses to protect the rights of legal entitlement holders. Appropriate action may include the development and adoption of a rule to address unauthorized diversion. The rule will provide a process for a water user to appeal a finding that an unauthorized diversion of mainstem water is taking place. Enforcement of the Decree is a nondiscretionary action. Contracting with nonauthorized users is a discretionary action.

Table 2-18 lists the discretionary/nondiscretionary activities for unauthorized use.

Table 2-18. Activities for Unauthorized Use

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Enforcement of provisions of the Boulder Canyon Project Act (BCPA) in *Arizona v. California* to limit the release and delivery of Colorado River water to authorized users	Implementation of appropriate policy or rule to address four types of unauthorized use.	Consult with states in the development of policies or rules to address four types of unauthorized use
	Execution of water delivery contracts with entities identified as non-contract users.	Consult with the states on the execution of water delivery contracts with entities identified as noncontract users.

Unallocated or Noncontracted Water in Arizona, Exclusive of Central Arizona Project

In Arizona, the 2.8 mafy of Colorado River water available for consumptive use is allocated to individual entitlement holders, under contracts, as first, second, third, or fourth priority water.

After allowing for delivery to holders of the first three priorities and the CAP (which is also in the fourth priority), a maximum annual quantity of 164,652 af of fourth priority water is available for diversion within Arizona, exclusive of CAP. Of the 164,652 afy of fourth priority water available for diversion for non-CAP use, 11,689 afy are currently unallocated. Arizona has recommended to the Secretary that contracts be offered to 11 entities for delivery of water with a combined maximum annual diversion of 9,175 af. Reclamation is working to complete these contract actions with the 11 entities. Arizona already has requests for water delivery contracts on file that far exceed this amount of unallocated water. As Reclamation completes its contracting process in Arizona and consults with Arizona on the status of outstanding recommendations, a decision can be made on how to commit any water that remains uncommitted within Arizona's 2.8-mafy apportionment. The potential amounts of such unallocated Arizona water are included in Table 2-13. It may be decided to commit and contract some of this water to cover unauthorized uses that are now occurring in Arizona. Contracting for unallocated (or noncontracted) water in Arizona is a discretionary action.

Table 2-19 lists the discretionary/nondiscretionary activities for unallocated or noncontracted water in Arizona, exclusive of CAP.

Table 2-19. Unallocated or Noncontracted Water in Arizona, exclusive of Central Arizona Project (CAP)

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water pursuant to executed contracts for unallocated water in Arizona (non-CAP)	Execution of water delivery contracts for unallocated water in Arizona (non-CAP)	Review of water delivery contracts and consultation with Arizona on contract recommendations

Central Arizona Project Contract Actions

About 1.5 maf of Arizona's 2.8 maf annual basic apportionment of Colorado River water for consumptive use is projected to be diverted from Lake Havasu through CAP diversion facilities. Initially, non-Indian agricultural users, through CAP water delivery subcontracts, were expected to fully use that portion of Arizona's 2.8 maf annual basic apportionment not otherwise put to use by other Arizona entitlement holders. Those non-Indian agricultural users have not been able to use all that water, and since late 1996, the Arizona Water Banking Authority (AWBA) has taken delivery, for off-stream storage in Arizona, of otherwise unused Colorado River water within Arizona's apportionment. As junior users within the Arizona priority system, the non-Indian agricultural users and the AWBA will have less water available for their uses if higher priority water users in Arizona use all the water available to them under water delivery contracts.

As additional water delivery contracts are executed for delivery of Arizona's basic apportionments, less water will be available for delivery via the CAP. This is a relatively minor amount, as less than 12,000 afy remain uncontracted at this time. Any CAP water that is reallocated to a water user in central Arizona should have minimal, if any, changes in Colorado River mainstem flows. The maximum identified impact on stream flows that could occur through the reallocation of CAP water would be a reduction in stream flows below Hoover Dam caused by prospective allocations to water users upstream from Hoover Dam, such as the Navajo Nation or Hopi Indian Tribe. Specific CAP contract actions have not been identified to date, but the movement of any water subject to future contract actions is included in the quantified amounts in Table 2-13. CAP contract actions are discretionary actions.

Table 2-20 lists the discretionary/nondiscretionary activities for CAP contract actions.

Table 2-20. Central Arizona Project Contract Actions

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water pursuant to executed contracts	Completion of allocation and execution of contracts for delivery of CAP water subject to Congressional direction	Review of contracts and consultation on proposed allocation

Changes in Delivery Related to Water Transfers

Several municipal areas are actively seeking to acquire additional Colorado River water, such as Las Vegas, Nevada, southern California, and some Arizona communities. These and other municipalities may contractually arrange for water transfers with other current Colorado River water entitlement holders. Generally, transfers are expected to occur between irrigation districts that divert water below Lake Havasu to municipalities that divert water at or above Lake Havasu. Water transfers may be temporary or permanent. An entitlement holder might agree to temporarily convey a right to use water associated with its entitlement to another party while retaining the underlying entitlement. Water transfers represent a viable method for areas such as Las Vegas, San Diego, and several communities in Arizona to obtain additional water supplies, even if those transfers are temporary agreements. The flow changes quantified in Tables 2-13 and 2-14–2-16 include potential future changes caused by water transfers. As required by applicable Federal law, the Secretary must approve changes in points of diversion, whether temporary or permanent, of Colorado River water within the Lower Basin. The approval of changes in points of diversion by the Secretary is discretionary.

Table 2-21 lists the discretionary/nondiscretionary activities for changes in delivery related to water transfers.

Table 2-21. Activities for Changes in Delivery—Water Transfers

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water pursuant to contracts that recognize temporary or permanent transfers of water entitlements	Approval of new contracts or contract changes to recognize temporary or permanent transfers of water entitlements	Review of contracts and consultation on new or amended contracts that recognize transfers of water entitlements

Changes in Delivery Related to Off-Stream Storage

Changes in points of diversion could occur as a result of actions taken under the rule for off-stream storage of Colorado River water. This rule, found at 43 C.F.R. Part 414, became effective December 1, 1999. The rule allows an authorized entity in a Lower Division State to store otherwise unused Colorado River water off stream to assist an authorized entity in another Lower Division State in meeting its future water needs.

Under the rule, Colorado River water could be moved from one diversion point to another. For example, for off-stream storage in Arizona, water would be diverted from Lake Havasu and delivered through the CAP canal for off-stream storage in Arizona under an interstate storage agreement between an expressly authorized Arizona entity (such as AWBA) and an entity in Nevada or California. Under the terms of such an agreement, when the Nevada or California entity requests delivery of the water it paid to store in Arizona and all requirements of the rule and applicable contracts are satisfied, Arizona will use the water previously stored off stream under the interstate storage agreement and decrease its current diversion of Colorado River water through CAP facilities. Decreased diversions by CAP will reduce Arizona's consumptive use of Colorado River water and thereby result in an "intentionally created unused apportionment" within Arizona's apportionment of Colorado River water. This intentionally created unused Arizona apportionment may then be released by the Secretary for delivery to the Nevada or California entity that paid to have the water stored under the interstate storage agreement.

Some of Arizona's apportionment may be delivered to a different point of diversion. When Arizona forbears consumptive use of part of its Colorado River water to develop intentionally created unused apportionment, the diversion point for water released and delivered by the Secretary to the Nevada entity to satisfy Nevada's right to the intentionally created unused apportionment will likely change from Lake Havasu to Lake Mead (or to the Laughlin area below Davis Dam). For intentionally created unused apportionment delivered to a California entity, the change in the diversion point may be less significant because the likely California participant in an interstate storage agreement, Metropolitan, diverts water from the same reach of the river (Lake Havasu) as the CAP. When intentionally created unused apportionment is released, up to 100,000 af of water may be delivered at an upstream diversion (e.g., Lake Mead) as a result of agreements relating to off-stream storage. The 100,000 af is included in the quantified values in Tables 2-13 and 2-14–2-16 (43 C.F.R. Part 414). The Secretary must approve individual Storage and Interstate Release Agreements (SIRAs) between parties; approval of these agreements is a discretionary action. However, once a SIRA is approved and entities have taken the required actions, delivery of ICUA in accordance with the contracts is nondiscretionary.

Table 2-22 lists the discretionary/nondiscretionary activities for changes in delivery related to off-stream storage.

Table 2-22. Activities for Changes in Delivery—Off-Stream Storage

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water under executed off-stream storage agreements, pursuant to 43 C.F.R. Part 414	Execution of Storage and Interstate Release Agreements pursuant to 43 C.F.R. Part 414	Delivery of water under executed off-stream storage agreements, pursuant to 43 C.F.R. Part 414

Changes in Amount of Delivery

Holders of water delivery contracts can request changes in amounts of diversion (or point of diversion). The most likely reason for seeking such specific changes would be to implement a water transfer to another entity or to allow the delivery of intentionally created unused apportionment for delivery to a consuming entity pursuant to a SIRA. In such circumstances, Secretarial approval is required. Refer to the discussion in the previous two administrative subsections.

However, not all changes in water use require specific Secretarial approval. For example, water users may enter into voluntary forbearance arrangements that use the existing water priority system, allowing water to flow "down" the priority system by operation of law and contract.

Table 2-23 lists the discretionary/nondiscretionary activities for changes in amount of delivery.

Table 2-23. Activities for Changes in Amount of Delivery

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water pursuant to executed contracts or amendments to recognize changes in amounts of delivery or changes in points of diversion	Execution of contracts or amendments to recognize changes in amounts of delivery or changes in points of diversion	Review of contracts and consultation on new or amended contracts

Changes in Type of Water Use

A contractor may request approval of a conversion of all or a portion of its contracted water right from irrigation use to domestic use. Generally, such a request involves a continued use by the same person or entity at the same location; only the type of use changes. This type of action has become more common as municipalities grow and expand into rural areas. When farmland is taken out of agricultural production, the water district needs a source of water for household use. Water conversions have already occurred in several places in Arizona and California, and more are likely to occur in the future and are included in the amounts in Table 2-13. This is a discretionary action because the Secretary must approve contracts (or contract amendments) that recognize changes in the type of water use.

Table 2-24 lists the discretionary/nondiscretionary activities for changes in type of water use.

Table 2-24. Activities for Changes in Type of Water Use

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water pursuant to executed contracts or contract amendments that recognize changed water use types	Execution of contracts or contract amendments that recognize changed water use types	Review of contracts and consultation with Reclamation on new or amended contracts

Inclusions and Exclusions to Service Areas

Contractors may want to expand contract service area (inclusions) or take land out of contract service area (exclusions). Either action could affect the point of diversion and the quantity of water that is diverted. When an irrigation contractor requests an inclusion, the land must be classified as suitable for irrigation and appropriate environmental compliance must be completed. An exclusion could be requested because the contractor wants to either use the water to irrigate other lands within the district or retire land in order to transfer the water associated with the entitlement to another entity. In general, these actions do not result in changes in stream flows because they usually consist of the movement of water use to different land, but still within the same district's boundaries. Moreover, because Colorado River water is already almost fully committed in the Lower Basin, if an irrigation contractor with a quantified allocation wants to expand its service area to irrigate additional lands, it must reduce its water use on its existing lands. Therefore, even though different lands may be irrigated, the point of diversion and total quantity of water diverted and consumed may not change. Approval by the Secretary of water delivery contracts (or contract amendments) that include or exclude lands in service areas is discretionary.

Table 2-25 lists the discretionary/nondiscretionary activities for inclusions and exclusions to service areas.

Table 2-25. Activities for Inclusions and Exclusions to Service Areas

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
Delivery of water pursuant to executed contract amendments or new contracts that includes or excludes lands in service areas	Execution of contract amendments or new contracts that includes or excludes lands in service areas	Review of contracts and consultation on new or amended contracts

Contract Terminations

Contract terminations may result in a small quantity of Colorado River water being made available for reallocation. Some entitlement holders are not using their full entitlements, and if it can be shown that abandonment has occurred, the Secretary may reduce that entity's water entitlement or terminate the water delivery contract and the associated water can be made available for reallocation. Any Colorado River water that is relinquished by a water user in a Lower Division State would be reallocated by the Secretary for use within that same state after consultation with the appropriate state agency. Subsequent to the state's recommendation, the Secretary makes the final decision to whom to allocate and contract for the water use. Termination of a contract is discretionary.

Table 2-26 lists the discretionary/nondiscretionary activities for contract terminations.

Table 2-26. Activities for Contract Terminations

Nondiscretionary Actions	Discretionary Actions	Nondiscretionary Actions Related to Non-Federal Actions
None	Termination of water contract due to abandonment Execution of contract amendments when entitlement holder has relinquished water	Consultation on the disposition of any water allocated for use but not consumptively used within a State

2.2.3 Ongoing Non-Flow-Related (Facilities and Channel) Activities

Section 6 of the BCPA established the priorities for the use of Hoover Dam and Lake Mead and recognized river regulation, improvement of navigation, and flood control as the first priority. The Colorado River Front Work and Levee System Act of 1927 (44 Stat. 1010) (CRFWLSA), as amended (54 Stat. 708, 60 Stat. 338, and 72 Stat. 101), also addresses protection of works and facilities from flood damage. The CRFWLSA authorizes money to be appropriated for Reclamation to defray its costs for operating and maintaining the Colorado River Front Work and Levee System, including constructing, improving, extending, operating, and maintaining certain protection and drainage works. Reclamation conducts its non-flow-related OM&R and river management of the Colorado River from Davis Dam to the SIB mainly under the CRFWLSA, and the Colorado River Floodway Protection Act of 1986 (Pub. Law No. 99-450) (CRFPA). The CRFPA establishes and designates the Colorado River Floodway and establishes a task force to advise the Secretary and Congress on the establishment of the floodway and on managing existing and future development within the floodway, including the appropriateness of compensation in specified cases of extraordinary hardship. Under the CRFWLSA, Reclamation constructed and maintains drainage works and "controls" the river by modifying the channel where and when appropriate to provide flood protection and regulate the river. Under the CRFPA, a protective floodway was established to accommodate 100-year flood flows or 40,000 cfs, whichever is greater. Reclamation has discretion as to which specific actions it takes to protect property and persons in the floodway for flood protection and river regulation and when and where on the LCR Reclamation takes those actions to meet nondiscretionary water deliveries. Reclamation also operates and maintains pursuant to applicable laws and regulations power generation facilities on the lower Colorado River, such as Hoover, Davis, and Parker Power Plants. Table 2-27 lists the discretionary/nondiscretionary actions for Reclamation's OM&R and river management actions.

Table 2-27. Reclamation Operation and Maintenance and River Management Actions

Nondiscretionary Action	Discretionary Action	Nondiscretionary Action Related to Non-Federal Action
Operate, maintain, and control river in Arizona, California, and Nevada Construct, maintain, and improve drainage works for water projects Maintain floodway to accommodate flood flows for 100-year event or 40,000 cubic feet per second, whichever is greater Measure diversions and return flows to and from the mainstem of the Colorado River	Wash fan removal Protected bankline location and maintenance Maintenance and replacement of power plant facilities Levee location and maintenance Sediment dredging upstream of principal canal diversions and disposal sites Jetty and training structure location and maintenance Haul roads (380 miles) and riprap storage location and maintenance; location of three future stock piles Maintenance of Yuma area drainage wells and conveyance facilities including maintenance and access roads Maintenance of open channel drains and outfall channels Maintenance and replacement of gauging stations (14), survey line markers, and boat ramps (5) Vegetation management in channels, around structures, and along roads Maintenance of facilities to provide flood flow capacity Maintenance of settling basins to remove sediment and maintain flows; four principal basins Backwater maintenance	Administration of contracts for water district operation and maintenance of Federally owned facilities

The Rivers and Harbors Act of August 30, 1935 (49 Stat. 1028, 1039), authorized the United States to construct, operate, and maintain Parker Dam and appurtenant structures, canals, and incidental works necessary for that project. Davis Dam was originally authorized by the Secretary in a finding of feasibility on April 26, 1941, under the authority of the 1939 Act, which, among other things, authorized the United States to enter into contracts for repayment of construction charges and payment of OM&R charges. The 1944 Water Treaty obligated the United States to construct Davis Dam at its own expense within 5 years from the date (November 8, 1944) the treaty became effective. Section 301(a) of the CRBPA (82 Stat. 885) authorized the United States to construct, operate, and maintain the CAP, including a system of conduits, canals, and pumping plants and related distribution and drainage works. Reclamation conducts non-flow-related OM&R activities along the Colorado River to carry out the Secretary's responsibilities in the construction, operation, and maintenance of facilities pursuant to these projects.

Reclamation and the USGS install flow measurement sites as needed to meet the reporting requirements defined by Article V of the Decree. The reporting requirements defined by Article V of the Decree require the quantification and reporting of all diversions from, and return flows to, the LCR.

Under the authority of the CRFWLSA, Reclamation currently maintains approximately 275 miles of channel, 336 miles of protected banklines, 114 miles of levees, and associated river control structures, including, but not limited to, 102 jetties, 28 training structures, access roads, boat ramps, backwater inlets and outlets, diversion structures, four drainage pump outlet channels (DPOCs), over 80 drainage wells, over 600 observation wells, weirs, siphons, and several drains, including the Yuma Mesa Conduit, the Main Outlet Drain, the MODE, and the Bypass Drain. Reclamation also maintains the 242 Lateral at the SIB, numerous cable way gauges, survey markers, line-of-sight vegetation clearing for survey lines and access to markers (lines and markers are approximately 5 feet wide, 5,280 feet long, and, thus, 0.6 acre per site), and other related monitoring and measuring structures and devices. Also included here is the authority to operate and maintain the Senator Wash Dam, dikes, pumping plant, and regulating reservoir. Reclamation also is committed to developing and maintaining 42 backwater inlets and outlets and 53 backwaters. The location of many of these features and cross-sectional examples of facilities are shown in Drawings 423-303-2750T and 423-303-2750–2769 and figures in Appendix R. All the above activities are described in detail in the following sections of this chapter.

Within the LCR MSCP planning area, several federally owned facilities are operated and maintained by state water districts under contract. For example, the Bard Water District maintains the Reservation Main Drain and other irrigation and drainage facilities in the Reservation Division (Bard and Indian Units of the Yuma Reclamation Project). The IID maintains the Imperial Dam, Laguna Dam, Senator Wash, Senator Wash Pumping Plant, All American Canal seepage interceptor drains, and Araz Drain; the North Gila Irrigation and Drainage District maintains several drains and wasteways that enter the Colorado River, irrigation facilities within the floodplain; and the Yuma County Water Users' Association maintains irrigation facilities, drains and wasteways in the Yuma Valley, the California Wasteway off the Yuma Main Canal, the Yuma Main Canal, the Siphon Drop Power Plant, the Boundary Pumping Plant and several drainage wells located in the Yuma Valley as well as the salinity control features installed at the SIB. The CAWCD operates the CAP and its diversion facility at Lake Havasu. The Palo Verde Irrigation District performs the OM&R of the Palo Verde Diversion Dam. The OM&R performed by the water districts on federally owned facilities is described in the state covered actions (see Chapter 3). The Federally owned facilities maintained by local water districts are discussed in the major Federal facilities section of this chapter and are intended, because of Federal ownership, to be included in this assessment as a Federal covered action.

2.2.3.1 Channel Maintenance

Channel maintenance is defined for the purpose of the LCR MSCP BA as the OM&R activities that are conducted in accordance with the CRFWLS, as amended, and the CRFPA, on a recurring basis, as needed, in the LCR from Davis Dam to the SIB. Some of the purposes for channel maintenance are to ensure that the flow dynamics are maintained in the river; Federal, state, and local facilities and property are protected; Indian lands are protected; and ecological functions and cultural resources are maintained and enhanced when opportunities arise. In general, OM&R activities are performed to maintain performance of water delivery and diversion facilities; maintain existing river channel capacity; improve the flow-carrying capacity of the river channel in areas where increased capacity is needed, when feasible and economical; and maintain or improve backwaters along the river for which Reclamation is responsible, maintain levees and levee access roads, and jetties and training structures located along the river from Davis Dam to the SIB. Also included are the maintenance of desilting basins located at Needles, Laguna, and upstream of Morelos Diversion Dam and Laguna and Imperial Reservoirs which also trap sediment carried by the river. These activities may include dredging to remove sediment deposits or to widen and deepen the river channel or backwater. Some areas will need work more frequently than others. In general, recurring work for channel maintenance has occurred at a frequency varying from 3 years to 30 years or more, depending on the location along the river. Also, since river systems are dynamic, the frequency of maintenance for a particular location changes over time.

Efforts to maintain or improve existing channel capacity and protect banklines occur principally in areas where valuable resources are in danger of being damaged by floods, such as water diversion facilities, homes, or other private, county, state, Federal, or Tribal facilities or property.

In the past, portions of the river channel were relocated to improve the hydraulic efficiency of the river. The main river channel was relocated at the river reach from Bullhead City to Topock, the river reach from Palo Verde Oxbow to just upstream of the Walter's Camp, and the river reach from about RM 126 to RM 124 near Blythe, California. Reclamation has not conducted any maintenance dredging since initial relocation was completed and does not expect to conduct maintenance dredging in these areas in the immediate future.

Reclamation has discretion regarding the timing, geographic scope, and location of the above activities. The nature and priority of the work will be determined by what is occurring at the time.

The maintenance of the capacity of the river channel from the NIB to Cocopah Bend (approximately RMs 23.3–25.6) is important to protect the water diversion function of Morelos Diversion Dam and to maintain the flow capacity in the river reach from Pilot Knob to Morelos Diversion Dam for use in flood-routing procedures. This segment of the river channel is located west of Yuma, Arizona, near RM 25.6 and upstream of the NIB. The location of this reach is identified on Drawing Number 423-303-2904 in Appendix R.

During the 1993 Gila River flood, considerable sediment was deposited in the Yuma Division, raising the river channel bottom approximately 5 feet and causing concerns from Mexico about its ability to continue to divert its treaty water at Morelos Diversion Dam into its canal system. In addition, the higher river bottom caused local groundwater levels to rise, and the flow-carrying capacity of the river channel was severely compromised. As a result, the United States agreed to deepen the channel bottom above the NIB and, on a one-time basis, from the NIB to Morelos Diversion Dam.

This work improved channel flow capacity, reduced local groundwater levels and ensured Mexico that it can divert its treaty water at Morelos Diversion Dam. The deepened channel also traps sediment being carried by the river before flows enter Mexico. The channel deepening was completed in May of 2001, and the future maintenance thereof is not the responsibility of Reclamation.

In summary, over the next 50 years, Reclamation is seeking coverage for maintenance of the existing minimum flow capacities of the Colorado River channel (i.e., bank to bank) and the current estimated levee capacity (i.e., capacity with vegetation that has established between the levees, not the original design capacity), as summarized in Table 2-28. The capacities will be maintained through nine types of maintenance activities:

- wash fan removal,
- bankline protection,
- levee maintenance,
- settling basins,
- jetties and training structures,
- stockpiles,
- riprap placement and haul roads,
- maintenance at the SIB facilities,
- and access roads for levees, river bank line, canals and drains.

Reclamation's execution of these activities is discussed below. With regard to the United States–Mexico boundary formed by the Colorado River channel near Yuma, Arizona, the USIBWC is responsible for maintaining the river channel from the NIB to Morelos Diversion Dam and below the dam to the SIB. The USIBWC's maintenance is not included in the LCR MSCP as a covered action.

Wash Fans

Numerous washes drain directly into the LCR between Davis Dam and Imperial Dam that are easily identified on USGS quadrangle maps (Drawings 423-303-2750–2769 in Appendix R). Storms causing flashfloods in the surrounding watershed send tons of alluvial material into the river channel, forming wash fans that settle adjacent to or in the river channel. These depositions cause hydraulic restrictions, impeded flow, bankline erosion, and losses of associated riparian habitat. The wash fans also provide some habitat. Reclamation removes or modifies them only when the channel is significantly restricted or erosion is accelerated, usually using a bulldozer and/or amphibious and land-based heavy equipment during low-water periods.

Removal of wash fans occurs as needed. No individual wash fan is routinely removed. The wash fans are not removed until such time as the river flow is forced by the fan into the opposite bankline, causing erosion, or when the wash fan is constricting the flow and reducing the channel capacity. Only enough of the wash fan is removed to stop bankline

Table 2-28. LCR Channel, Flood, and Levee Capacities (cubic feet per second)

River Maintenance	Feature by River Mile	Estimated River Channel Capacity (cfs) (July 1999)	Flow Used to Determine Floodway Boundary (cfs)	Estimated Levee Capacity (cfs)
Mohave Division	Davis Dam (RM 277.7) to Piute Wash (RM 255.5)	30,000	40,000	50,000
	Piute Wash (RM 255.5) to Needles Airport Drain (RM 240.8)	30,000	42,700	70,000
	Needles Airport Drain (RM 240.08) to Sacramento Wash (RM 234.0)	30,000	43,000	70,000
Topock Division (includes Topock Gorge, Lake Havasu and Parker Dam)	Sacramento Wash (RM 234.0) to Osborne Wash (RM 179.7)	30,000	47,100	N/A
Parker Division	Osborne Wash (RM 179.7) to Tyson Wash (RM 132.8)	(Below Parker Dam) 19,000	40,000	50,000
Palo Verde Division	Tyson Wash (RM 132.8) to La Paz Arroyo (RM 123.0)	(Below Headgate Rock Dam) 15,000	42,200	75,000
	La Paz Arroyo (RM 123.0) to Trigo Wash (RM 115.0)	15,000	42,000	75,000
	Trigo Wash (RM 115.0) to Gould Wash (RM 105.8)	15,000	42,500	75,000
Cibola Division	Gould Wash (RM 105.8) to Paymaster Landing (RM 88.4)	15,000	42,600	80,000
	Paymaster Landing (RM 88.4) to Cibola Lake (RM 87.4)	15,000	43,400	80,000
	Cibola Lake (RM 87.4) to Julian Wash (RM 77.7)	15,000	43,400	80,000
Imperial Division	Julian Wash (RM 77.7) to Gavilan Wash (RM 74.1)	15,000	43,400	80,000
	Gavilan Wash (RM 74.1) to Yuma Wash (RM 62.5)	15,000	43,400	80,000
	Yuma Wash (RM 62.5) to Indian Wash (RM 60.3)	15,000	43,500	80,000
	Indian Wash (RM 60.3) to Martinez Lake (RM 56.3)	15,000	43,500	80,000

River Maintenance	Feature by River Mile	Estimated River Channel Capacity (cfs) (July 1999)	Flow Used to Determine Floodway Boundary (cfs)	Estimated Levee Capacity (cfs)
Imperial/Laguna Divisions, includes Imperial & Laguna Dams	Martinez Lake (RM 56.3) to Gila River (RM 34.4)	(Above Imperial Dam) 15,000	43,500	80,000
		(Below Laguna Dam) 11,000		
Yuma Division	Gila River Confluence (RM 34.4) to Pilot Knob (RM 25.1)	9,000	40,000	90,000
	Pilot Knob (RM 25.1) to Morelos Diversion Dam (RM 22.1)	21,000	40,000	90,000
Limitrophe	Morelos Diversion Dam (RM 22.1) to SIB (RM 0.0)	15,000	N/A	90,000

Notes:

RM = river mile.

cfs = cubic feet per second.

N/A = not applicable.

SIB = Southerly International Boundary.

erosion, restore channel capacity, and improve the efficiency of water moving through the river. Depending on site conditions and available space, opportunities to enhance habitat for covered and other fish and wildlife species will be considered. These opportunities include, but are not limited to, maintaining diversity for fish and bird habitat, including low-velocity and shallow "backwater" areas and associated gravel substrates, typically on the downstream margins of wash fans.

The number of wash fans requiring removal varies from year to year because it is related to the number of significant storm events that generate sufficient rainfall and overland flow conditions to carry sediment to the river from the tributary watershed. Generally, 2–10 wash fans require removal or modification each year.

The major washes that may develop wash fans requiring modification or removal are listed in Table 2-29. Table 2-30 describes historical and projected wash fan removal activities. Other smaller washes requiring wash fan modification or removal on an intermittent basis are shown on Drawings 423-303-2750–2769 in Appendix R and the referenced USGS quadrangle maps.

Table 2-29. Major Washes along the LCR

Name	State	River Mile	100-Year Tributary Flow (cubic feet per second)
Silver Creek	Arizona	270.9	14,400
Piute Wash	California	252.0	24,600
Needles Airport	California	240.0	10,300
Sacramento Wash	Arizona	234.0	27,600
Osborne Wash	Arizona	179.7	14,400
Vidal Wash	California	166.0	18,700
Big Wash	California	152.2	9,900
Unnamed Wash	California	147.0	8,200
Tyson Wash	Arizona	132.0	31,000
La Paz Arroyo	Arizona	130.5	10,800
Trigo Wash	Arizona	115.0	13,700
Pete's Wash	Arizona	113.5	Not applicable
Mule Wash	Arizona	107.3	Not applicable
Gould Wash	Arizona	106.0	11,300
Milipitas Wash	California	89.5	Not applicable
Cibola Lake	Arizona	87.4	10,300
Julian Wash	California	77.6	10,000
Gavilan Wash	California	74.0	8,700
Yuma Wash	Arizona	62.5	11,200
Indian Wash	Arizona	60.0	13,500

Name	State	River Mile	100-Year Tributary Flow (cubic feet per second)
Martinez Lake	Arizona	56.4	12,600
Laguna Wash	Arizona	44.0	8,400
Mission Wash	California	29.8	Not applicable
Fortuna Wash	Arizona	Gila River near confluence	Not applicable

Table 2-30. Historical and Projected Wash Fan Removal Activities

Wash Fan Location by River Mile	Estimated Quantity of Material Removed (cubic yards)	Year Removed
C235.8	10,000	1989
C143.3	15,000	1991
C142.8	2,500	1991
A105.7	4,000	1994
A107.4	4,000	1994
A113.4	2,500	1994
C91.0	6,000	2002
C144.0	1,000	1999
C151.7	4,000	2000
C247.4	2,000	Future work
C247.8	2,000	Future work
C158.2	10,000	Future work
C166.2	2,500	Future work
C250.7	Unknown	Future work

Note: Other wash fans were removed prior to 1989.

The rough average volume of material removed is approximately 3,000–16,000 cubic yards per wash, ranging in area from 1–3 acres. Exceptional events could result in the need to remove in excess of 75,000 cubic yards of material from larger wash fans. The area of disturbance, including removal and relocation of material, can range from 4 acres to more than 30 acres annually. However, in consideration of the environmental benefit of wash fans for fish and wading and roosting birds, not all of the material from the wash fans would be removed.

A typical wash fan maintenance undertaking is illustrated in Drawing 423-303-2908 in Appendix R. This drawing illustrates that a typical wash fan is excavated only for purposes of maintaining channel capacity. The wash fans would not always be excavated to the original channel bottom. Whenever possible a portion of the fan to maintain diversity of habitat for fish, certain birds, and other wildlife would be left in place.

Impact to the channel habitat is minimized because much of the work is accomplished by equipment ingressing and egressing from land routes.

The removed material is placed at suitable upland sites adjacent to or near the wash fan (e.g., along the sides of the wash and other locations where the material will have little possibility of being returned to the river by flows in the wash). The disposal sites are chosen to minimize impacts to habitat to the extent possible.

Protected Bankline Maintenance and Care of Unprotected Banklines

Reclamation is responsible for maintaining armored or protected banklines on the LCR from Davis Dam to the NIB (Drawings 423-303-2750–2769 in Appendix R). Banklines include both protected and unprotected sections. Protected banklines are armored with rock (riprap) (Drawing 423-303-2902 in Appendix R). Conversely, unprotected banklines are those that are natural and are not armored with riprap and are subject to erosion. During unusually high-flow conditions, large amounts of material can be eroded from protected banklines as well as unprotected banklines. Erosion along the protected banklines can result in mass removal of the rock armoring. This loss of armoring can also threaten the integrity of adjoining protected bankline. There is a tendency for active erosion to scallop into the bankline beyond its armored protection, resulting in greater loss of adjacent land and associated riparian vegetation. Flood protection loss occurs when there is undercutting and erosion of the levee system. Reclamation takes anticipatory action where a flood or sizeable space-building release would cause harm. Once in a flood or high-release condition for space-building purposes, it is often either too late to stop the damage or the costs associated with preventing damage end up being higher than would have been required had the protection been installed prior to a high-flow event. Reclamation will evaluate the need to perform work on the river in advance of high-flow events, and, when required, measures will be taken to avoid or minimize impacts to the environment.

Approximately 336 miles, or 61 percent, of the banklines (both channel sides) from Davis Dam to the NIB have been previously protected. This protection represents only the riverine portions of the river and does not include shorelines along Lake Mohave, Lake Havasu, or banks adjacent to backwater areas (Drawings 423-303-2750–2769 in Appendix R). To maintain the integrity of the existing protected banklines, rock is placed in areas where pockets or segments have been or are currently eroding. Banklines are generally protected with approximately a 10-foot horizontal thickness of clean, graded rock (riprap). For the purposes of this LCR MSCP BA, it is assumed that the banklines are protected with riprap about 10 feet in width. Using this figure, approximately 407 acres of banklines are currently protected along the LCR.

It is estimated that approximately 60,000 cubic yards of rock are placed on eroding, previously protected banklines annually. Rock is obtained from stockpile sites and transported by truck to the repair site on access roads located along the bankline (Drawings 423-303-2750–2769 in Appendix R). Under normal operations, the rock is then placed by heavy equipment at the site needing repair.

Unprotected bankline is not riprapped with rock protection unless the bankline is currently eroding and there is a threat of loss of property, facilities, or habitat. Stopping erosion of unprotected bankline with riprap or a river structure, such as a jetty, also reduces the sediment load carried by the river, reducing the amount of sediment traveling downstream and forming sandbars, which constricts the river flow, block flow into backwaters, or fill in backwaters with sediment along the river. Eventually much of this sediment moves into downstream settling basins, where it is removed on a routine basis. Unprotected bankline downstream of riprapped bankline may begin to erode, and large scallops may form during flood flows. These areas must be monitored during floods to determine how much protection is required to prevent erosion.

Levee Maintenance

Levees were constructed in the floodplain of the Colorado River from Davis Dam to the SIB to manage the floodway and to protect life and property from flooding during unusually high water conditions, which are usually associated with flood events. The levees also were constructed to protect developed lands in the floodplain. U.S. Department of Interior policy regarding Floodplain Management and Wetlands Protection (520 DM 1) requires Reclamation to assess risks and minimize harm to the floodplain and wetland resources in regards to new or modified Federal construction projects, while acquiring, managing, or disposing of Federal land or facilities and administering construction or other programs where Federal grants or other financial assistance are involved. For the above types of actions, Reclamation is required to look for either alternative locations when practicable or ways to reduce harm to the floodplain resources.

U.S. Department of Interior policy also requires Reclamation to inform private parties and state and local governments participating in regulatory, financial, and land transactions of the hazards and impacts of locating structures in floodplains and harming wetlands. These processes could include the Clean Water Act 404 permitting process or the National Flood Insurance Program (NFIP) through which the Federal Emergency Management Agency (FEMA) allows communities to join the NFIP for the benefit of getting flood insurance in identified flood-prone areas. To participate in the NFIP, local communities must develop local zoning regulations that are acceptable to FEMA and the NFIP.

The boundaries of the floodway of the LCR were established and are reviewed through an administrative study process, rather than through legislation, so the boundaries are based on current scientific information and analysis. The study process was conducted to provide extensive local involvement and congressional oversight. FEMA has incorporated the CRFPA and its provisions (including the prepared floodway boundaries) in the NFIP. For a community to join or to continue to participate in the NFIP, the local regulations must incorporate the adoption of the Colorado River Floodway. Local zoning regulations are the enforcing criteria regarding development in the floodway fringe (i.e., over bank areas that are wetted during a flooding event at the specified level). No development is allowed in the floodway. The act calls for future 5-year reviews of the floodway (Floodway Map in Appendix R). Development of the floodway map was based on river modeling programs and river cross sections to determine where the boundaries for a 40,000 cfs flow or a 100-year event, whichever is greater, would be located.

There are 114 miles of levee in place, which occupy approximately 1,589 acres from Davis Dam to the SIB (Drawings 423-303-2750–2769 in Appendix R). Approximately 161 miles, or 59%, of the riverine LCR has no levees. Approximately 500–10,000 cubic yards of riprap are used each year during normal river flow conditions to repair the levees (Drawing 423-303-2903 in Appendix R). Areas where heavy riprap placement may be required are those portions of the levee system that are adjacent to river meanders. During floods, considerable quantities of replacement riprap may be required to maintain existing protected levees and bankline. Maximum quantities of replacement riprap during major flood events may approach 25 million cubic yards of large rock. The ultimate amount of protective riprap will be determined by the size and duration of a flood. In addition, levee road surfaces are maintained, which involves grading and resurfacing the roads with gravel. Brush along the levee roads is routinely cut back to keep the road surface open for traffic.

Levees upstream of Imperial Dam have been maintained since 1949. Levees in the Yuma, Arizona, area have been maintained since the early 1900s. Levees in the Yuma area were raised, and additional protection added to them during 1983–1985. Maintenance of the levee system is performed annually as needed from Davis Dam to the SIB.

Project design flood flows were used to determine the levee heights and define the inundated portion of the floodplain. The existing dams on the LCR, as well as inflow from tributaries, were considered in these calculations, which produced the project design flood for each reach of the river and its associated estimated discharge rate. The flood estimates used for levee design have a frequency of occurrence greater than once in a 100-year period.

Levee design capacities for each river division are listed in Table 2-31. Reclamation expects to maintain the current estimated levee design capacity at a minimum.

Table 2-31. Levee Design Capacities

Division	Capacity (cubic feet per second)
Mohave below Davis Dam	50,000
Mohave below Piute Wash	70,000
Havasu	No levee
Parker	50,000
Palo Verde	75,000
Cibola	80,000
Imperial	80,000
Laguna	No levee
Yuma above Gila River	103,500
Yuma below Gila River	140,000
Limitrophe	140,000

Desilting Basins

Three established settling basins on the LCR facilitate the collection of sediment as it is transported downstream. The three established settling basins are Laguna, Imperial, and Topock. A settling basin is a relatively wide area in the river channel where the flow of water slows to allow sediment to fall out of the flowing water and deposit on the channel bottom. This deposition of sediment protects inlet and outlet structures at the dams from sediment inundation and generally improves flow hydraulics in the river.

Settling basins must occasionally be dredged to maintain capacity and effectiveness. Historical quantities of sediment dredged and removed from these settling basins ranges from 100,000 to 8 million cubic yards of material. The amount of sediment that is deposited in the settling basin depends on flow conditions, flood events, side wash inflows, regulated flood control releases, and duration of intervals between sediment removal maintenance operations at each facility. The physical parameters of the settling basins are listed in Table 2-32.

Table 2-32. Existing Settling Basin Dimensions and Estimated Volume

Name	Length (feet)	Width (feet)	Depth (feet)	Surface (acres)	Volume (million cubic yards)	Disposal Site (acres)
Laguna	5,000	500	25	60	3.0	1,500[a, b]
Imperial	3,200	(var.) 500	25	62	2	1,500[b]
Topock	29,040	500	25	333	8	400

[a] Adjacent to settling basin and Laguna yard (Drawing 423-303-2905).

[b] The same 1,500 acres used for both Laguna and Imperial Settling Basins.

Laguna Settling Basin

In the 1940s and 1950s large sediment return flows from the AAC desilting works to the California Sluice Way located downstream of Imperial Dam caused the channel to fill in along the Laguna, Yuma, and Limitrophe Divisions. In addition, Mexico expressed concern about the amount of sediment carried through Morelos Diversion Dam, caused by the accumulation and transportation of sediment below Laguna Dam. As a result of these problems, Laguna Settling Basin and connecting channels were dredged in the Laguna Division between Imperial Dam and Laguna Dam in the late 1960s to intercept the incoming sediment and store it until it could be dredged out for disposal on upland sites.

To handle the sediment inflow to the Laguna Division, a 12-inch hydraulic suction cutter head-type dredge, the “Gila,” was acquired in 1963 and used to construct a settling basin 450 feet wide, 3,000 feet long, and 24 feet deep in the swamp area between the two dams. An inlet channel was constructed from the California Sluice Way to the settling basin and an outlet channel was constructed from the settling basin to the Laguna Diversion Pool.

The Laguna Settling Basin is located at RM 43.2 (Drawing 423-303-2905 in Appendix R). Construction was accomplished in 1963–1965. The Laguna Settling Basin was extended about 1,000 feet south in 1989 to make up for lost capacity caused by the

1983 and 1984 Colorado River floods. The basin was extended by another 1,000 feet in 2004 to improve its efficiency in removing sediment. Reclamation estimates the Laguna Settling Basin will require dredging once every 3–5 years and will involve the removal of 1–2 million cubic yards of material for disposal in the designated Laguna disposal site. The Laguna Settling Basin was extended 1,000 feet to the south in fiscal year (FY) 2004 under compliance separate from the LCR MSCP.

Imperial Settling Basin

The reservoir, which is not designed for regulatory water storage, behind Imperial Dam traps sediment being carried by Colorado River flows arriving at Imperial Dam and can be referred to as the Imperial Settling Basin. This basin is located at RM 49.2 (Drawing 423-303-2905 in Appendix R). The sediment deposited in the reservoir upstream of Imperial Dam is removed from approximately the same locations each time the reservoir is dredged. The sediment may then be discharged into the California Sluice Way where sudden large water releases sluice the sediment to the Laguna Settling Basin downstream. There the material is removed again by a hydraulic suction cutter head-type dredge and transported to adjacent upland disposal sites by pipeline. At times, the dredged material may be transported by pipeline through a series of booster pumps from the Imperial Settling Basin directly to the upland disposal sites surrounding the Laguna Settling Basin. To facilitate diversions to the AAC and Gila Gravity Main Canal, sediment must be removed, when needed, from the basin by dredging. The frequency may be once every 3–5 years but may be earlier with consecutive flood- and/or storm-related flows. Dredging above Imperial Dam normally lasts for 6–8 months.

Topock Settling Basin

The Topock Settling Basin is located at RM 240 (Drawing 423-303-2907 in Appendix R). It was constructed in the 1950s to trap and remove sediment before it reached Topock Gorge, thus preventing the buildup of sediment in the river channel, which had caused flooding in the past in the area of Needles, California. A hydraulic suction cutter head-type dredge is used to remove material from the basin and discharge the material through a pipeline to adjacent upland disposal sites. Normally, dredging is performed in the Topock Settling Basin approximately every 10–20 years, and a typical dredging activity lasts 12–24 months.

Jetties and Training Structures

Jetties and training structures have been constructed along the LCR to protect particular areas of banklines and levees from erosion. Reclamation has constructed and maintains 102 jetties and 28 training structures (Drawings 423-303-2750–2769 in Appendix R). These structures also protect lands adjacent to the river from floods. Historically, these structures have been constructed with various sizes of rock. They have been constructed and maintained in all reaches of the river. Tables 2-33 and 2-34 describe these features. After construction, sand tends to fill in behind the structure, creating sand bars along the jetties and small backwaters behind the training structures.

Table 2-33. Existing Jetties

Maintenance Division	Number of Jetties	Total Length of Jetties (feet)	Total Acres of Jetties (approximate)
Mohave Valley	76	8,382	15.4
Parker	7	1,563	2.9
Palo Verde	2	697	1.3
Cibola	12	2,087	3.8
Yuma	2	300	0.56
Limitrophe	3	80	0.50
Total	**102**	**13,109**	**24.46**

Table 2-34. Existing Training Structures

Maintenance Division	Number of Structures	Total Length (feet) of Structures	Total Acres of Structures (approximate)
Mohave Valley	4	20,704	38.1
Parker	13	12,498	23.9
Palo Verde	3	4,764	8.7
Cibola	3	3,133	5.8
Yuma	2	8,000	14.7
Limitrophe	0	0	0
Total	**25**	**49,099**	**91.2**

Reclamation is responsible for the maintenance of jetties and training structures in the LCR. Maintenance activities consist of placing additional riprap at damaged areas and removing sediment affecting the performance of the structures or the backwaters behind the structures (Drawing 423-303-2902 in Appendix R). Sediment removal helps maintain the associated fish and wildlife benefits in the backwaters created by the structures; the continuous build up of sediment can physically change backwaters from aquatic to marsh and eventually terrestrial habitat. The typical jetty is approximately 150 feet long and 80–180 feet wide at the base and occupies approximately 0.3–0.6 acre. Training structures are typically 2,800 feet long and 80 feet wide and occupies approximately 5.2–11.6 acres.

Jetties, when used appropriately, can generally be constructed for less cost than riprapping eroding bankline. They are also hydraulically efficient and often less costly to maintain than riprapped bankline. Construction of jetties can also be done with less impact to aquatic and riparian habitat. However, if misplaced, jetties can kick river flows over to the opposite bankline, which often results in erosion of the bankline.

Maintenance activities associated with the jetties and training structures include repair of damaged areas to prevent erosion. During periods of high flows, considerable damage can result, necessitating immediate replacement of the eroded materials with riprap. Rock for riprap is obtained from nearby stockpile sites and hauled to the eroding area by truck. The repair is made by using land-based equipment. Continuous repairs may be needed during a normal year, requiring approximately 1–15 tons per linear foot of rock deposited to a width of approximately 10 feet horizontally. It is estimated that approximately 500–10,000 cubic yards of riprap is needed on an annual basis during routine maintenance activities. During flood events, the amount of riprap required for structure protection increases dramatically and could range from 150,000 to 500,000 cubic yards per year or more.

Vegetation growing on jetties or training structures is generally left undisturbed. Vegetation will be removed only if it will impact access to the structure. Small quantities are removed for access purposes each year.

Stockpiles

Rock is hauled from quarries to stockpile sites by truck on approximately 380 miles of roads. There are currently 56 stockpile sites within the historical floodplain that require replenishment every 1–15 years. Table 2-35 lists the stockpile sites along the LCR. The locations of many stockpiles are shown in Drawings 423-303-2750–2769 in Appendix R. These stockpile sites total approximately 818 acres of area along the river.

Table 2-35. Existing Stockpile Sites by Division and Haul Roads, with Associated Bankline and Levee Roads

Feature	Length (miles)	Acres	Number of Sites
Roads	380	46	Not applicable
Mohave Valley	Not applicable	220	16
Topock Gorge	Not applicable	0	0
Havasu	Not applicable	0	0
Parker	Not applicable	61	8
Palo Verde	Not applicable	148	8
Cibola	Not applicable	224	11
Imperial	Not applicable	0	0
Laguna	Not applicable	26	1
Yuma	Not applicable	85	5
Limitrophe	Not applicable	19	3
Gila River	Not applicable	35	4
Totals	**380 miles of roads**	**864**	**56**

Riprap Placement and Haul Roads

Rock to be used for riprap to protect banklines, river structures, or levees is normally hauled from stockpiles strategically placed to allow easy access and reduce haul distances to areas that may require maintenance or protection in the future. Riprap for the stockpiles is hauled from quarries located nearby. Access roads are watered during riprap-hauling operations to minimize dust.

Reclamation maintains several roads to allow hauling of rock to or from stockpiles. Existing roads are used to the extent possible to allow access to new stockpiles. Maintenance activities include trimming brush lining the roadway, grading and graveling road surfaces, and watering road surfaces to minimize dust in the air.

Riprap placement for river maintenance is accomplished by using large trucks and heavy equipment, such as bulldozers or front end loaders. Riprap is normally placed by dumping the rock over the edge of the river bankline or facility that is eroding. In areas where extensive damage is occurring to a river control structure, bankline, or levee, the riprap may be dumped directly in the damaged or threatened section. Historically, approximately 90,000 cubic yards of riprap have been used on an annual basis to maintain training structures, levees, and banklines. Up to 20,000 cubic yards of gravel for road surfaces is applied each year (Drawings 423-303-2902 and 2903 in Appendix R). During flood events, surplus or space-building releases, or other conditions that change either the channel configuration or river flow rates, the amount of riprap used for maintenance of river facilities could be considerably higher.

2.2.3.2 Major Federal Facilities and Miscellaneous Operation, Maintenance, and Replacement

Numerous features have been constructed in the LCR floodplain. These features include, for example, the DPOCs, the Yuma Mesa Conduit, the MOD, the MODE, the US Bypass Drain, Yuma area drainage wells located in the South Gila Valley and the Yuma Valley irrigation facilities located in the Reservation Division, the South and North Gila Valleys, and the Yuma Valley, the Araz Drain, the Reservation Main Drain, North Gila Irrigation and Drainage District drains and wasteways, Yuma County Water Users' Association drains and wasteways, weirs, siphons, boat ramps, California Wasteway, and numerous cable way gauges, survey markers, and other related monitoring and measuring structures and devices. Table 2-36 lists specific features and their location on the river. The nature of maintenance activities for these features depends on the feature's characteristics and functions.

For example, Reclamation administers contracts for the OM&R of certain Federal facilities (title held by the United States). Some major Federal diversion and power generation facilities on the LCR include the CAP at Lake Havasu, Palo Verde Diversion Dam, Imperial, Laguna, and Senator Wash Dams, the Senator Wash Pumping Plant, the Siphon Drop Powerplant, and irrigation and drainage facilities located in the Yuma Valley, the South Gila Valley, the North Gila Valley, and the Reservation Division. Maintenance activities may include road maintenance, structural and mechanical repairs, lubrication and cleaning of equipment, painting of facilities, and weed control. Typically,

Table 2-36. Major River Features Requiring Maintenance

Feature	River Mile	Feature	River Mile	Feature	River Mile
Hoover Dam—F	342.1	Outlet to Riveria Backwater—F	C119.8	Inlet to Mittry Lake Canal—FD	A49.3
Hoover Powerplant—F	342.1	Outlet of A-7 Backwater—F	A118.7	Inlet to Mittry Lake—F	A47.9
Hoover Dam Gaging Station—F	342.2	Inlet to C-5 Backwater—F	C118.2	Inlet to Laguna Settling Basin—F	C47.4
Davis Dam—F	277.7	Outlet of C-5 Backwater—F	C117.4	Outlet of Laguna Settling Basin—F	C45.5
Davis Powerplant—F	277.7	Inlet to A-10 Backwater—F	A115.1	Laguna Settling Basin Weir—F	C44.4
Davis Dam Boat Launch—F	N277.5	Inlet to C-8 Backwater—F	C114.4	Outlet of Mittry Lake—F	A43.3
Davis Dam Gaging Station—F	275.1	Outlet of C-8 Backwater—F	C113.7	Laguna Dam—FD	A43.2
Big Bend Gaging Station—F	264.6	Outlet of A-10 Backwater—F	A113.6	Laguna Reservoir—F	A43.2
Inlet to Topock Marsh—F	246	Inlet to C-10 Backwater—F	C109.9	Laguna Gaging Station—F	41.7
Needles Desilting Basin—F	244–235	Outlet of C-10 Backwater—F	C109.2	North Gila Drains, Wasteways and Irrigation fac.—FD	40.0–34.0
Inlet to Needles Yard—F	C244.3	Taylor Ferry Gaging Station—F	106.6	Bruce Church Boat Launch—FD	A37.3
Needles Gaging Station—F	243.6	Inlet to Old Cibola Yard—F	C104.0	Outlet of DPOC No. 1	A34.2
Outlet of Topock South Dike—F	A234.6	Oxbow Inlet—F	C102.0	MODE I—F	A34.2
Topock Gaging Station—F	230.9	Oxbow Outlet and Boat Ramp—F	C99.8	Outlet of 4E Drain—F	A33.2
Central Arizona Project Diversion Facility—PF	A194.0	Walter's Camp Channel—F	C88.3	Inlet to Prison Hill Siphon—F	A30.6
Parker Dam—F	192.3	Cibola Gaging Station—F	87.2	Outlet of Prison Hill Siphon—F	A30.1
Parker Powerplant—F	192.3	Inlet to Ferguson Lake—F	C57.6	Reservation Drains, irrigation facilities and California Wasteway—FD	C-29, C30
Parker Gaging Station—F	191.8	Face Lake—F	A56.4	12th Avenue Check Structure—F	A29.5
Levee System Parker to Cibola	192-80	Inlet to Fisher's Landing—F	A56.4	Yuma Gaging Station—F	28.7

Feature	River Mile	Feature	River Mile	Feature	River Mile
Inlet to No Name Lake—F	A155.7	Fence Lake—PF	A56.0	Outlet of Yuma Mesa Conduit—F	A28.0
Outlet of No Name Lake—F	A154.4	Inlet to Martinez Lake—F	A56.0	Araz Drain—FD	C25.6
Water Wheel Gaging Station—F	151.9	Entrance to California Channel—F	C54.0	MOD-F	From A35 Eastward
Inlet to West Channel—F	C146.5	Entrance to Crappie's Hole—F	C53.5	MODE–F	A22-A35
North Inlet to East Channel—F	C145.6	Senator Wash Drain—FD	C51.2	MODE II Discharge—F	A23.9
Outlet of East Channel (Aha Quin)—PF	C144.5	Inlet to Senator Wash—FD	C51.2	MODE II Boat Ramp—F	A23.7
South Inlet to East Channel (Aha Quin)—PF	C144.5	Senator Wash Dam and Dikes—FD	C51.2	NIB Gaging Station and Rockwood weir—F	A23.1
Outlet of West Channel (Aha Quin)—PF	C143.4	Senator Wash Pumping Plant—FD	C51.2	Siphon Drop Powerplant—FD	Discharge to Yuma Main Canal upstream of C-29
Palo Verde Diversion Dam—FD	133.8	Middle Pond Senator Wash—FD	C51.2	MODE III Discharge—F	A22.0
Palo Verde Gaging Station—FD	133.7	Backwaters upstream of Imperial Dam	49-52	U.S. Bypass Drain—F	A22.0–0
Inlet to Riveria Recreation Vehicle Park—PF	C121.2	Imperial Reservoir Desitling Basin	49-50	Yuma Area Levee System	0.0-43 and A35 Eastward along Gila River
Inlet to A-7 Backwater—F	C120.6	Imperial Dam—FD	C50.2	South Gila DPOC's and drainage wells—F, South Gila Irrigation Facilities—FD	A34-A36
Inlet to Riveria Backwater—PF	C120.2	Imperial Dam Gaging Station—F	C49.5	Yum Valley Drainage wells and drainage and irrigation facilities—FD	A0-A29

Notes:

F = federally operated and maintained facility.

FD = federal facilities that are operated and maintained by an irrigation district or other nonfederal entity.

MODE = Main Outlet Drain Extension.

PF = nonfederal facilities maintained by federal entities on a cost share basis. See text for typical maintenance performed at these facilities. See also nonfederal covered action descriptions with respect to FD facilities.

Reclamation oversees the OM&R of these facilities by reviewing maintenance plans and budgets, performing periodic inspections, and inspecting maintenance activities performed by the district operator. In exigent circumstances, Reclamation is authorized to perform any necessary repairs at district expense.

Additionally, there are four DPOCs that total approximately 14 miles in length (70 feet wide) and occupy approximately 122 acres. Drains and siphons total 5,500 feet (60 feet wide) and 7.5 acres. Generally, new vegetation along the drains and at the siphon inlets and outlets is removed annually to protect the integrity of the facility. The Yuma Mesa Conduit in the Yuma Valley is about 7.5 miles long (about 50 feet wide) and totals approximately 4.5 acres. Periodic maintenance of the outlet of the conduit is normally performed about every 5 years to remove brush and add rock to stabilize the banklines by the outlet structure. There are five boat ramps totaling approximately 3.5 acres. New vegetation growing on boat ramps is generally removed each year, and old vegetation is trimmed back every 1–2 years. There are 42 backwater inlets and outlets (most are for flows from the river, some are for marina access also) with a total maintenance area of approximately 40 acres. Maintenance of these backwaters is done periodically based on need and availability of cost sharing funds. At times, line-of-sight survey transects are needed, which can be 5,280 feet long and 5 feet wide and cover 0.6 acre at any one time. Minor brush clearing for line-of-sight surveys occurs about 50 times a year. The brush is normally not destroyed but is cut back or crushed, to allow line-of-sight vision, and left to grow. Approximately 1–2 miles of brush at a width of about 5–10 feet may be cleared for line-of-sight surveys each year.

There are 15 major gauging stations along the river. They must be maintained to facilitate river operations and data collection essential to understanding current river conditions and maintaining current and accurate databases. Each gauging station has a maintenance radius of 5–10 feet around cable support towers. Maintenance functions include clearing of vegetation around the facilities and along access roads, re-establishment of benchmarks, removal of sediment deposited near and around the facility, replacement or repair of the facility, placement or replacement of riprap, re-contouring of gradients, grading and graveling of access roads, and other facility-related actions, such as painting or replacement of metal works or cable. In general, some removal of new vegetation growth around each gauging station and along access roads is performed each year. Some cutting back of old vegetation may be required to maintain access to the facilities. Other maintenance activities are performed periodically as needed.

Survey markers are usually maintained as needed. This work consists mostly of clearing brush within a 10-foot radius of the markers to maintain access to them. This work is conducted about every 2–3 years for the most-used survey markers.

Weirs may be made of steel, concrete, or rock. They are normally used to either improve flow measurements at gauging stations or to create backwaters where sediment control may be needed. Weir maintenance is done on an as-needed basis and may include replacement of rock or repair or replacement of steel or concrete. Brush removal around the ends of the weirs is normally performed to allow access to them. Brush removal is normally performed every 1–2 years.

Specific types of maintenance activities for miscellaneous facilities include clearing brush (normally new saltcedar or phragmites), cleaning canals or drains, grading and graveling access roads and boat ramps, removing sediment from backwater inlets and outlets, and repairing structures, including replacement or repair of concrete or metal works and or painting of metal works. Most of the work is done periodically as needed, but clearing of brush is generally done annually.

Reclamation and the USGS install flow measurement sites as needed to meet the reporting requirements defined by Article V of Decree. The reporting requirements defined by Article V of that Decree require the quantification and reporting of all diversions from and return flows to the LCR.

Reclamation operates and maintains drainage wells located in the Yuma Valley, the South Gila Valley, and on the Yuma Mesa. Ongoing operations are done principally to maintain acceptable groundwater levels in the Yuma area and to provide return flow credits to the State of Arizona. Typically, maintenance activities include blading access roads to the wells, weed control around the wells and along the access roads, and repairs to or replacement of pumps or wells. Painting of structures and above ground piping is an ongoing yearly project. Reclamation specifically operates and maintains about 60 drainage wells. Other agencies operate and maintain about 24 additional drainage wells owned by Reclamation. The Yuma County Water Users' Association owns and maintains about 6 drainage wells, whose operation is coordinated with Reclamation's drainage well operations. See Appendix J for additional information about drainage facilities.

Under the direction of the Yuma Area Water Resource Management Group (YAWRMG), a project to achieve better control of groundwater levels in the Yuma area (specifically the Yuma Valley) has been implemented. The project includes upgrading existing drainage wells, installation of new drainage wells, operation of existing drainage wells for a larger portion of the year and installation of additional groundwater monitoring wells parallel to and within the Limitrophe division. Drainage pumping has been increased by approximately 12,000 afy and may be increased up to 23,000 afy beginning in 2005 to achieve acceptable groundwater levels in the Yuma Valley. A Categorical Exclusion covered environmental compliance for the construction and operation of this project. Maintenance of these wells is included in the LCR MSCP.

Maintenance Activities at the Southerly International Boundary

Reclamation maintains the 242 Well Field and Lateral, which is located in the Five-Mile Zone near the SIB. Maintenance activities include weed control, cleaning the lateral, grading and graveling access roads, repairing motors and pumps, repairing or replacing fence, repairing electrical equipment, and painting pipelines, motors, and buildings.

Reclamation constructed a diversion canal from the Boundary Pumping Plant in the Yuma Valley west to the Bypass Drain in 2002. The terminus of this canal will include a bifurcation structure that will allow the diverted Yuma Valley drainage water to be discharged into either the Bypass Drain or the Colorado River channel. This channel is approximately 3 miles long and covers approximately 15 acres.

Highly saline flows arriving at the Boundary Pumping Plant can be discharged to the diversion canal by Reclamation when salinity levels in the water to be delivered to

Mexico at the SIB are too high. Flows in excess of the capacity of Mexico's Sanchez Mejorada Canal can also be diverted to this canal to prevent localized flooding. Future maintenance activities will include grading and graveling access roads, cleaning the diversion canal, replacing or repairing concrete, controlling weeds, repairing electrical equipment, and repairing, replacing, and/or painting metal works. Normal maintenance will not affect areas that have not been previously disturbed and will include control of new vegetation and repair of facilities, which will not affect the environment. Compliance for construction of these facilities has been completed and the maintenance work is included here to cover future operation and maintenance of these facilities. A map of these areas is included in Appendix R.

In addition, the Yuma County Water Users' Association will continue to perform maintenance on its canals, drains, wells, access roads, and bridges in the Yuma Valley, as it has done in the past. This work includes blading and grading roads, cleaning banklines and drain inverts, repairing lining and concrete structures, painting facilities, and repairing electrical equipment. Other water districts in the Yuma area in the floodplain will be performing similar maintenance work on their facilities.

2.2.3.3 Backwater Maintenance

Reclamation's OM&R program along the historical floodplain includes the maintenance of backwater areas created by various features associated with river management (Appendix R). Some of these backwater areas were formed when they were cut off from the main channel-by-channel relocation, training structures, jetties, or related features. Others were created to satisfy a mitigation commitment to enhance resource values by constructing these structures. Other backwaters exist as a natural part of the river ecosystem. The number of backwaters for which Reclamation has a maintenance and/or mitigation responsibility as a result of channel improvement actions is listed by divisions in Table 2-37. The backwaters listed by division in Table 2-37 include backwaters for which Reclamation has no responsibility for mitigation, backwaters for which Reclamation has some maintenance responsibilities, and backwaters that have been or are planned to be improved (with cost sharing) in the future. Complete descriptions of all the backwaters for which Reclamation has maintenance/mitigation responsibility are provided in the report titled *Colorado River Backwater Summary 1999, Volumes 1 and 2* and subsequent revisions, copies of which are maintained by Reclamation's Yuma Area Office or Lower Colorado Regional Office. Backwater maintenance is discussed below for each maintenance division.

Table 2-37. Backwaters for which the Bureau of Reclamation has Mitigation and Maintenance Commitments

Division	Total Backwaters	Mitigation Commitment	Maintenance Commitment
Mohave Division	36	0	3
Topock Gorge and Havasu Division	100+	0	0
Parker Division	40	15	16
Palo Verde Division	28	6	7
Cibola Division	19	4	1
Imperial Division	181	0	32
Laguna Division	7+	1	1
Yuma Division	13+	3	3
Limitrophe Division	3+	2	2
Total	**427+**	**31**	**65**

Typically, backwaters subject to fluctuating water levels and sediment deposition decrease in surface area and depth over time. Without proper maintenance, after long periods of time or major flooding events, backwaters can become silted in, colonized by vegetation, and decline in value as an aquatic system. The longevity of a given backwater is expected to be approximately 20 years, depending on the frequency of large flood events. Sedimentation and the vegetation it supports can cut backwaters off from the river, thereby restricting incidents of water circulation and exchange by river flows. Permeable structures and culverts used to allow water to enter or leave a backwater are beneficial, but they require periodic maintenance to ensure they are working properly. Reclamation has a program to review these structures annually. Facilities found to be in need of work are noted, and required work is scheduled for implementation in the near future.

Backwater maintenance includes dredging. Historically, the amount of material dredged from each backwater varied from approximately 100,000 to 500,000 cubic yards after a flood event. It takes 6 months to 1 year to dredge a backwater; for the purpose of the LCR MSCP BA, Reclamation expects to dredge up to three backwaters each year. Material removed from the backwaters is normally placed in upland disposal sites adjacent to or near the backwater, where disposal would cause the least possible environmental impacts. Where allowed, sediment has also been discharged back into the main river channel. Permits to discharge sediment back into the river must be obtained from the appropriate Arizona and California agencies.

Mohave Division

The Mohave Division is located on the reach of the Colorado River from Davis Dam to Topock, Arizona. There are no backwater areas in the Mohave Division for which Reclamation has a continuing mitigation responsibility, but there are three backwaters in which Reclamation has some degree of maintenance responsibility, such as inlet channels. Beal Slough, south of Needles, California, was mitigation for work in the Mohave Division and was dredged in the late 1970s. It is managed by the BLM and the California Department of Fish and Game (CDFG).

Laughlin Lagoon was created in 1969 as a result of the construction of a training structure at the Big Bend area of the Colorado River, a few miles south of Laughlin, Nevada. The structure was placed at this location to avoid changing the channel in the vicinity of the Big Bend any more than was absolutely necessary to obtain river and bank stabilization. Once the training structure was completed, the lagoon formed behind the structure. The Colorado River flood of 1983 caused sediment to be deposited in the Lagoon and deepened the river channel by the lagoon, causing the water remaining in the Lagoon to become shallow. Reclamation has no future requirements to maintain Laughlin Lagoon. However, Reclamation will continue to maintain the installed training structure and culverts for the purpose of supplying fresh water to the lagoon. Reclamation has no further obligation to perform maintenance in the lagoon itself.

The USFWS has the responsibility for the OM&R of Topock Marsh. However, Reclamation maintains the inflow and outflow structures, the outlet dike, and inflow and outflow channels for Topock Marsh. When necessary, maintenance consists of repairing or replacing structures, grading of the road over the outlet dike, some weed control, and cleaning of the inlet and outlet channels with a hydraulic suction cutter head-type dredge or other equipment that can accomplish the same end. Dredging work at Topock is performed approximately every 10–20 years, while some of the other minor maintenance work is performed annually. Table 2-38 below shows backwater mitigation and maintenance responsibilities in the Mohave Division.

Table 2-38. Backwater and Structure Maintenance Commitments—Mohave Division

Backwater or Structure	River Mile	Year Completed	Last Maintained	Mitigation/Maintenance Commitment
Laughlin Lagoon	N268.9–267.65	1969	2000	Bureau of Reclamation (Reclamation) maintains training structure, culverts, and circulation channel
Boy Scout Camp	N266.3	1969	1991 training structure	Reclamation maintains training structure
Unnamed	A263.1–261.6	1969	1989 bankline	Reclamation maintains bankline
Fort Mohave	A261.5	1960	1995 bankline	Reclamation maintains bankline
Potholes	C251.8	1960	1995 bankline	Reclamation maintains bankline
Needles Lagoon	C246.4	1964	1989 bankline	Reclamation maintains bankline; City of Needles maintains backwater
Needles Marina	C245.7	1960	1989 training structure	Reclamation maintains training structure; City of Needles maintains backwater and entrance
Jack Smith City Park	C244.5	1951	1989 training structure	Reclamation maintains training structure; City of Needles maintains backwater
Topock Marsh	A244.4–A234.6	1951	1988 outlet works	U.S. Fish and Wildlife Service maintains inlet outside the levee; Reclamation maintains banklines, jetties, south dike structure, and outlet channel; Bureau of Sport Fisheries and Wildlife maintains backwater
Icehouse Bay	C240.6	1961	1991 training structure	Reclamation maintains training structure; no responsibility for backwater
Beal Slough	C238.3–C 237.8	1951	1996 training structure Scheduled for work again in 2001	Reclamation maintains training structure and inlet and outlet channels; California Department of Fish and Game and Bureau of Land Management maintain backwater.
Park Moabi and County Park	C236.1–234.9	1951	1996 training structure and backwater	Reclamation maintains training structure; San Bernardino County Department of Parks and Recreation maintains backwater

Parker Division

The Parker Division begins at Headgate Rock Dam and extends down the river for approximately 33 miles to the Palo Verde Diversion Dam. Reclamation backwater mitigation responsibilities for this division are summarized in Table 2-39. No Name Lake and Aha Quin are mitigation for the Parker II Channel Modification Project and are located south of Parker, Arizona, and north of Blythe, California. Ahakhav is located below Parker, Arizona, and is part of the Deer Island Complex, which is also mitigation for the Parker II Channel Modification project, as well as the referenced unnamed backwaters.

Table 2-39. Backwater and Structure Maintenance or Mitigation Commitments—Parker Division

Backwater or Structure	River Mile	Year Completed	Last Maintained	Mitigation/Maintenance Commitment
Ahakhav	A172.8	1966	1999	Training structure completed in 1966; backwater restored in 1999; Colorado River Indian Tribes responsible for backwater
Deer Island and adjacent backwaters (100 acres)	A171.90–160.5	1966	1986	Completed in 1967; Bureau of Reclamation (Reclamation) maintains training structure and backwater
Backwaters	A169.1, A168.8, A168.1, A167.4, C167.1, A166.6, C166.5	1966	Not applicable	Reclamation maintains the training structure and backwater for each site
Unnamed backwater at training structure	A159.65–159.6	1995	1995	Reclamation maintains training structure; maintenance requirements for backwater to be developed by special subcommittee on the backwaters (Colorado River Management Work Group)
Unnamed backwater at training structure	C157.6–157.4	1995	1995	Reclamation maintains training structure and backwater
No Name Lake	A155.6–154.4	1995	1996	Reclamation maintains training structure and backwater
Unnamed backwater at training structure	A145.2–144.75	1993	1993	Reclamation maintains training structure and backwater
Aha Quin	C143.6–143.3	1992	2000	Reclamation maintains training structure and East/West Channel; when Desert Trust completes housing development, it will have operation and maintenance of the West Channel
Rancho Not So Grande	C140.8–140.0	1992	1995	Reclamation maintains banklines and marsh
Unnamed training structure	A138.15–137.85	1992	1992	Reclamation maintains training structure and backwater

Palo Verde Division

The Palo Verde Division, with six principal backwaters, includes approximately 28 miles of river channel between Palo Verde Diversion Dam and Taylor's Ferry. A-7, A-10, C-5, C-8, and C-10 backwaters are maintained as mitigation for the Palo Verde Division Channelization Project (Table 2-40). Schwendt Slough is located south of Ehrenberg, Arizona, and is maintained for the enhancement of fish and wildlife habitat.

Table 2-40. Backwater and Structure Mitigation or Maintenance Commitments—Palo Verde Division

Backwater or Structure	River Mile	Year Completed	Last Maintained	Mitigation/Maintenance Commitment
A-7	A120.6–118.7	1964	1993	Completed in 1969, Bureau of Reclamation (Reclamation) maintains training structure and backwaters
C-5	C118.85–117.4	1964	1992	Completed 1970; same as above
A-10	A115.1–113.7	1964	1994	Completed 1970; same as above
C-8	C114.4–113.8	1964	1997	Completed 1972; same as above
C-10	C110.6–109.2	1964	1994	Completed 1970; same as above
Schwendt Slough	A108	1989	1989	Reclamation to restore the backwater to enhance fish and wildlife habitat; operation and maintenance responsibility to be determined

Cibola Division

The Cibola Division has four mitigation backwaters and adjoins the Palo Verde Division at Taylor's Ferry, extending downstream approximately 24 miles to Adobe Ruin at the lower end of Cibola Valley (Table 2-41). The Palo Verde Oxbow is mitigation for the Cibola Division Channelization Project. Cibola Lake is located adjacent to the Colorado River in Yuma County, Arizona, about 30 miles south of Blythe, California. The lake lies within the Cibola NWR and is approximately 2 miles long, less than 1 mile wide, and maintained as mitigation for channel improvement in the Cibola and Palo Verde Divisions. Three Fingers Lake is located at the lower end of the Cibola Division and on the west side of Cibola NWR. When originally created, it contained 102 acres of surface waters; however, it reduced to approximately 20 acres. Approximately 120 acres of channels and shallow backwater areas and one 20-acre native fish–rearing pond were created by dredging in 1995, thereby satisfying Reclamation's mitigation commitments. Future maintenance of Three Fingers Lake is the sole responsibility of the USFWS.

Walter's Camp is approximately 27 miles south of Blythe, California. The backwater in this area was created by a channel relocation project back in the 1950s. The 1983 flood deposited sediment in the old river channel (backwater). Subsequently, in the late 1990s, Reclamation dredged the Old River Channel to reopen this backwater. Reclamation has no mitigation responsibilities for this backwater and does not anticipate doing any further dredging in this area, unless it is subsequently part of an LCR MSCP conservation area.

Table 2-41. Backwater and Structure Mitigation or Maintenance Commitments—Cibola Division

Backwater or Structure	River Mile	Year Completed	Last Maintained	Mitigation Commitment
Palo Verde Oxbow Lake	C101.0	1966	1997	Bureau of Reclamation (Reclamation) performed work in 1970 and 1997 on bankline and inlet and outlet channels; California Department of Fish and Game has operation and maintenance (OM&R) responsibility for backwater
Cibola Lake	A90.0	1970	1990	Reclamation does not have responsibility for OM&R on Cibola Lake; U.S. Fish and Wildlife Service (USFWS) has OM&R responsibility for backwater
Three Fingers Lake	C89.3	2000	1995	Reclamation performed work 1995–2000; USFWS has OM&R responsibility for backwater
Walter's Camp	C88.3	1969	1998	Reclamation performed work in 1969, 1974, 1987, 1997 and 1998; Palo Verde Irrigation District and private land owners have OM&R responsibility for backwater.

Imperial Division

The Imperial Division extends 36 miles from Adobe Ruin at the lower end of Cibola Valley to Imperial Dam. This division includes the Imperial Dam, the diversion works for the AAC and Gila Gravity Canal, the AAC desilting works, and the Laguna Settling Basin. This division has only one small armored bankline at the new Martinez Lake backwater inlet, and Reclamation has responsibility for the Arizona and California Channels (Table 2-42).

Table 2-42. Backwater Mitigation Commitment—Imperial Division

Backwater	River Mile	Year Completed	Last Maintained	Mitigation Commitment
Martinez Lake Backwater inlet	A60.05	2001	NA	Bureau of Reclamation (Reclamation) maintains bankline and flow through the new channel.
Arizona Channel and backwaters	A55.6–51.4	2002	NA	Reclamation completed all channel work. For the life of the project, 20 years, Reclamation must keep the channels and backwater entrances open. Backwaters must also be maintained.
California Channel and backwater	C57.4–51.0	2003	NA	For the life of the 20–25 year project, Reclamation must keep the channels and backwater entrances open, along with maintaining the backwater.
Draper Lake	C 84			Open inlet and outlet to river
Walker Lake	C 86			Conservation restoration
Adobe lake	A 71–72.5		2003 short term inlet	Inlet and outlet channels to river for freshening flows

Laguna Division

The Laguna Division extends almost 6 miles between the Imperial and Laguna Dams (RM 49.2 to RM 43.2). Early work facilitated the construction and operation of the Laguna Settling Basin and the appurtenant channels leading to and from the basin. These facilities were created by dredging. Dredging in the Laguna Settling Basin occurs approximately every 3 years. The settling basin was dredged in 2002 and 2003, with about 1.7 million cubic yards of material removed. The settling basin was extended in 2004 another 1,000 feet southward. Approximately 810,000 cubic yards of sediment was removed. The division is located between Imperial Dam and Laguna Dam.

The old river channel between the upper end of the Laguna Settling Basin and Laguna Dam includes potential future sites for conservation projects identified for the LCR MSCP Conservation Plan. Restoration (possibly starting in 2005) of the reservoir behind Laguna Dam is described in more detail in Section 2.2.4.2.

The reservoir behind Laguna Dam was dredged on a reoccurring basis of approximately every 10 years until the late 1970s. Since that time, the reservoir has lost much of its storage capacity through the deposition of sediment. It is anticipated that the reservoir area behind Laguna Dam will be restored again through dredging in or after 2005. Between 1 and 5 million cubic yards of material are expected to be removed by dredging from the reservoir area (Section 2.2.4.2). Once restored, the reservoir will be maintained on an as needed basis via dredging about every 10 years.

Mittry Lake (RM A47.9) was a mitigation backwater created in the division in the late 1960s, with a Reclamation mitigation commitment to maintain the control structure (Table 2-43). This backwater will eventually fill in from natural processes over the next 50 years and will need to be restored. The lake was dredged as mitigation for stabilizing the upper end of the Yuma Division. Additionally, dredging was conducted in Mittry Lake in the 1980s as partial mitigation for the Bypass Drain portion of the Title I Salinity Control Project.

Table 2-43. Backwater and Structure Mitigation/Maintenance Commitments—Laguna Division

Backwater or Structure	River Mile	Year Completed	Last Maintained	Mitigation Commitment
Mittry Lake	A47.9–A50.0	1960–1980	Not applicable	Bureau of Reclamation maintains inlet control structure and outlet structure

Yuma Division

Three mitigation backwaters are located in the Yuma Division, which includes 21 miles of river channel between Laguna Dam and Morelos Diversion Dam. The channel reflects changes resulting from construction of storage dams and diversions of water for irrigation purposes upstream. RM 31 and 33 backwaters, located near Yuma, Arizona, are mitigation for two training structures constructed to protect the Reservation Levee at these locations. The RM 33 training structure was completed in 1984, and the RM 33 backwater was restored in 1990. The RM 31 training structure was completed in 1999. The 1993 Gila River flood moved the river channel at RM 33, which impacted the backwater's inlet and outlet. Also, sediment carried by the river entered the backwater, partially refilling the backwater with sediment. Reclamation has dredged the outlet channel and backwaters and lowered the inflow culverts. This facility will require periodic maintenance to maintain flows through the backwater, including the removal of sediment-impeding flows. This periodic maintenance is expected to occur every 10–15 years. (Drawing 423-303-2904 in Appendix R.) Table 2-44 lists the backwater and structure mitigation/maintenance commitments—Yuma Division.

Table 2-44. Backwater and Structure Mitigation/Maintenance Commitments—Yuma Division

Backwater or Structure	River Mile	Year Completed	Last Maintained	Mitigation/Maintenance Commitments
River Mile 31	A31.0	1998	1999	1999, Bureau of Reclamation (Reclamation) maintains training structure and backwater.
River Mile 33	A33.6–32.9	1990	2000	1990 and 2000, Reclamation maintains training structure and backwater as a fish and wildlife area with boat access from the river
Unnamed backwater at jetties	C26.3–26.2	1987	1991	Reclamation maintains backwater and jetties

Limitrophe Division Mitigation Obligations

The Limitrophe Division encompasses an area along the Colorado River from Morelos Diversion Dam to the SIB. Reclamation has a role in the management of Hunter's Hole and two Gila River–associated ponds (Fortuna and Quigley) that are maintained for mitigation of actions in the Limitrophe Division (Table 2-45).

Hunter's Hole consists of a series of interconnected ponds located northwest of San Luis, Arizona. Historically, these ponds were known as Gadsden Lakes, which formed in the early 1950s when the river channel moved. River flows comprised primarily drainage water from the Wellton-Mohawk Division, Gila Project, Arizona. In 1977, these flows were bypassed through a concrete-lined canal to the Cienega de Santa Clara in Mexico with the completion of the Bypass Drain. To mitigate the impacts of the Bypass Drain, Reclamation agreed to maintain Hunter's Hole. The last time Reclamation performed maintenance at Hunter's Hole was just prior to the 1983 Colorado River flood. Due to sedimentation caused by the 1983, 1984, and 1993 floods, the ponds were lost. Through agreements with the Arizona Game and Fish Department (AGFD) all mitigation commitments for the Hunter's Hole Pond Complex were transferred to Quigley Pond in 1987, where Reclamation placed a well. Quigley Pond is located along the Gila River channel in the upper end of the Wellton-Mohawk Irrigation and Drainage District. AGFD has OM&R responsibility for Quigley Pond.

Fortuna Pond, located adjacent to the Gila River near Fortuna Wash, is about 6.7 miles upstream of the Gila River confluence with the Colorado River. Fortuna Pond was created as environmental mitigation for loss of habitat in the Limitrophe channel and

Reclamation has maintenance responsibility for the inlet, outlet, and water supply well for the life of the project.

Studies are being conducted to determine the feasibility of restoring Hunter's Hole in the future, and such restoration may be one of the restoration sites eventually developed and implemented by the LCR MSCP Conservation Plan.

Table 2-45. Backwater and Structure Mitigation or Maintenance Commitments (Past and Present)—Limitrophe Division

Backwater or Structure	River Mile	Year Completed	Last Maintained	Mitigation/ Maintenance Commitment
Fortuna Pond on the Gila River (mitigation for Limitrophe Division work)	Gila	1985	Annually	Bureau of Reclamation (Reclamation) has maintains for life of project as defined in environmental assessment
Hunter's Hole - lower end of the Limitrophe Division	A2.5	1979	Annually	Mitigation responsibility transferred to Quigley Pond in 1987; Reclamation has only maintenance responsibility to provide flows from a siphon to the marsh habitat
Quigley Pond on the Gila River (mitigation for Limitrophe Division work)	Gila	1987	1991	Reclamation has no operation and maintenance (OM&R) responsibility; Arizona Game and Fish Department has OM&R role; Reclamation obligation for Hunter's Hole transferred in 1987

2.2.3.4 Limitrophe Division Maintenance

The Limitrophe Division of the Colorado River extends from the NIB to the SIB. Reclamation's authority in this division is limited to maintaining the bankline road, the levee, various wasteways and drains flowing to the river, and the Bypass Drain that carries agricultural drainage water to the Cienega de Santa Clara in Mexico. By treaty with Mexico, the USIBWC is obligated to maintain the river channel in this division. With the exception of Hunter's Hole, Reclamation has no ongoing backwater maintenance responsibilities in the Limitrophe Division.

The Limitrophe Division has undergone vegetation species composition shifts since the mid-1970s as a result of periodic flood control and space building releases followed by groundwater depletion after the flood flows receded. As a result, during normal hydrologic conditions in the Basin, the Limitrophe Division does not support surface water flows or sustained river flows throughout most of its reach. The vegetation community that is currently present is a reflection of the "wetter" climatic cycle during the past several years, starting around 1979. As the system returns to normal conditions, vegetation community response would shift from the current native riparian habitat to a more sandy community type with invasive saltcedar. The lower-lying depressed areas would, if groundwater conditions are favorable, continue to support isolated wetlands communities within these pocket areas, at a greatly reduced extent.

Control of vegetation growth within the Limitrophe Division is regulated by international treaty. The act of August 10, 1964, Title 22, Section 277d-26, authorized the Secretary of State, acting through the USIBWC, U.S. and Mexico sections, to conclude agreements with Mexico for joint construction, operation, and maintenance of the LCR emergency flood control works. Additionally, Minute No. 291 of the 1944 Water Treaty titled *Improvements to the Conveying Capacity of the International Boundary Segment of the Colorado River*, dated July 16, 1994, pertains to actions required for sediment removal necessary to permit adequate diversion of water by Mexico.

Currently, the USIBWC is preparing the Lower Colorado River Boundary and Capacity Preservation Project Environmental Impact Statement to establish the study area in the river channel from the NIB to the SIB, to restore the river's capacity from Morelos Diversion Dam to the SIB, and to establish long term OM&R activities. USIBWC is not a participant in the LCR MSCP.

2.2.4 Future Non-Flow-Related Actions

2.2.4.1 Topock Marsh

Topock Marsh was created by Reclamation in 1965 as mitigation for a large channelization project near Needles, California. Reclamation built the inlet and outlet works, dikes, and dredged the marsh. The USFWS is responsible for OM&R of the marsh, and Reclamation is responsible for OM&R of the dikes and outlet works. Future restoration and habitat improvement at the marsh may be necessary and would be coordinated between USFWS and Reclamation. The amount of habitat improvement that may be needed has not been determined at this time.

2.2.4.2 Laguna Reservoir

Background

Laguna Dam, located about 12 miles north of Yuma, Arizona, and completed in 1909, was originally built to create a diversion structure for the old Yuma Main Canal and the North Gila Irrigation District, then a part of the Yuma Project. Once the AAC and Gila Main Gravity Canal were completed, water deliveries to the Yuma Project and the North Gila Irrigation District were made from these new canals.

The Laguna Reservoir serves three principal functions: as regulatory water storage, to retain water from sluicing operations at Imperial Dam, and to make deliveries to Mexico in place of deliveries from Imperial Dam when shortages in flows at Imperial Dam occur. When used as a regulating reservoir, which began in the early 1950s, Laguna Reservoir stores excess flows that exceed the storage capacities of Imperial and Senator Wash Reservoirs. The storage of such excess water reduces the potential for overdeliveries to Mexico. Also, if there is a temporary shortage of water arriving at Imperial Dam, it can be mitigated by the release of water from Laguna Reservoir to make up a portion of Mexico's water order being delivered through the AAC, which will make more of the water arriving at Imperial Dam available for the water users in the United States. This action would prevent or reduce a temporary water shortage to irrigation districts.

The second of Laguna Dam's principal uses is to contain sluicing flows used to remove sediment from the California Sluice Way below Imperial Dam. Sluicing flows normally range from about 8,000 to 12,000 cfs for about 20 minutes and discharge a volume of about 300–350 af of water into Laguna Reservoir. This containment prevents over deliveries to Mexico as a result of sluicing activities at Imperial Dam. The storage in Laguna Reservoir also prevents temporary high and potentially dangerous flows from passing below Laguna Dam as a result of sluicing activities performed at Imperial Dam for sediment control. Currently, to conduct a sluice and prevent safety problems downstream, the reservoir must be nearly empty prior to sluicing. With more capacity available, Laguna Reservoir would not have to be completely drained prior to sluicing, and the average water level during the year would remain at a higher level. If the storage capacity in Laguna Reservoir continues to deteriorate, critical sluicing operations for sediment control at Imperial Dam will have to be terminated to prevent dangerously high flows from entering the low-flow channel below Laguna Dam, or the sluicing operations would have to be modified to the point where their effectiveness in moving sediment would be greatly impeded.

Laguna Reservoir's original storage capacity was approximately 1,500 af. Sediment deposition events have reduced the original storage capacity to about 400 af. The reduction in reservoir capacity has been facilitated by sediment deposition during the floods of 1983 and 1984. After the floods of 1983 and 1984, damage done to the settling basin outlet weir reduced the effectiveness of the settling basin in capturing sediment. The Laguna Settling Basin outlet weir was not repaired until the late 1990s.

In the past, sediment dredging in Laguna Reservoir was performed about every 10 years. This process began in the 1940s, shortly after Imperial Dam was constructed and the settling works for the AAC were put into operation. The last time the reservoir was dredged was in the late 1970s.

In summary, the loss of storage capacity in Laguna Reservoir reduces Reclamation's ability to manage river flows arriving at Imperial Dam and safely contain sluicing flows and may cause an increase in over deliveries to Mexico. It also increases the likelihood of a temporary water shortage for local water districts and Mexico, which, in turn, could affect crops by delaying irrigation.

Enhancement and Maintenance

Due to the need to preserve water management flexibility on the LCR, Reclamation proposes to restore the Laguna Reservoir. Over time, the capacity of the Laguna Reservoir has decreased, safety of dam concerns with vegetation growing on and near the dam weir has increased, and operating restrictions were imposed on Senator Wash Dam and Reservoir in 1992, 2000, and 2004.

The existing storage capacity available upstream of Laguna Dam is estimated to be approximately 400 af. Incremental storage capacity of approximately 1,100 af will be created by excavating a large channel placed immediately adjacent to the upstream face of Laguna Dam. The reservoir configurations are laid out and located on the west side of the old river channel and avoid or minimize potential impacts to the marsh and habitat that exists on the east side of the old river channel.

The approximately 2,000,000 cubic yards of material from the excavated areas will be placed on 62 acres of the existing Laguna Silt Disposal Site. The total depth of the excavation will vary depending on the overburden existing at various locations throughout the area to be excavated. The bottom of the new excavated areas is proposed to be at an elevation of about 136 feet and the maximum water depth would be about 15 feet. The range of operating water levels will remain between elevations 142 feet and 151.3 feet. Infrequent periodic maintenance dredging of the reservoir may be required throughout the 50-year term of the LCR MSCP.

The reservoir would be filled by releasing water flowing past Imperial Dam through the California Sluiceway gates. The water would then flow through the dredged California sluiceway channel and Laguna desilting basin and enter the reservoir. The water would fill the excavated channel as a backwater from Laguna Dam northward toward Imperial Dam.

Habitat restoration and enhancement under this project area may be implemented under the LCR MSCP. The project includes a habitat restoration element designed to benefit riparian and aquatic species. The habitat restoration elements of the project could create wetlands and riparian habitat in or parallel to the excavated channel.

2.2.4.3 Bankline Maintenance—Unprotected Banklines

Unprotected bankline is bankline that is not armored or riprapped with rock or protected with a river structure such as a jetty or training structure. Future work to armor or protect such bankline is dependent on observed erosion in areas where loss of property, facilities, or habitat is occurring or could occur. In addition to protecting property, facilities, and habitat, stopping erosion of unprotected bankline with riprap or a river structure reduces the sediment load carried by the river, thereby reducing the formation of sandbars, which constrict the river flow, block flow into backwaters, and fill in backwaters with sediment along the river. Eventually, much of this sediment will move into downstream desilting basins, where it is removed on a routine basis. Reclamation will not protect raw bankline unless erosion of such bankline is or could become problematic in the future.

Reclamation's maintenance of banklines and training and jetty structures is documented in a report titled *Yuma Area Office, Colorado River, Banklines and Training and Jetty Structures (with No Associated Backwaters) 1999,* Volume III, which, by this reference, is incorporated herein.

In areas where bankline protection has not been previously provided, high flows could result in the creation of large scallops along the natural bankline. These scallops could cause erosion of tremendous amounts of material from areas adjacent to the unprotected bankline and result in the loss of the riparian habitat, property, or facilities in the vicinity of occurrence. In addition, erosion of unprotected bankline could result in undercutting of existing protected bankline. Materials eroded from these areas could be deposited in the channel, increasing turbidity and channel bottom elevation and causing greater downstream sedimentation. The result of sedimentation from unprotected banklines translates into an increased need to remove accumulated sediment from established settling basins, river facilities, backwaters, or the river channel.

There are about 13.9 miles of unprotected river bankline that may require stabilization in the near future to prevent potentially damaging impacts. Before protective measures will be added, however, each unprotected reach of bankline will be evaluated to determine the potential for damage that would be caused by erosion of this bankline. These unprotected bankline areas under consideration for protection are distributed along the Arizona and California banks in the Mohave Valley, Parker, and Palo Verde Divisions (Drawings 423-303-2750–2769 in Appendix R). The bankline segments that may require stabilization are summarized by division, river mile, and total length in Table 2-46. Quantities of unprotected bankline that would normally be protected with rock are approximately 2,500 to 5,000 linear feet per year. The actual amount varies from year to year, depending on the amount and location of erosion and the potential damage that will occur if erosion is not stopped. Maintenance of the riprap placed in the future on unprotected and eroding bankline would then be an ongoing OM&R activity within the LCR MSCP.

The river has eroded portions of both riverbanks immediately upstream of Palo Verde Diversion Dam. By 2002, the river had eroded approximately 0.5 mile of bank on the California side in an area nicknamed the "Palo Verde Scallop," including a cut back of nearly 300 feet from the original bankline. The Arizona bank has also experienced erosion. To protect the structure and functions of Palo Verde Diversion Dam, both banks will require long-term stabilization and maintenance. This project is proceeding under separate NEPA and ESA compliance but is included here for coverage of future maintenance of the project once it is completed.

Table 2-46. Summary of Potential Unprotected Bankline Stabilization

Mohave Valley Division		Parker Division		Palo Verde Division	
River Mile	Length (miles)	River Mile	Length (miles)	River Mile	Length (miles)
A-238.5 to A-241.5 Havasu Wildlife Refuge	3.0	A-140.0–A-144.2 CRIT land	4.0	A-124.4–A-125.8 CRIT land	1.4
				A-126.0–A-127.7 CRIT land	1.7
A-242.7 To A-244.2 Fort Mojave Indian land and private and railroad land	1.5			A-132.5–A-133.8 CRIT land	1.3
				River miles 133.8–134.3, immediately upstream of Palo Verde Dam	0.5 on each bank

CRIT = Colorado River Indian Tribes

Placing bankline protection requires clearing to access the bankline. Access roads parallel to the bankline would be cleared of all vegetation (normally saltcedar) in a strip approximately 24 feet wide (Drawing 423-303-2902 in Appendix R). Riprap is normally dumped from a truck over the bankline from the access road, allowing existing habitat to remain to the extent possible. The access roads require 6 inches of road base material and 6 inches of gravel surfacing material. Turnouts for construction equipment are required about every 600–1,000 feet and are generally 50 feet wide and 40 feet long. The normal quantity for bankline riprap material is 5 tons per foot. Table 2-47 summarizes the total estimated quantities needed in each division.

Bankline protection is not normally required in the Havasu and Imperial Divisions.

Table 2-47. Summary of Potential Material Required for Stabilization

Location	Material	Quantity (tons)
Mohave Valley Division	Riprap	118,800 tons
	Gravel	18,800 tons
Parker Division	Riprap	105,600 tons
	Gravel	16,710 tons
Palo Verde Division	Riprap	92,400 tons
	Gravel	27,108 tons

Three major areas with unprotected bankline are identified as needing work in the next 1–2 years because of ongoing erosion. These sites are located at RMs A238.5–A240.0 (jetties), RMs A242.8–A244.0, and RMs A132.7–A133.4 (work requested by the CRIT). The CRIT have also identified protection needs at three sites less than 500 feet long. These sites are located at RM A135.0, RM A145.0, and RM A162.8. The other sites listed in the table are not of immediate concern, but are under close scrutiny.

2.2.4.4 Proposed Jetties

Table 2-48 shows locations of new jetties that are planned to be completed in the near future or may be needed, based on past experience, sometime in the future. The latter jetties may be constructed for troublesome areas on the river as needed.

Table 2-48. Proposed Jetties

Location (Mohave Division)	Quantity	Status
RMs A238.5–A240.0	9–21	Pre-design
RM’s 50–260	1–20	Future critical river sections

2.2.4.5 Proposed Stockpiles and Access Roads

Reclamation anticipates a need for the establishment of new stockpiles. At this time, at least one new stock pile adjacent to the levee system is proposed. This stockpile is to be located near Reclamation's dredging and maintenance facility at Needles, California, in the Mohave Division. Additional stockpiles, especially in the Mohave and Palo Verde Division, are also being considered for construction in the future. Each new stockpile will be approximately 200 feet wide and 200 feet long and will cover an area of about 1 acre. Access roads into the stockpile sites will be required. Each stockpile access road is anticipated to be about 100 feet long and 24 feet wide, covering an area of about 0.6 acre. The roads and stockpiles will be located in previously disturbed areas to the extent possible. Otherwise, activity in valuable habitat will be avoided. New stockpile sites will be chosen based on the:

- need to have rock stored near areas that may be damaged by future floods,
- ease of access,
- ability to minimize new road construction to the sites, and
- Ability to locate sites with the least possible impacts to the surrounding and underlying environment.

Additional access roads may also be needed for work on new or existing jetties or training structures or to gain access to eroding unprotected or protected bankline. These roads would be expected to vary in length from 100 to 500 feet and be at least 24 feet wide.

Construction of new roads involves clearing brush, construction of road embankment, and placement of gravel surfacing. Watering is used during the construction process to reduce dust particles in the air. Similar activities occur for the preparation of new stockpile sites. In most cases, only saltcedar would be removed to allow access for road construction and to develop a base for the stockpiles.

2.3 Western Area Power Administration

As discussed above in Section 2.2.1.5, Reclamation generates electricity associated with the release of water from project facilities. The generation of electricity is consistent with the operational parameters contained in Reclamation and Western's JOA and is a byproduct of Reclamation's operation of the river in accordance with the priorities pertaining to the LCR which are established by statute. As provided for in the JOA, Western has responsibility for operation and maintenance of switchyards, substations and transmission lines, except for equipment retained by Reclamation. See Appendix S for excerpts of relevant sections of the JOA.

As the agency responsible for releasing water and operating the generating facilities, Reclamation informs Western of the amount of power production projected for future years. Western, the agency responsible for marketing the power, uses the Reclamation projection, along with other data, in setting out the terms and conditions for long-term contracts. Under the BCPA, flood control and water delivery are higher priorities than power production. As a result, the amount of water to be released in a given month is based on the requirements for flood control and meeting water orders. On a daily and hourly basis, the water release schedule is structured to coordinate the maximum release through the power facilities at the time of the peak usage of electricity, to the extent such release is compatible with the timing of the water deliveries and other constraints. If Western requests power when water is not on order, Western is obligated to purchase power from other sources to satisfy the contractual agreements. For purposes of the LCR MSCP BA, Reclamation assumes, and the hydrologic modeling is based upon, the assumption that current operating conditions and practices will continue throughout the 50-year period. Thus, ongoing power operations for the term of the LCR MSCP are covered actions and any impacts have been fully analyzed in the impact analysis.

Western's Energy Planning and Management Program (EPAMP) regulations located at 10 C.F.R. Part 905 were adopted in 1995 (60 FR 54151*)* in part, to establish a framework for extension of existing firm power resource commitments. Under Subpart C of these regulations, Western may make a major portion of the resources currently under contract available to existing long-term firm power customers for a period of time beyond the expiration of their current contracts. (10 C.F.R. §905.30) On May 5, 2003, Western issued a decision notice to apply EPAMP to the Parker-Davis Project (P-DP) and extend contracts beyond 2008 (65 FR 23709*)*. Western conducted its own environmental analysis of the P-DP contract extensions and concluded that the action of extending contracts will not affect any listed threatened or endangered species. Existing contracts, renewal of existing contracts, extended contracts and new contracts do not change LCR operations and do not determine the availability of generation resources. When hydropower generation is insufficient to fulfill contractual commitments, Western purchases power from other sources.

Regardless of any P-DP contract actions undertaken by Western, all impacts associated with water releases (and associated power generation) have been fully analyzed in Chapter 5 for the full term of the LCR MSCP (50 years). With regard to BCPA contracts, Western and Reclamation assume that power generated at Hoover Dam will continue to be marketed pursuant to the BCPA and other relevant authorities. Hydropower availability will continue to be subject to water schedules and interagency coordination will continue pursuant to the JOA. Existing contracts, renewal of existing contracts, extended contracts and new contracts do not change LCR operations and do not determine the availability of generation resources.

Regardless of any BCPA contract actions undertaken by Western, all impacts associated with water releases (and associated power generation) have been fully analyzed in Chapter 5 for the full term of the LCR MSCP (50 years).

2.4 National Park Service

2.4.1 Introduction

The NPS's Lake Mead NRA has three broad categories of projects for inclusion in the LCR MSCP BA:

- riparian habitat restoration,
- fishery management, and
- boating access.

The spatial range of these projects is summarized in Table 2-49, and a map of the NRA with recreational facilities is provided in Figure 2-3. For clarification purposes, a short discussion on NRA activities not covered by the LCR MSCP BA is also provided.

Table 2-49. Programs/Facilities Proposed for LCR MSCP Biological Assessment Coverage

Program	Lake Mead (quantity)	Lake Mohave (quantity)
Riparian habitat restoration (acres)	500	100
New native fish grow out coves (acres)	10	10
Sport fishing docks (at approximately 600 square feet)	2	2
Fish attractors (approximately 1 acre each)	4	4
Existing boat ramps, maintenance and improvements	9	4

2.4.2 Riparian Habitat Restoration

The first broad category for programmatic coverage is riparian habitat restoration through replacement of nonnative species with native vegetation. This restoration would include potential projects on both Lake Mead and Lake Mohave. On Lake Mead, such projects would likely be restricted to the tributary confluence areas of the Virgin River, Muddy River, and Las Vegas Wash. Activities associated with these projects may include the removal of nonnative tamarisk by mechanical means (e.g., chain saws, bulldozers), prescribed fire, and EPA-registered herbicides well-established for tamarisk removal protocols. Native riparian species, including willow and cottonwood, may be planted through seed, cuttings, poles, or transplants of nursery stock. The purpose of such projects on Lake Mead would be to enhance the native riparian vegetation and potentially to increase high-value habitat for native riparian obligate wildlife. The Lake Mead NRA is seeking programmatic coverage on Lake Mead for up to 500 acres. The season of treatment on Lake Mead would be October–March, and it is not anticipated that work would ever exceed more than 20 acres in any given year.

Objectives of riparian restoration on Lake Mohave would also be primarily the enhancement of native riparian vegetation and native riparian obligate wildlife. Unlike Lake Mead, which supports little riparian vegetation away from the inflow areas, Lake Mohave currently supports isolated populations of mature willow stands, mainly in the vicinity of Cottonwood Cove. The goal of riparian restoration on Lake Mohave would be to enhance the existing stands to ensure that willow remains a part of the overall shoreline vegetation, as well as seek other areas with suitability for conversion to willow. Enhancement of existing stands would include removal of adjacent tamarisk stands and

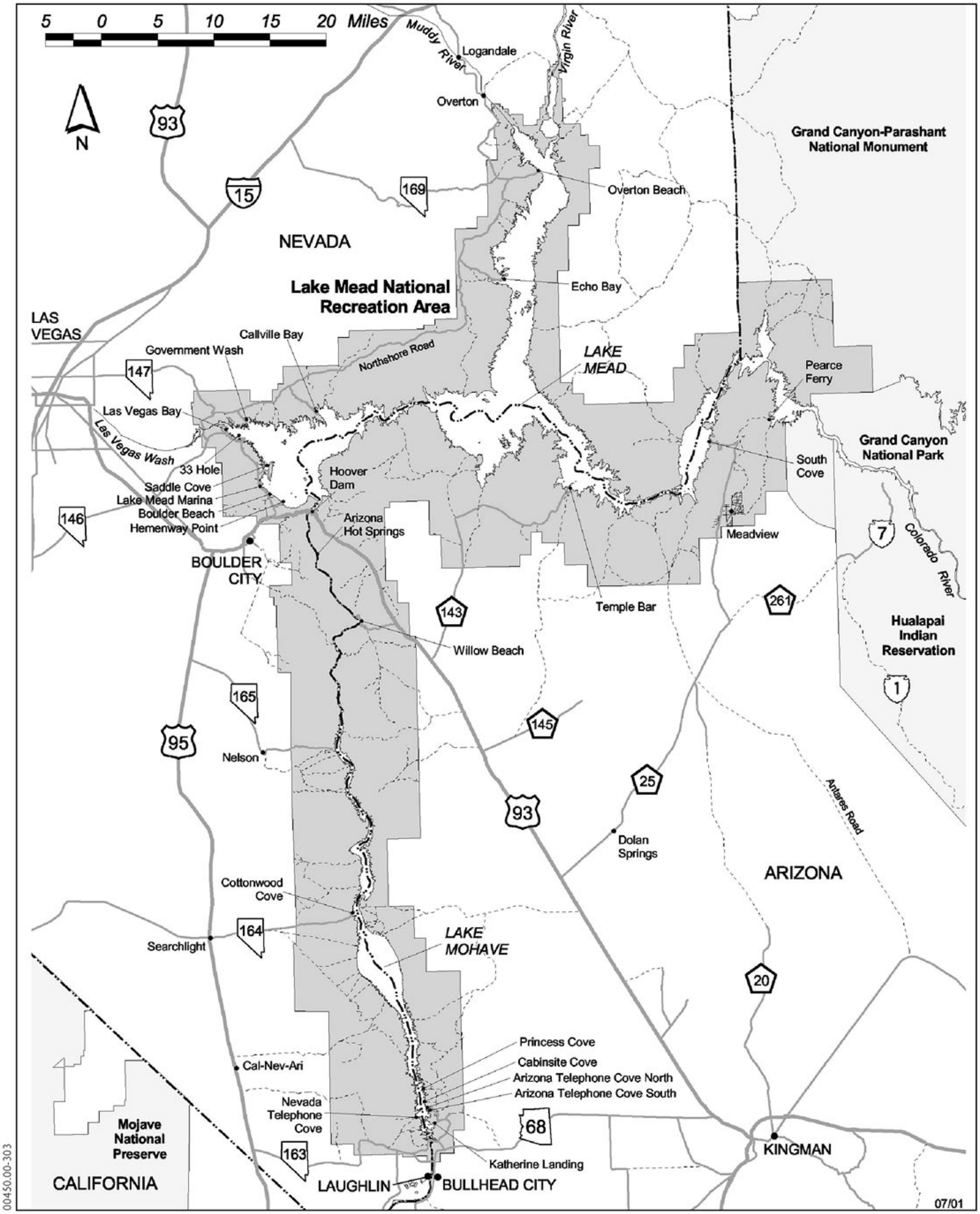

Figure 2-3
Lake Mead National Recreation Area

perhaps augmentation with plantings of willow. At selected shoreline areas with potential to support willow, tamarisk would be removed and willow would be planted by seed, poles, cuttings, or nursery stock. Tamarisk removal would most likely be accomplished through use of chainsaws and EPA-registered herbicides but may also include prescribed fire and bulldozers.

On Lake Mohave, a secondary objective of tamarisk removal or willow plantings would be the enhancement of aesthetics for recreation in selected areas through creation of open shoreline or shade. Tamarisk removal for recreation purposes would be limited to specific areas, no more than 10 coves on Lake Mohave. The current list of potential tamarisk removal sites for recreation enhancement includes Nevada Telephone Cove, North Telephone Cove, South Telephone Cove, Cabinsite Cove, and the boat-beaching area adjacent to the Arizona Hot Springs drainage (Figure 2-3). It is not expected that any of the removals for recreation enhancement would exceed 2 acres.

The Lake Mead NRA requests programmatic coverage for up to 100 acres for saltcedar control and native riparian restoration within Lake Mohave. The season for treatment for Lake Mohave would be October–March. It is not anticipated that work would exceed 10 acres in any one year.

2.4.3 Fishery Management

The second broad category for programmatic coverage would be for habitat modifications for the purposes of fishery management, including both native fish propagation and the enhancement of sport fishing opportunities. Programmatic project coverage for native fish would include development or maintenance of backwater grow-out ponds for native fish propagation. The Lake Mead NRA is seeking programmatic coverage for Lake Mead to develop up to 10 surface acres and for Lake Mohave to develop up to 10 surface acres. In general terms, 1–10 sites would constitute the 10-acre sum for each lake. Associated activities would include building rock and earthen berms, using heavy equipment, digging existing backwaters with equipment, using herbicides for weed control in backwaters, and using piscicides to control nonnative fish in backwater grow-out ponds.

Programmatic activities for enhancing sport fishing opportunities include the construction of docks for angler access, including handicapped angler access. The Lake Mead NRA requests programmatic coverage for two docks each on Lake Mead and Lake Mohave. Docks would be free-floating wooden structures secured with cable to concrete anchors. Surface area of docks would likely not exceed 600 square feet, including walkways and terminal dock platform. Programmatic coverage for enhancing sport fishing opportunities also includes the creation of fish attractors, such as natural brush or nonnatural structures that aggregate sport fish. Such areas would be coordinated with the LCR MSCP Steering Committee and the Native Fish Work Group to maximize sport fish take and angler success in a manner, which does not conflict with the native fish recovery goals. The current list of potential areas includes Saddle Cove, Thirty-Three Hole, Hemenway Point, Government Wash on Lake Mead, and the north point of the harbor at Cottonwood Cove on Lake Mohave (Figure 2-3).

Programmatic coverage is sought for four such angler enhancement structures on each lake. Each structure or aggregation of structures would be placed at the shore-side end of a cove, and total bottom coverage of any one aggregation of structures would not exceed 1 acre.

2.4.4 Boating Access

The third broad category for programmatic coverage is maintenance of existing boating access and the potential for enhancement of existing ramps. The park maintains nine boat ramp facilities on Lake Mead and four boat ramp facilities on Lake Mohave. The Lake Mead NRA is seeking programmatic coverage for maintenance and enhancements to these ramps. Maintenance activities include patching of potholes in ramps with asphalt or concrete and the occasional removal of silt at ramps through use of a backhoe or dredge. Dredged materials typically do not exceed 10 cubic yards for any one location in any given year; the return cycle for such dredging has not been more frequent than once in every 10 years per location. Programmatic coverage for enhancement of ramps includes the replacement of asphalt ramps with concrete ramps in the same location, as funding and water levels permit. Additional enhancement activities would potentially include widening existing boat ramps to add another lane that is approximately 20 feet wide along no more than 200 feet of ramp below high water.

2.4.5 Flow-Related Actions

In managing the Lake Mead National Recreation Area, the NPS makes decisions regarding the temporal and spatial diversion (i.e., whether to divert surface flows or pump) of its Colorado River water rights and, in some situations, return flows to the river. Recent deliveries and return flows are identified in Appendix Q (Article V Decree Accounting Report for 2000). The NPS, through PPR No. 82 (Executive Order 5105), dated May 3, 1926, has a diversion right of 500 cfs with an estimated consumptive use of 300 cfs. In addition, the NPS, through the 1964 Supreme Court Decree (Executive Order No. 5339) dated April 25, 1930, has a diversion entitlement of 1,500 cfs with an estimated consumptive use of 900 cfs.

2.4.6 Additional Planning Activities Not Covered under the LCR MSCP BA

The Lake Mead NRA has recently completed a Lake Management Plan, which provides management direction for water-based recreation on both Lake Mead and Lake Mohave. Water-based recreational activities and management have undergone separate section 7 consultation under the ESA and, thus, are outside the Federal covered actions in this LCR MSCP BA.

2.5 Bureau of Indian Affairs

2.5.1 Introduction

The BIA administers provides assistance and funding for several Indian projects that are situated along or near the Colorado River. Alternatively, the BIA's program responsibility and administration can be assumed by Tribes through self-determination contracts or self-governance compacts.

Indian Tribes may operate any BIA program, including construction (with the exception of trust or inherently Federal functions) under a self-determination contract or self-governance compact. BIA provides funding, monitors activity (including the expenditure of funds and the inspection of construction), and retains decision and approval authority for certain non-delegated trust actions, such as permits, leases and the NEPA process (25 U.S.C. §450 et. seq. and 25 C.F.R. Part 900). Most of the proposed covered actions identified by BIA for the LCR MSCP BA can be administered by the Tribes pursuant to 25 U.S.C. §450 et. seq. Such administration will not affect the environmental effects or analysis under this LCR MSCP BA.

There are six reservations in the LCR MSCP planning area, and the Havasupai Reservation is immediately east of the LCR MSCP planning area (Figure 2-4). Five of the reservations are located between Lake Mead and the SIB. There are currently no identified potentially covered projects with BIA involvement at Havasupai or Hualapai. The five reservations and the Fort Yuma Homesteads are briefly described below.

Fort Mojave

The Fort Mojave Indian Reservation is located on both sides of the Colorado River in Arizona, California, and Nevada, near Needles, California, approximately 15 miles south of Davis Dam. The early history of farming on the reservation indicates there was limited success because of flooding and meandering of the river. The construction of Hoover Dam and Davis Dam and channelization of the river allowed agricultural development to take place, and development leases were issued in the 1960s and 1970s. Approximately 14,000 acres of land are actively farmed on the reservation.

Chemehuevi

The Chemehuevi Indian Reservation is fronted by 25 miles of Colorado River shoreline. It is located in California, across the river from Lake Havasu City, just upstream of Parker Dam. The Chemehuevi Tribe has a 45-acre experimental farm, which is irrigated by a river pump and a filtered drip and sprinkler system. The project was funded partially by BIA.

Colorado River

The Colorado River Indian Reservation (CRIR) is located along the Colorado River, adjacent to Parker, Arizona, in southwestern Arizona and southeastern California. CRIR includes 90 miles of the Colorado River shoreline. Approximately 80,000 acres of land are being farmed, and most of the land is leased.

Fort Yuma

The Fort Yuma Indian Reservation is located in southeastern California and southwestern Arizona near Yuma, Arizona, with a Colorado River shoreline of about 15 miles and is the home of the Quechan Tribe. Approximately 9,500 acres of land are irrigated on the reservation, most of which are leased.

Cocopah

The Cocopah Reservations are south and west of Yuma, Arizona, with a Colorado River shoreline of about 2 miles at North Cocopah and 9 miles at West Cocopah. Approximately 2,260 acres are farmed under lease on the reservations.

The Fort Yuma Homesteads are farm unit operations, leased to non-Indians, occupying about 380 acres on two parcels of land in the Yuma Valley, about 4 miles from the river, southwest of Yuma, Arizona.

The BIA covered projects are described below as ongoing activities and future projects. In addition to the following text, tables, maps, and the timing for their implementation, a description of habitats affected by covered actions is provided in Chapter 5 of the LCR MSCP BA.

2.5.2 Ongoing Activity

2.5.2.1 Irrigation System Operation and Maintenance

Irrigation system OM&R is an activity that is ongoing in all of the irrigation projects along the LCR. Table 2-50 shows the existing irrigated acreage, the total mileage of canals, the mileage of lined canals and access roads maintained, and the amount of gravel needed for annual maintenance of the access roads for each of the irrigation projects.

Colorado River Indian Irrigation Project

Congress appropriated funds to design and construct an engineered canal system in 1860. Since then, approximately 80% of the Colorado River Indian Irrigation Project (CRIIP) has been completed and associated acreage subjugated. BIA is responsible for operating the system and for repairing, maintaining, upgrading, and protecting system structures, such as the diversion to the main canal, laterals, turnouts, gates, check structures, measurement structures, electronics, spillways, certain groundwater pumps, access and system rights of way (ROW), roads, and fences. This work is done on an as-needed basis but scheduled as much as possible to avoid an accumulation of problems. The cleaning of canals and drains involves the mechanical removal of sediment and vegetation, both of which are deposited on previously disturbed, established system ROWs. The work includes patching of lined canals, gate replacement, culvert replacement, well construction, and improvements to the measurement system. Also included is repair or replacement of steel structures; spray cleaning and repainting; maintenance and replacement of rolling stock, such as graders, dozers, gradalls, and trucks; and installation or replacement of safety features, such as guardrails and fences.

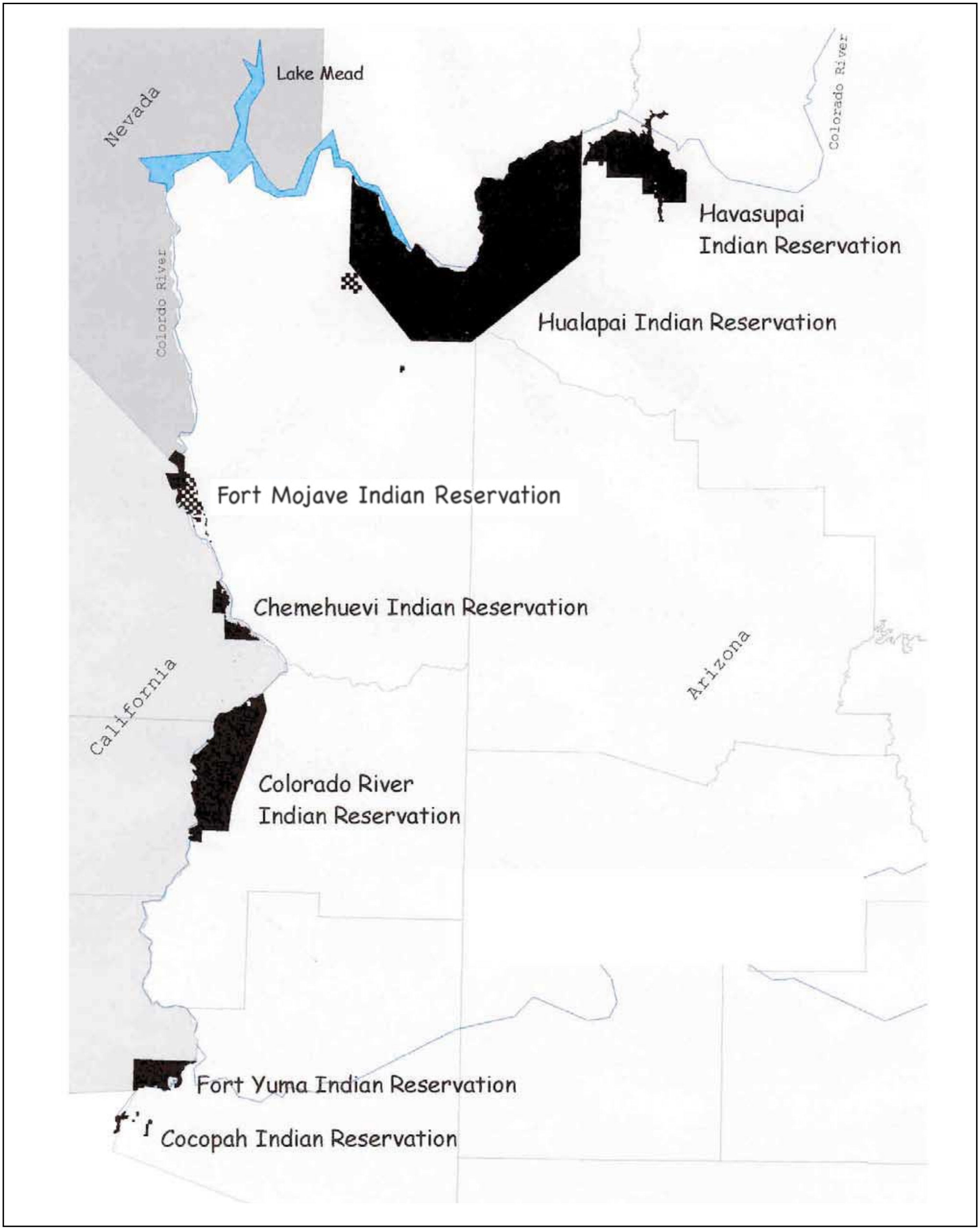

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Figure 2-4
Indian Reservations along the LCR

Table 2-50. Summary of Existing and Potential Additional Irrigated Lands, Irrigation Infrastructure and Maintenance, and Present and Future Woodland Restoration by Tribes on the LCR

	Colorado River Indian Reservation	Fort Mojave	Chemehuevi	Fort Yuma	Fort Yuma Homesteads	North and West Cocopah
Existing irrigated land (acres)	80,000	13,825	45	9,500	380	2,260
Potential additional irrigated land (acres)	25,000 (27,620)	3,745 (4,160)	1,855 (2,020)	650 (730)		500 (635)
Canals (miles)	210	100	30 (pipeline)	96	7	24
Lined canals (miles)	75	84	30 (pipeline)	18	2	16
Potential miles of lined canals	135 (existing) + 60 (new) = 195	16 (existing) + 20 (new) = 36	150 (pipeline)	60	5	8
Maintained roads (miles)	520	100	20	75	6	16
Gravel for annual road maintenance (cubic yards)	62,500	10,000	2,000	8,000	400	2,000
Present woodland restoration (acres)			3			
Future total woodland restoration (acres)			6			

Number in parentheses is the total acreage of land needed to irrigate the additional acres.

Routine maintenance of the ROWs includes road grading, application of gravel or fill, and weed control along the canals and drains. Vegetation is initially removed by mechanical means and is subsequently controlled on the ROW by contracted professional application of herbicides (using appropriately registered herbicides and appropriately trained applicators). Cleared areas are retreated annually with Diurex and spot treated with Roundup as needed. Diurex (3,840 gallons) and Roundup (3,953 gallons) were applied in 1999. Approximately 332 miles of ROW are treated each year. No herbicides or fish are used for aquatic weed control. Flood control structures at the river and two major washes have been constructed; however, BIA has no responsibility for maintenance of these structures or construction of additional structures. Three maps of the existing irrigation system, titled CRIR Irrigation Districts 1, 2, and 3; 4, 5, and 6; and 7 and 8, respectively, are incorporated by reference (Bureau of Indian Affairs 1992).

Fort Mohave Irrigation Project

Since the entire reach of the Colorado River along Fort Mohave's checkerboarded reservation lands has been riprapped, irrigation water is pumped from facilities at the edge of the river to farmland, which is either farmed by the Tribe or by lessees on long-term leases. As leases expire, the Tribe is adding the associated land to its Tribal farm. The Tribe has agricultural land in Arizona, California, and Nevada. All canals are lined, except for a few laterals in California. Construction and OM&R of all system facilities are conducted by the Tribe or the lessees. No BIA funds are expended for these purposes and have not been since the early 1990s. At that time, BIA funds were used to construct some of the pumping facilities at the edge of the river just below the bridge from the city of Needles, California, to the Fort Mojave Indian Reservation in Arizona.

BIA supports three soil conservationist/technicians through a self-determination contract. These personnel perform a variety of physical and natural resources functions for the Tribe, other than irrigation system OM&R. The soil conservationist (Tribal physical resources director) serves on the Tribal Farm Board.

The current and future farmland and irrigation facilities are displayed on Figure II-1 and Maps II-1–II-5 and IX-1–IX-5 of the rehabilitation and betterment report by Cooper Consultants and Harza Engineering Company (January 1991), which with this reference is incorporated herein (Cooper Consultants–Harza Engineering 1991).

Chemehuevi Irrigation Project

Development of a portion of the reservation's 1,900 practicably irrigable acres (PIA) began in 1994 on a test-scale basis to determine what crops could be grown on a sustainable basis on the droughty terrace soils west of the river. The PIA are based on water entitlements granted to the Chemehuevi and other Tribes by the Decree. BIA continues to support this effort through a self-determination contract. Water is pumped from a diesel-fueled facility at Catfish Bay on the Colorado River. When the water reaches the terrace via pipeline, it is filtered and applied to the land by solid set sprinkler or drip irrigation systems. Three hundred acres have been archeologically cleared for development, and the currently irrigated land (45 acres) is being expanded at the rate of 10–20 acres per year as funding (BIA supplemented by the Tribe) is available. The Tribe has conducted all the work associated with the construction and OM&R of the system. By design, the self-determination contract is to terminate when the farm transforms from a test facility to a profit-making enterprise. BIA also contributes technical assistance through its Agency Resources Branch, which completed the final *Environmental Assessment Chemehuevi Agricultural Development* (February 1995).

Fort Yuma Irrigation Project

The Reservation Division (Bard and Indian Units of the Yuma Reclamation Project) was built by Reclamation (which holds title) and is operated and maintained by the Bard Water District under contract with Reclamation. OM&R of the on-farm delivery system (farm ditches) is done by the farmer/lessees. Off-project pumps and wells are operated by the farmers and maintained jointly with the Quechan Tribe. Irrigation water is supplied through facilities of the IID (Colorado River diversion at Imperial Dam and the AAC, Yuma County Water Users' Association (Yuma Main Canal), and the Reservation

Division. BIA's role is primarily administrative by oversight of OM&R through lease compliance activity and collection of OM&R assessments.

Dredging, bank stabilization, and flood control operations in the Colorado River are carried out by the Reclamation. High flows are bypassed through the AAC as much as possible and then returned to the river at the Pilot Knob Power Plant. Flood control operations on the Colorado River within the Fort Yuma Indian Reservation are carried out by Reclamation and the respective irrigation districts.

Cocopah Reservations

Irrigation on the North and West Cocopah Reservations is a farm unit operation with the farmer/lessees responsible for on-farm OM&R. Most of the land is irrigated from wells, with the Cocopah Tribe assisting with major repairs to the distribution system and pump and well maintenance. About 1,200 acres at the West Cocopah Reservation can now be irrigated with water supplied by the Yuma County Water Users' Association from the West Main Canal (Valley Division, Yuma Reclamation Project, diversion at Imperial Dam) under a temporary water service contract, depending on supply. BIA has provided appropriated funds in the past for OM&R but not recently. BIA's role is primarily administrative by oversight of OM&R through lease compliance activity.

Flood control operations in the Colorado River at the North Cocopah Reservation are carried out by Reclamation and at West Cocopah Reservation by Reclamation in cooperation with the USIBWC.

Fort Yuma Homesteads

The Fort Yuma Homesteads are Indian lands on which the Federal government holds a trust responsibility; however, the allotments are not a Tribal reservation. The allotments are farm unit operations with the farmer/lessees responsible for on-farm OM&R. Irrigation water is supplied by the Yuma County Water Users' Association from the Central Canal (Valley Division, Yuma Reclamation Project, diversion at Imperial Dam) under temporary water service contracts, depending on supply.

2.5.2.2 Water Conservation Practices

Colorado River Indian Irrigation Project

The CRIR Tribal Water Resources Department and BIA are conducting or instituting measures to make the most efficient use on the reservation of the water diverted to the irrigation system. The positive effect of these efforts is evidenced by the significant reduction over the past 3 years in water diverted at Headgate Rock Dam. A systematic effort is underway to quantify the factors that contribute to inefficiency. The current total diversion is 659,900 af of the 717,148 af entitlement for the reservation. Spillage to Wasteway is being reduced by improving scheduling and delivery of water to all reaches of the existing system. Some of the water that was spilled at mid-system is being delivered to leases south of that point.

Data loggers have been installed at strategic check gates. An automatic Supervisory Control and Data Acquisition (SCADA) system is being installed to improve water flow to the appropriate points at the time water delivery is scheduled. These systems, which will be operated and maintained over the next several years, are summarized in Table 2-51.

Table 2-51. Colorado River Indian Irrigation Project Location of On-Farm Measurement Demonstration Project Facilities, February 23, 1998

	Sfc No.	Lateral	Turn Out	Location	Concrete
1	1009	Main	15	0.25 mile downstream / Mohave—left	Lined
2	1016	Main	14	0.5 mile / Booth—right	Lined
3	2015	19R	32	At Little Road exit—right	T.O./Unlined
4	2028	19R	33	0.5 mile north of Agnes Wilson on 13th Avenue 0.25 mile—left	Lined
5	2029	19R	37	0.25 mile north / Agnes Wilson—left	T.O./Unlined
6	2086	19R-14	3	South Mohave 0.25 mile west / 6th Avenue—left	Lined
7	2115	19R-34	37	0.75 mile south / west Agnes Wilson 14 west 12th Avenue—left	T.O./Unlined
8	2045	19R-37	12	1.75 miles north / west Agnes Wilson / 0.25 mile west 14th Avenue—right	T.O./Unlined
9	2194	27R11	16	0.25 mile west / 6th Avenue / 0.5 mile south Burns—right	Lined
10	2174	27R-23	2	0.25 mile west / 8th Avenue / 0.25 mile north Burns—left	T.O./Unlined
11	2150	27R-36	10	0.25 mile north / west Agnes Wilson—right	Lined
12	1278	42L	1	1 mile south Burns / 0.1 mile east Main Canal	Unlined
13	3069	73	11	0.25 mile north / east Peterson—left	Lined
14	3066	73	22	0.75 mile south / Macabe—right	Lined
15	3066	73	24	0.75 mile south / Macabe—right	Lined
16	3191	73-19R-4	1	1.25 miles west / Mohave 0.25 mile north Ploacca—left	T.O./Unlined
17	3122	73-25R	4	0.5 mile east Mohave / 0.5 mile south Tahbo—right	T.O./Unlined
18	3263	73-36-20	14	1.25 miles south Nez. / 1.5 miles east Mohave—last turn out	Lined
19	1251	79	1	0.5 mile north / Scott 0.75 mile west Mohave—left	Unlined
20	1075	90	32	Lateral 90 at west Navajo—right	Lined
21	1090	90	53	0.1 mile upstream / west Tsosie—left	Lined
22	1106	90	67	1.75 miles downstream / Tsosie—left	Lined
23	1129	90	94	1.25 miles south / Welch—right	Lined
24	1156	90-56	7	0.5 mile east / Mohave at east Tsosie—left	Lined
25	1174	90-56	28	3.75 miles south / Tsosie 1.5 miles east Mohave	Lined

* T.O. = Turn Out

Water measurement is being conducted at each farm unit delivery point by BIA ditch riders using velocity meters. All deliveries are measured rather than estimated. Growers are encouraged to install their own approved measuring devices. Twenty-five demonstration devices were installed to discover and show the standards and costs of such devices under a variety of grower turnout situations. The locations of these systems, which will be operated and maintained over the next few years, are summarized in Table 2-52.

Table 2-52. Colorado River Indian Irrigation Project Location and Purpose of System Measurement and Supervisory Control and Data Acquisition (SCADA) System Project Facilities

	Sfc No.	Location	Comment
1		Headgate Rock Dam	Measure flow to the main canal
2	1000	Main canal check 19	Measure flow in the main and laterals 19R and 19L
3	1013	Main canal check 27	Measure flow in main and laterals 27R and 27L
4	1026	Main canal check 42	Measure flow in main and lateral 42L
5	1028	Main canal check 56	Measure flow in main canal
6	1043	Main canal check 73	Measure flow in main canal and lateral 73
7	3062	Lateral 73 check 19	Measure flow in lateral 73 and laterals 73-19R and 73-19L
8	3065	Lateral 73 check 25	Measure flow in lateral 73 and lateral 73-25R
9	1044	Lateral 90 check 1	Measure flow to lateral 90 and flow to wasteway No.2
10	1088	Lateral 90-56 check 1	Measure flow to lateral 90-56 and lower lateral 90

Each site has a data logger installed that gathers data on the distribution system. The ongoing plan is to have each site report to a central location at the Poston Irrigation Office. Eventually, the system will be capable of controlling gates remotely with full SCADA capabilities.

If a lessee uses the full entitlement allotted to his farm, he can obtain additional water only by application and paying $17 per acre-foot (af) for “excess” water. This substantial charge creates an incentive for the grower to make the most efficient use of the annual entitlement included in the OM&R service received when the per-acre assessment is paid each year. On farm practices such as level basin irrigation, avoidance of over-irrigation and creation of less tail water are increasing.

BIA, the Natural Resource Conservation Service, and the Tribe are participating in a recently developed soil salinity program that will employ electronic meters and global positioning system (GPS) and geographic information system (GIS) technologies to map the salinity in a field. This program will provide growers with a tool to irrigate more efficiently and increase overall crop production from a field.

Water reuse is being carried out by BIA and by growers who are allowed to flood irrigate on sloping land. The water is pumped from collection areas or drains and mixed with much larger volumes of river water flowing in canals. BIA also is pumping some groundwater from a few farmland areas with soil conditions or other factors that prevent proper drainage to established drains.

The cleaning of canals and drains by BIA contributes to reliable flows in the system. Annual maintenance to replace or seal gates, for example, contributes to that reliability as well.

Sprinkler or drip irrigation systems are installed in locations such as sandy and sloped soils to increase application and crop use efficiency. However, the extent of such systems is limited by the often high costs associated with them.

Fort Mohave Irrigation Project

The Tribe is entering into a cost-share agreement with Reclamation for the installation of measuring devices at all the diversion pump locations. Currently, water use is estimated by a formula that has electricity used at a pump as the base and the employment of evapotranspiration formulae for crops grown. BIA encourages accurate water measurement. The current total diversion is 90,025 af of the 132,769-af entitlement for the reservation.

Virtually all the canals are lined and kept patched on a regular maintenance basis. This maintenance is the responsibility of whoever owns or leases the land. There is no BIA funding for this activity.

Chemehuevi Irrigation Project

Because the soils on the terraces are generally course textured, sprinkler and drip irrigation rather than flood or furrow irrigation is employed. The water pumped up from the river is sand filtered.

Windbreaks have been planted to partially prevent wind from disturbing sprinkler system application. Soil fertility and structure are being improved by rotating experimental crops with alfalfa. The alfalfa, Sudan grass, and small grain cover crops also minimize soil removal by wind erosion. Water removed from the river is measured at the pump site with a well-maintained flow meter. BIA supports these efforts through technical assistance by the Awarding Official’s Technical Representative and others as part of the self-determination contract. The current total diversion is 665 af of the 11,340-af entitlement for the Reservation.

Fort Yuma Irrigation Project

One lateral, the Pueblo has a demonstration flume and weir for water measurement installed by the Bard Water District.

Cocopah Reservations

Currently, the Cocopah Reservations have no water conservation practices. Possible future practices are described in "Future Projects."

Fort Yuma Homesteads

Currently, the Fort Yuma Homesteads have no water conservation practices. Possible future practices are described in "Future Projects."

2.5.2.3 Riparian Habitat Rehabilitation and Restoration

Colorado River Indian Reservation

Although BIA provided a small woodland grant in the early stages of the development of Ahakhav Tribal Preserve, it has not participated in the funding or approval process toward the realization of this large and successful Tribal enterprise. More detailed description will appear as either part of Reclamation/Tribal involvement and/or part of the LCR MSCP Conservation Plan.

Fort Mojave Indian Reservation

BIA has not funded or formally approved any activity of this sort on the reservation. The Colorado River Agency did participate in a National Interagency Fire Center Burned Area Emergency Rehabilitation effort in 1995 for 1,700 acres, of which a large portion was Tribal land; however, the plan was never implemented. A large amount of old growth mesquite was burned. The Tribe may at some later date restore all or a portion of that culturally valuable resource.

Chemehuevi Indian Reservation

Through the availability of nonrecurring BIA funds for woodlands projects, the Tribe has successfully completed approximately one-half of a shoreline/woodlands rehabilitation plan. The Tribe's woodland grants program was summarized in the Chemehuevi Conservation Department Woodlands Project (1999) report, which is incorporated herein by reference (Chemehuevi Tribe 1999). The plan involves mechanical clearing and suppression of invasive saltcedar at prime beach areas of the reservation to the west of Lake Havasu. Existing mesquite and Palo Verde are pruned according to accepted woodland practices. The beaches are then leased to boaters on a daily or longer basis. The Tribal Conservation Department patrols and maintains the beaches. The 50% of planned beaches that have been completed are south of the Havasu Landing Resort and north of the remaining planned beaches. Longevity of the restored beaches is enhanced because the saltcedar plants, including roots, are removed. No chemicals are used or are needed to suppress saltcedar regrowth. And the Tribe, through its monitoring program, has documented expanded wildlife use of the rehabilitated shorelines (Chemehuevi Tribe 1999).

Fort Yuma Reservation

The Quechan Woodlands Re-Establishment Project (Quechan Tribe 1997) calls for the reestablishment of native cottonwood, willow, and mesquite. A tree nursery is proposed as part of the overall restoration program.

Cocopah Reservations

The habitat enhancement concept plan for the Cocopah Tribal lands and adjacent areas along the River (Jones & Stokes Associates 1999) identified opportunities to enhance native habitats and cultural uses. The concept plan identified 15 sites for action consideration to enhance habitat value and public uses.

2.5.2.4 Wildland Fire Management

In addition to wildland fire suppression activities, BIA staff carries out imminent fuel hazard reduction around dwellings (e.g., tree and brush trimming or removal as appropriate on all the reservations).

2.5.2.5 Woodland and Shoreline Maintenance

Chemehuevi Indian Reservation

There is a recreation aspect to the shoreline/woodland project under “Riparian Habitat Rehabilitation and Restoration” (previously included 1999 Chemehuevi Woodlands Project [Chemehuevi Tribe 1999]). These popular beaches will generate income for the Tribe, from which a portion can be used to perpetuate the areas.

2.5.2.6 Flow-Related Actions

Native American tribes make decisions regarding the temporal and spatial diversion (i.e., whether to divert surface flows or pump) of their Colorado River water rights and, in some situations, return flows to the river. Recent deliveries and return flows are identified in Appendix Q (Article V Decree Accounting Report for 2000).

Tribal rights to Colorado River water are based on applicable Federal law including the 1908 *Winters v. United States* decision and have been further specified in the Decree and Supplemental Decrees issued by the Court in 1979, 1984, and 2000. Five of the six tribes with reservation lands located in or bordering the planning area possess Decreed rights to

Colorado River water for use on reservation lands. These tribes are the Fort Mojave Indian Tribe, the Chemehuevi Indian Tribe, the Colorado River Indian Tribes, the Quechan Indian Tribe (the Fort Yuma Indian Reservation), and the Cocopah Indian Tribe. Together, these five tribes have present Decreed rights to divert 925,840 af of Colorado River water annually. The United States acknowledges the senior priorities of the Decreed rights for these five reservations. Reclamation is committed to making progress in helping tribes make better use of their water rights and supports each Tribe's efforts to do so within the bounds of applicable law. Reclamation acknowledges that the Tribes' Decreed rights are Indian Trust Assets and that the United States, as trustee for those Tribal water rights, is committed to protect them. Any action taken to implement the LCR MSCP will not and cannot modify these decreed water rights in any manner.

The Fort Mojave Indian Reservation is located on the Colorado River near the meeting point of the boundaries of Arizona, California, and Nevada. The tribe has reservation land in, and possesses Decreed rights to Colorado River water in, all three states, as specified in the Decree. The tribe has rights to divert 132,789 af of Colorado River water, comprising 103,535 afy in Arizona, 16,720 afy in California, and 12,534 afy in Nevada (Bureau of Reclamation 2000d and 531 U.S. 1 (2000)).

The Chemehuevi Indian Reservation is located in southern California on plateau lands near the western shoreline of Lake Havasu. Pursuant to the Decree, the tribe possesses Decreed rights to divert 11,340 af of Colorado River water annually (Bureau of Reclamation 2000d).

The CRIT Reservation is located in southwestern Arizona and southeastern California, south of Parker, Arizona. In accordance with the Decree, the tribe possesses Decreed rights to divert 719,248 af of Colorado River water annually, comprising 662,402 afy in Arizona and 56,846 afy in California (Bureau of Reclamation 2000d and 531 U.S. 1 (2000)).

The Fort Yuma Indian Reservation is located in southwestern Arizona and southeastern California north and east of Yuma, Arizona. Water for the tribe is diverted from the Colorado River at Imperial Dam and is delivered through the Yuma Project Reservation Division—Indian Unit. The tribe also has small uses at homestead sites south of Yuma. Pursuant to the Decree, the tribe possesses Decreed rights to divert 51,616 af of Colorado River water annually in California (Bureau of Reclamation 2000d).

The Cocopah Indian Reservation is located in southwestern Arizona, south of Yuma, Arizona. Pursuant to the Decree, the tribe possesses Decreed water rights to 10,847 afy of Colorado River water (Bureau of Reclamation 2000d).

2.5.3 Future Projects

Future BIA activity includes technical assistance, coordination, and liaison with Tribal governments and others engaged in land development.

2.5.3.1 Canal Lining

It will be necessary at times to patch or reline lined canals. Additionally, the projects may include lining unlined stretches of canal. Lining materials could include reinforced or un-reinforced concrete, shotcrete, geotextile, or clay. Lining of laterals and on-farm ditches reduces seepage flow to subsurface drainage and improves irrigation efficiency. There are no known areas on any of the reservations where lining a canal will reduce the amount of riparian areas. Table 2-50 shows the potential number of miles of lined canals that may be added to the projects described below.

Colorado River Indian Irrigation Project

The previously cited and included irrigation facility maps show, among other key features of the existing irrigation system, the unlined canals. Although it will be desirable to line all unlined canals to better control the flow of water, economics will dictate that a priority for lining be established. Unlined canals, although not as flow efficient as lined canals, usually seal themselves with the deposition of fine materials in the canals. If cleaned carefully, which is performed under normal maintenance, the seal is left undisturbed and seepage is minimal. *Development Plan for the Colorado River Irrigation Project* (June 1993) was developed via contract for the BIA. The plan estimated a total cost of $15 million for the lining of 19 laterals and installation, replacement, and rehabilitation of water delivery structures. Details on these improvements are provided in the June 1993 revised development plan (SFC Engineering 1992), which, with this reference, is herein included. Facilities are located on the three CRIIP irrigation facilities maps previously cited.

On the Reservation, seepage will nearly always follow the drainage from irrigated fields to the drains. There are few riparian areas (none of significance) in the developed project that are likely to be fed by water seeping from irrigation canals. The vegetation overlays have been incorporated into the reservation and area maps and are on file with BIA.

Fort Mohave Irrigation Project

The approximately 16 miles of unlined canals in California may be lined in the future. The seepage, sealing, and riparian elements are the same as described above. Reference Map II-4 from the Cooper Consultants, Inc.—Harza Engineering Company Report (Cooper Consultants, Inc.—Harza Engineering Company 1991) and Table 2-50.

Fort Yuma Irrigation Project

Approximately 60 miles of unlined distribution canals are projected for concrete lining (Table 2-50). Most of the farm ditches are earth ditches and may be lined in the future by the farmer/lessees under BIA-authorized improvement leases with the Indian landowners.

Cocopah Reservations

Irrigation canals at West Cocopah that could be concrete lined are operated and maintained by the Yuma County Water Users' Association. Most of the existing farm ditches on the West Cocopah Reservation are already concrete lined. The remaining earth ditches will be lined at the farmer's/lessee's discretion under BIA-authorized improvement leases with the Cocopah Tribe. There are no plans to concrete line farm ditches at North Cocopah because the Cocopah Tribe intends to completely develop the farmland on this reservation for other purposes, including expansion of the existing recreation vehicle (RV) park.

Fort Yuma Homesteads

Irrigation canals at the Fort Yuma Homesteads that could be concrete lined are operated and maintained by the Yuma County Water Users' Association. Most of the existing farm ditches on the Fort Yuma Homesteads are already concrete lined. The remaining earth ditches will be lined at the farmer's/lessee's discretion under BIA authorized improvement leases with the Indian landowners (Table 2-50).

2.5.3.2 Water Conservation Practices

Colorado River Agency

The water conservation practices described earlier under ongoing activities will continue into the future. They no doubt will even intensify because all the Tribes will want to make the most efficient use of their water entitlements. Although no plans have been developed, other options, such as storage of water and increased reuse of irrigation and other reclaimed water will be considered. Canal lining, as described earlier, will contribute to water conservation.

Fort Yuma Agency

Because the Cocopah and Fort Yuma Reservations and Fort Yuma Homesteads use Colorado River water for irrigation, Reclamation has asked the Fort Yuma Agency to cooperate in developing water conservation plans and implementing them. Agency staff will be working with Reclamation, the Cocopah, and Quechan Tribes and the respective irrigation districts.

2.5.3.3 Farmland Development, Including Construction of Irrigation Systems

The BIA Indian irrigation projects have not been completed, and, therefore, none of the Tribes along the LCR have been able to fully use their entitlements to Colorado River water. The entitlements granted to the Tribes by Decree entitlement are based on the PIA on each reservation. All of the projects have additional lands that are PIA and may be converted to agriculture in the future, which will also require new irrigation systems or the extension of the existing systems. Environmental clearance must be completed for each project. Table 2-50 shows the breakdown by project (Tribe) of potential additional acres of irrigated agriculture. The general location of these potential areas of irrigated agricultural development is shown in Figure 2-5 and areas are detailed in Figures 2-6–2-19. A potential timeline for planning, compliance, and implementation for each of the projects is presented in Table 2-53.

The farmland development projects described in this section are covered under the LCR MSCP BA, with the exception of:

- the Chemehuevi Irrigation Project (described below) to convert 2,020 acres of existing lands to agricultural uses (see Table 2-50 and Figure 2-17); and
- 3,832 acres of the total 4,442 acres of agricultural development that would remove honey mesquite type IV land cover that provides habitat for the Arizona Bell's vireo (i.e., 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.

Colorado River Indian Irrigation Project

The Tribe plans to bring an additional 25,000 acres into agricultural production should Congress appropriate adequate funds to complete the CRIIP. These lands and associated infrastructure are shown in detail in the Cooper/Harza Rehabilitation and Betterment Report. Additional information on future development is contained in the *Development Plan for the Colorado River Irrigation Project* (SFC Engineering 1993). The location of the proposed agricultural development and acres of habitat types affected are illustrated in Figures 2-5–2-13. With the inclusion of necessary infrastructure for the new agricultural lands, the total acreage affected is 27,620 acres (Table 2-50).

There will be no future diversion points, at least on the Arizona side of the river because the diversion at Headgate Rock Dam was designed to service the completed system. Any mesa irrigation will be drawn from project canals because well water quality is not suitable for irrigation. Irrigation projects outside the designated boundaries (the historical floodplain) of the LCR MSCP planning area will not be covered by this LCR MSCP BA. In California, existing river pumping sites will be upgraded by the lessees.

Fort Mohave Irrigation Project

The Tribe plans to fully develop its farmland, which will increase farmed acreage by approximately 3,745 acres in Arizona (Table 2-50). New canals and new pumping stations would be constructed, bringing the total affected acres to 4,160 acres (Figure II-1

Table 2-53. Estimated Timeline for Development of Irrigation Facilities for Bureau of Indian Affairs (revised Jan 16, 2003)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
CRIR	Funding (Phase I and NEPA Process)		NEPA Process		Const. Phase I—	Funding		Const. Phase II—	Funding		Const. Phase III—	Funding		Const. Phase IV—	Funding		Const. Phase V--				
Fort Mohave	Funding Process		NEPA Process		Construction--- Phases I & II																
Chemehuevi	Funding Process		NEPA Process		Construction-------------------- Phase II																
Fort Yuma	Funding Process		NEPA Process		Construction----------- Phase II																
North and West Cocopah	Funding Process		NEPA Process		Construction------------ Phase II																

<u>CRIR</u>	<u>Funding Process</u>	<u>NEPA Process</u>	
Phase I	2007–2008 (for NEPA and Phase I Const.)	2009–2010 (one document for all phases)	2011–2013
Phase II	2012–2013		2014–2016
Phase III	2015–2016		2017–2019
Phase IV	2018–2019		2020–2022
Phase V	2021–2022		2023–2025

Total Acres: 25,000 (Each phase of construction will involve 5,000 acres)

<u>Fort Mohave</u>
Funding process: 2007 to 2008
NEPA Process: 2009 to 2010
Construction period: 2007 to 2014 (Phases I & II)
Acres: 5,400

<u>Chemehuevi</u>
Funding process: 2007 to 2008
NEPA Process: 2009 to 2010
Construction period: 2014 to 2016 (Phase II)
Acres: 1,600

<u>Fort Yuma</u>
Funding process: 2007 to 2008
Construction
NEPA Process: 2009 to 2010
Construction period: 2014 to 2016 (Phase II)
Acres: 715

<u>North and West Cocopah</u>
Funding process: 2007 to 2008
NEPA Process: 2009 to 2010
Construction period: 2014 to 2016 (Phase II)
Acres: 500

** This funding and construction time lines are presented only for projecting temporal impacts for the LCR MSCP BA and have not been reviewed by the affected tribes.

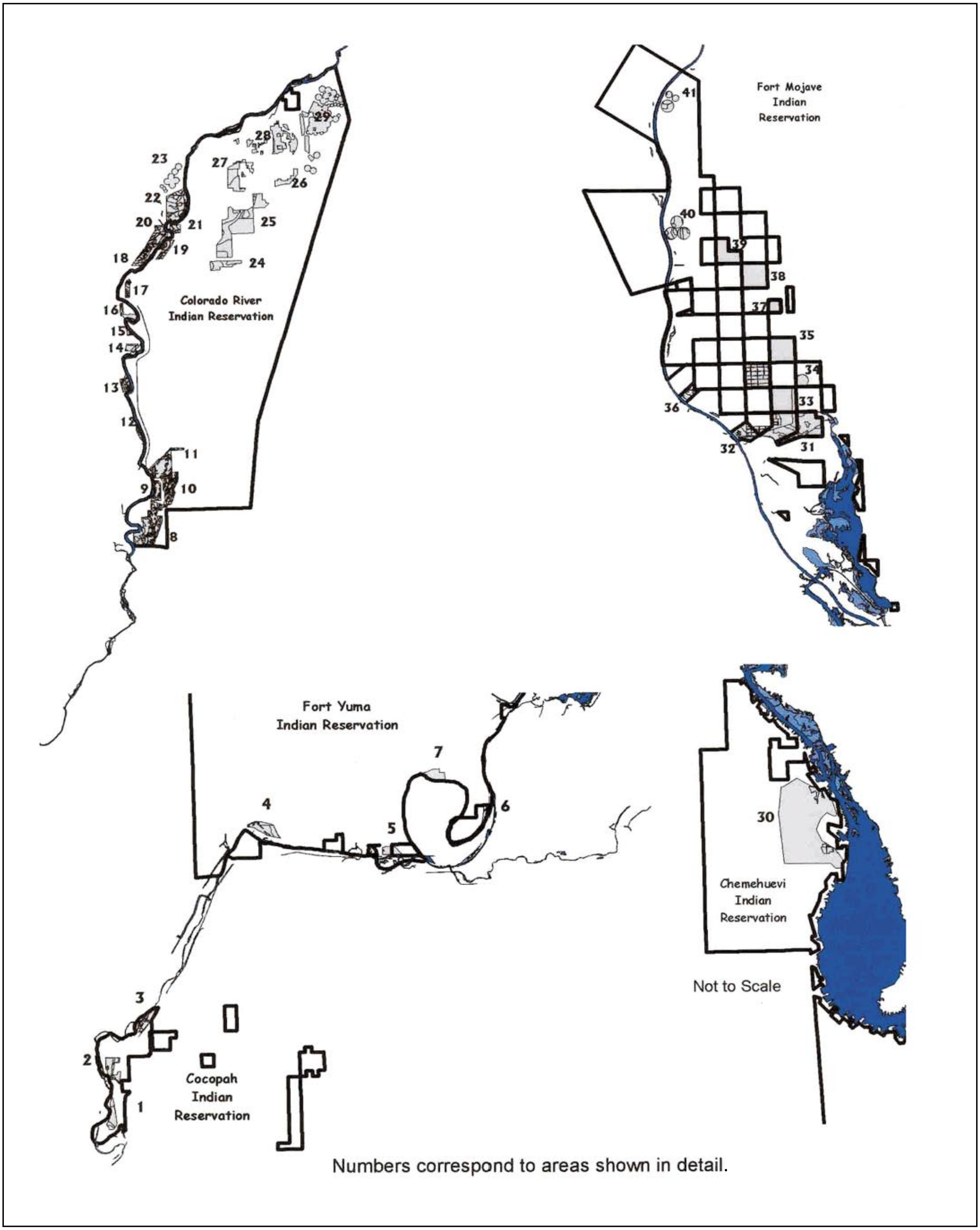

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Figure 2-5
Potential Agricultural Development for Indian Tribes along the LCR
(see detail in following maps)

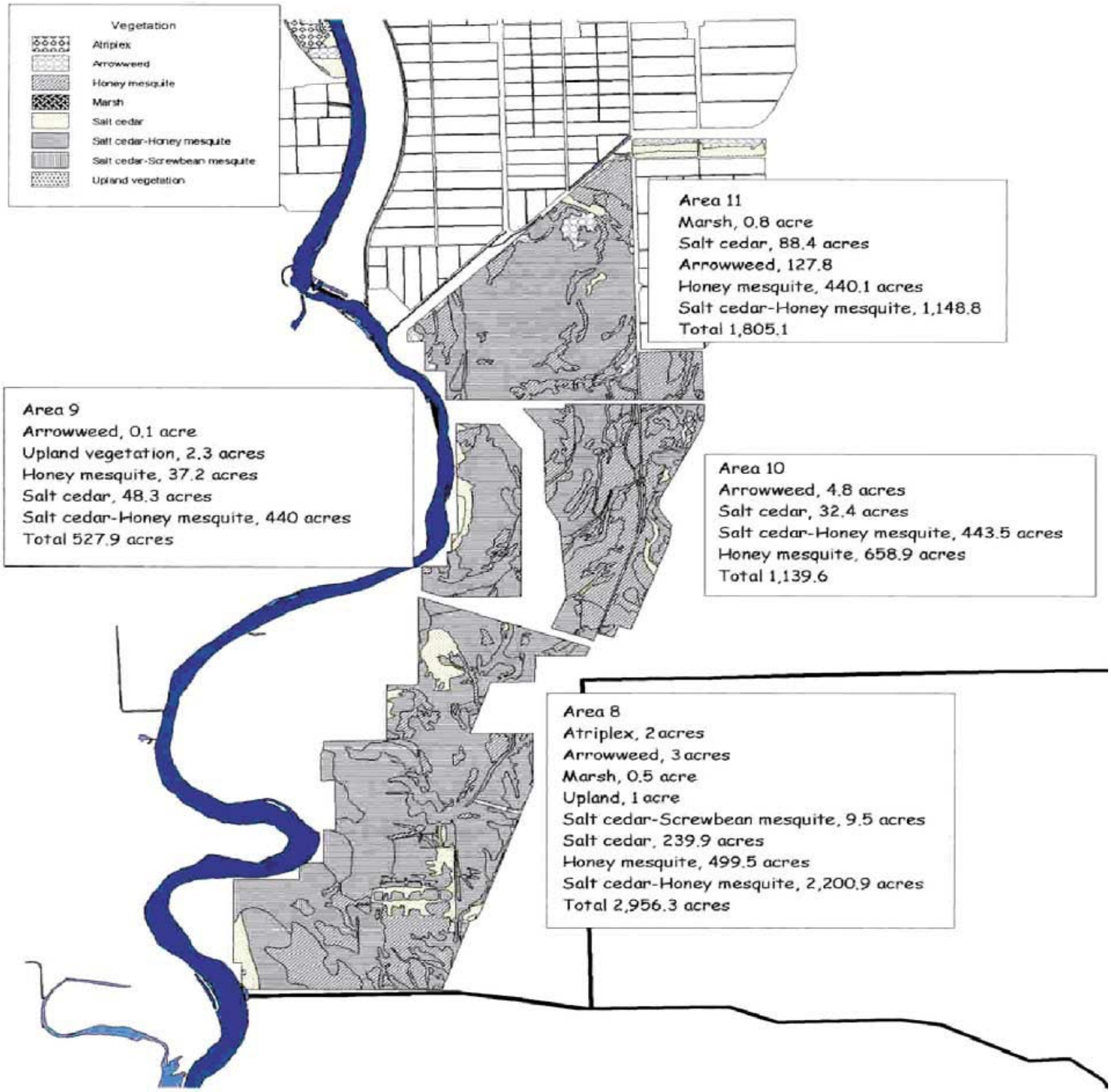

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Figure 2-6
Potential Agricultural Development in Areas 8, 9, 10, and 11 — Colorado River Indian Reservation

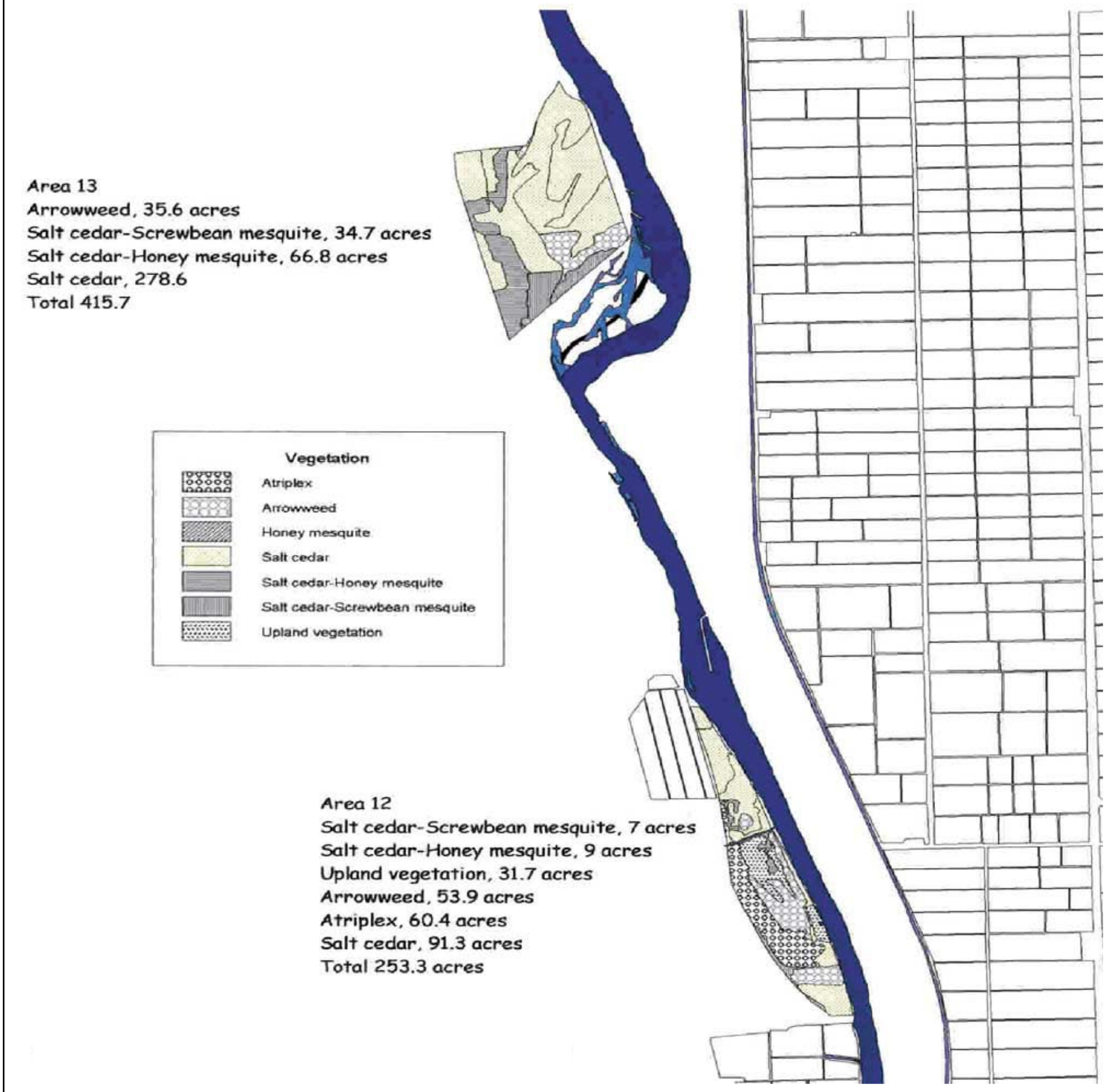

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Figure 2-7
Potential Agricultural Development in Areas 12 and 13 — Colorado River Indian Reservation

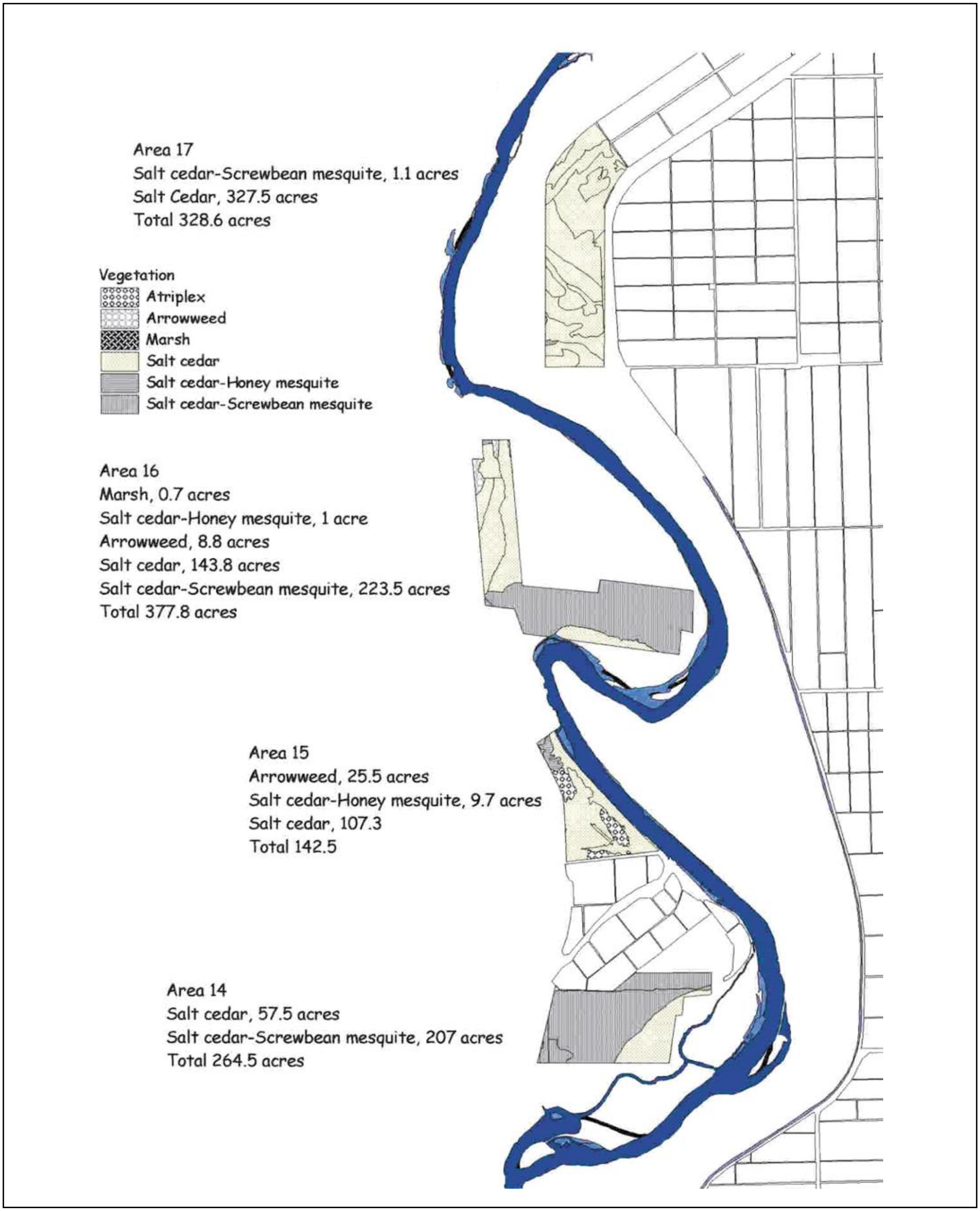

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Figure 2-8
Potential Agricultural Development in Areas 14, 15, 16, and 17 — Colorado River Indian Reservation

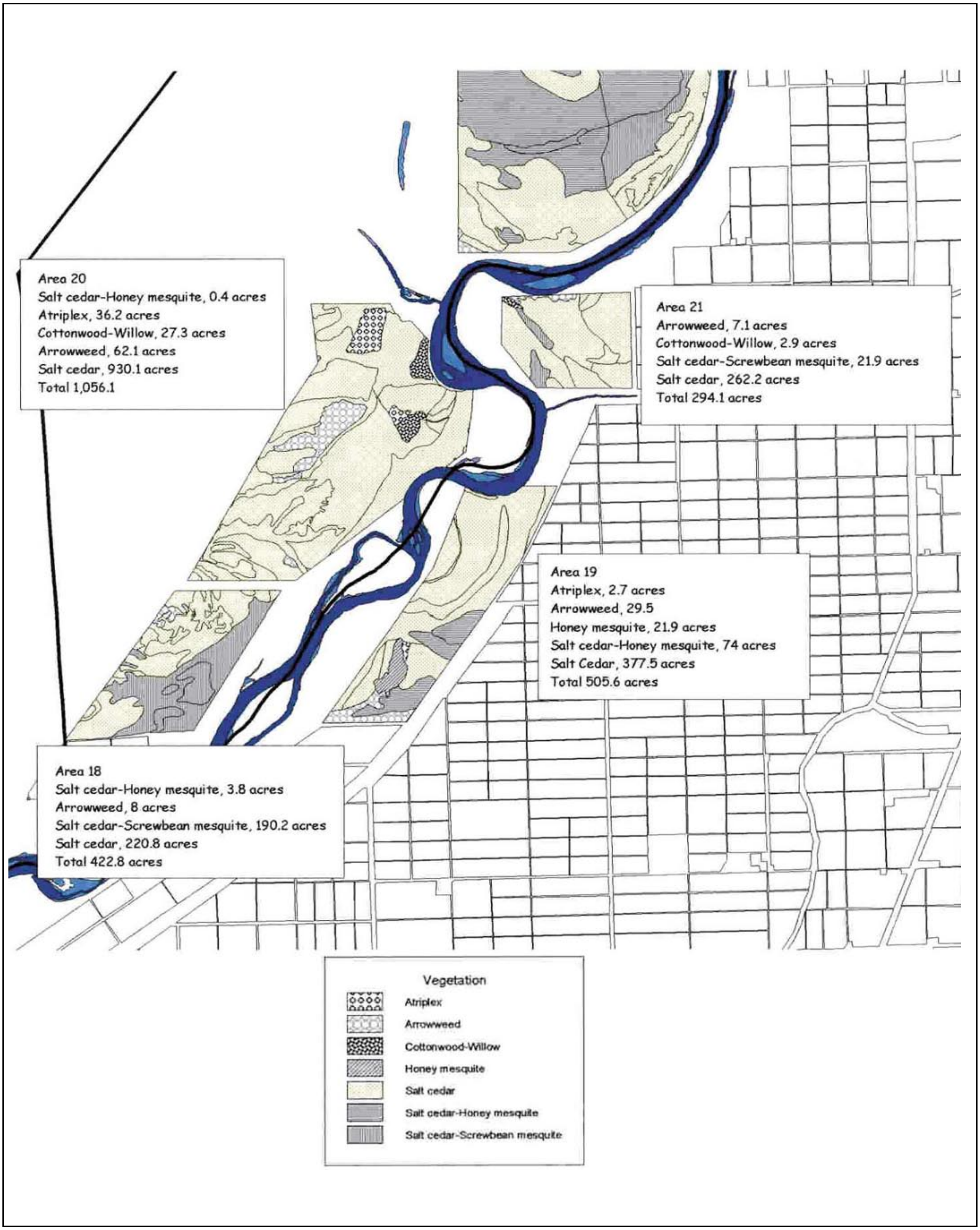

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Figure 2-9
Potential Agricultural Development in Areas 18, 19, 20, and 21 — Colorado River Indian Reservation

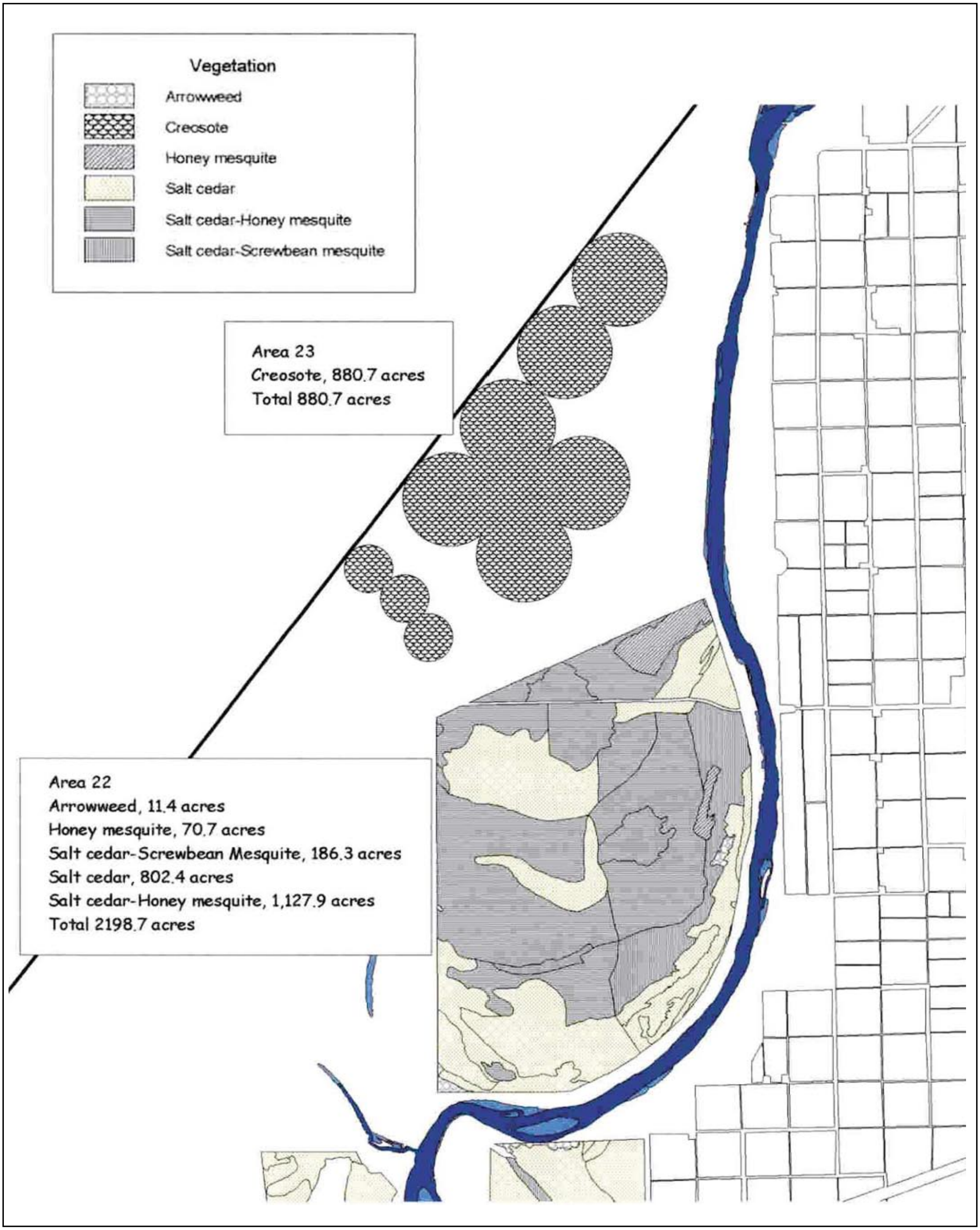

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Figure 2-10
Potential Agricultural Development in Areas 22 and 23 — Colorado River Indian Reservation

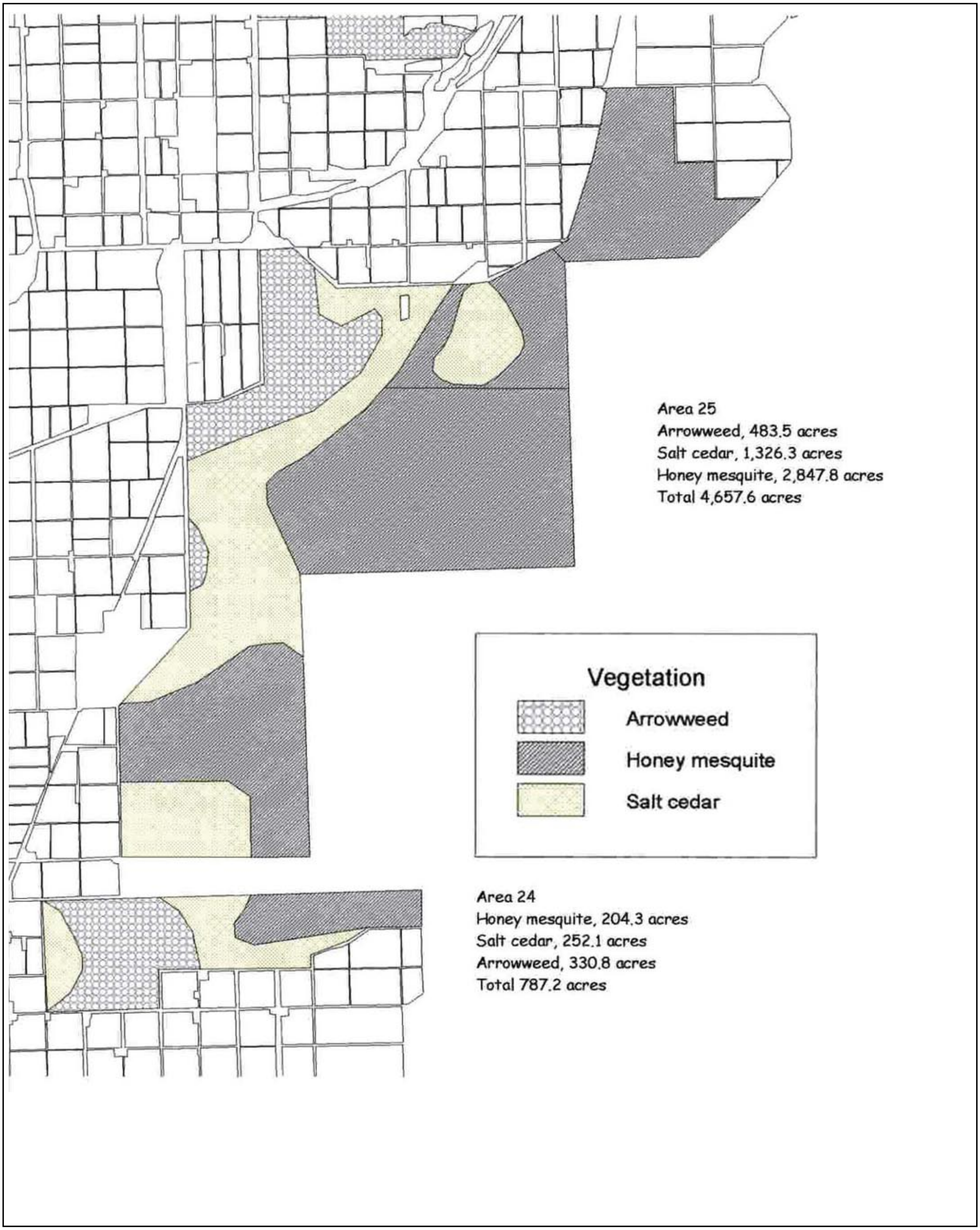

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Figure 2-11
Potential Agricultural Development in Areas 24 and 25 — Colorado River Indian Reservation

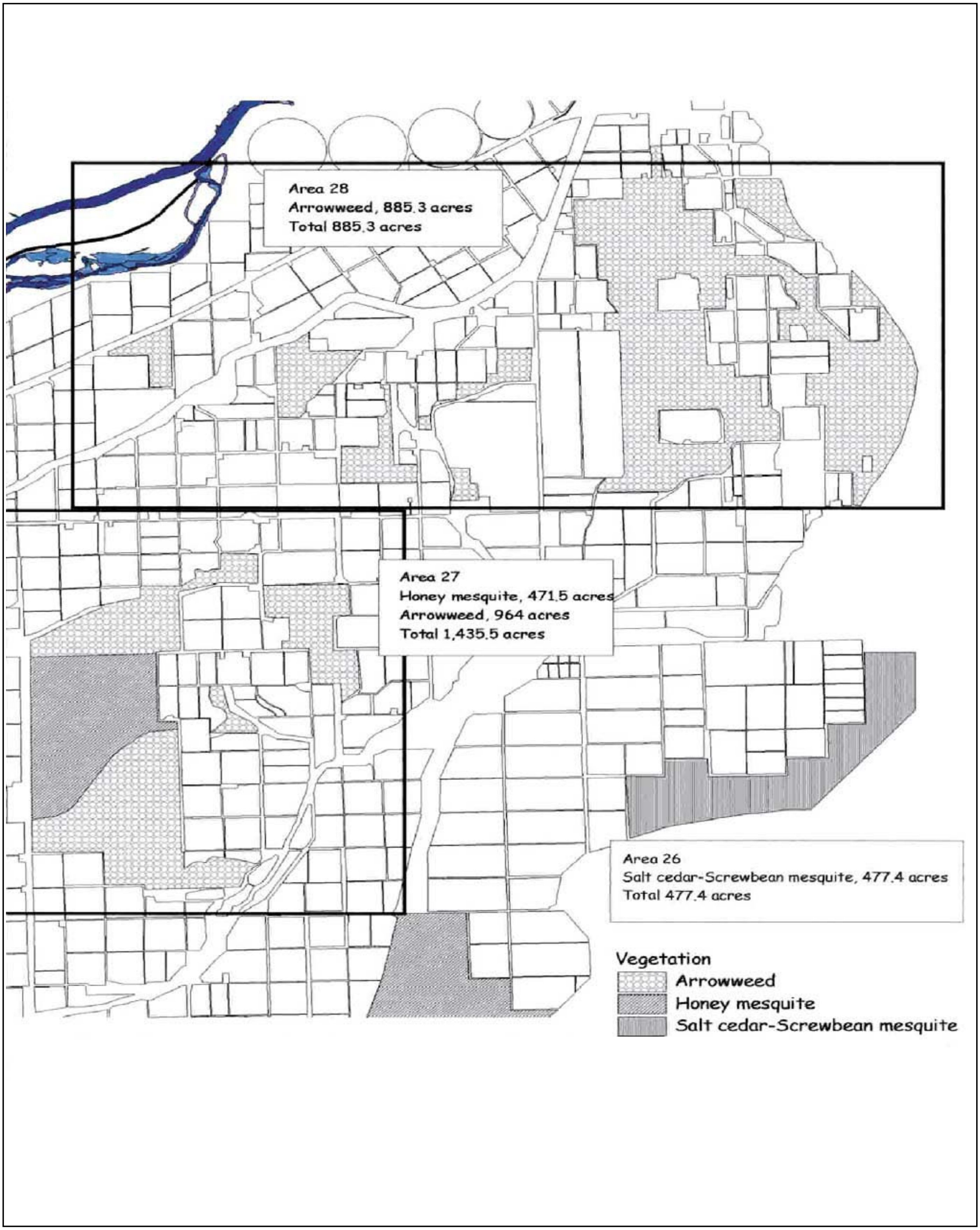

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Figure 2-12
Potential Agricultural Development in Areas 26, 27, and 28 — Colorado River Indian Reservation

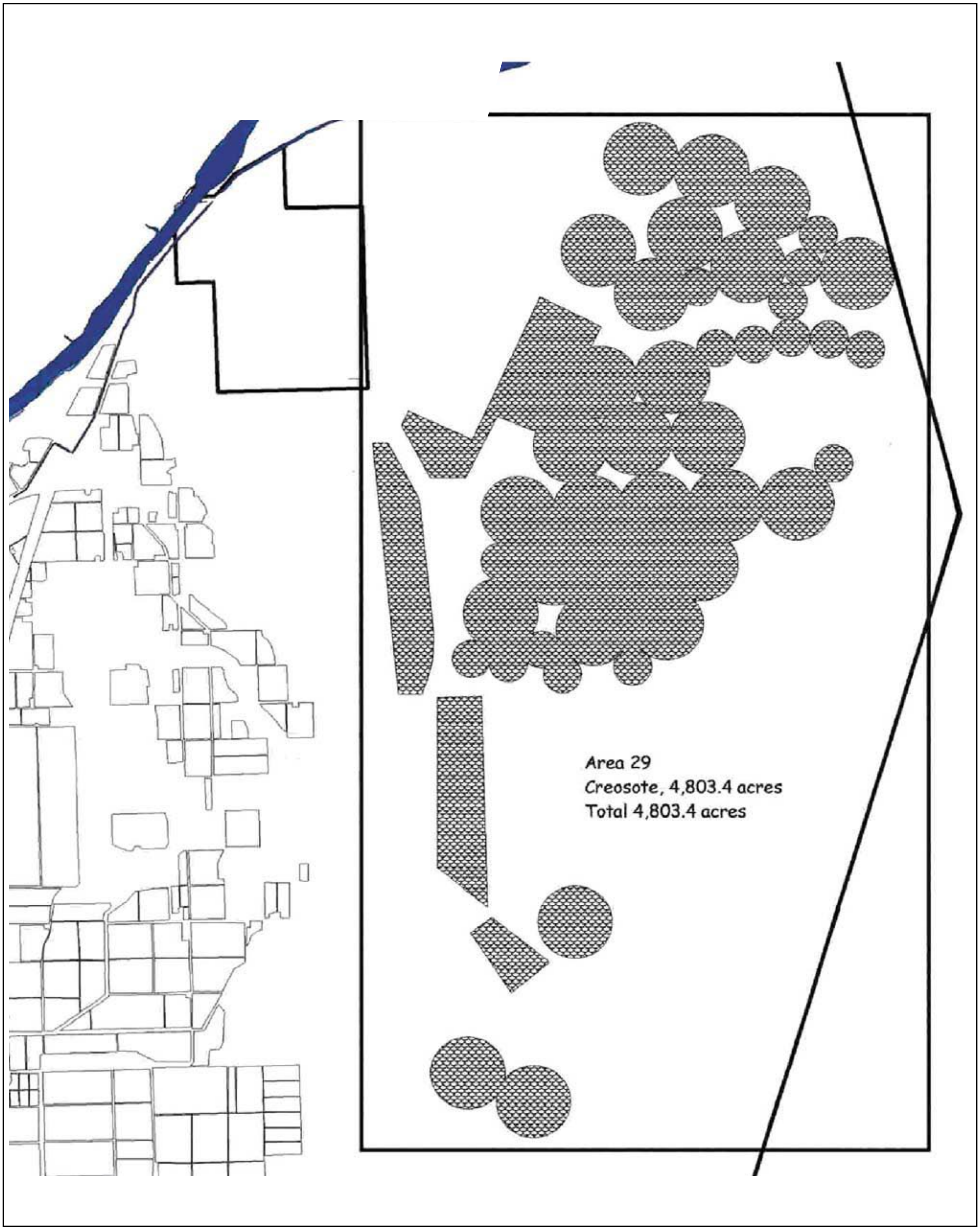

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Figure 2-13
Potential Agricultural Development in Area 29 —
Colorado River Indian Reservation

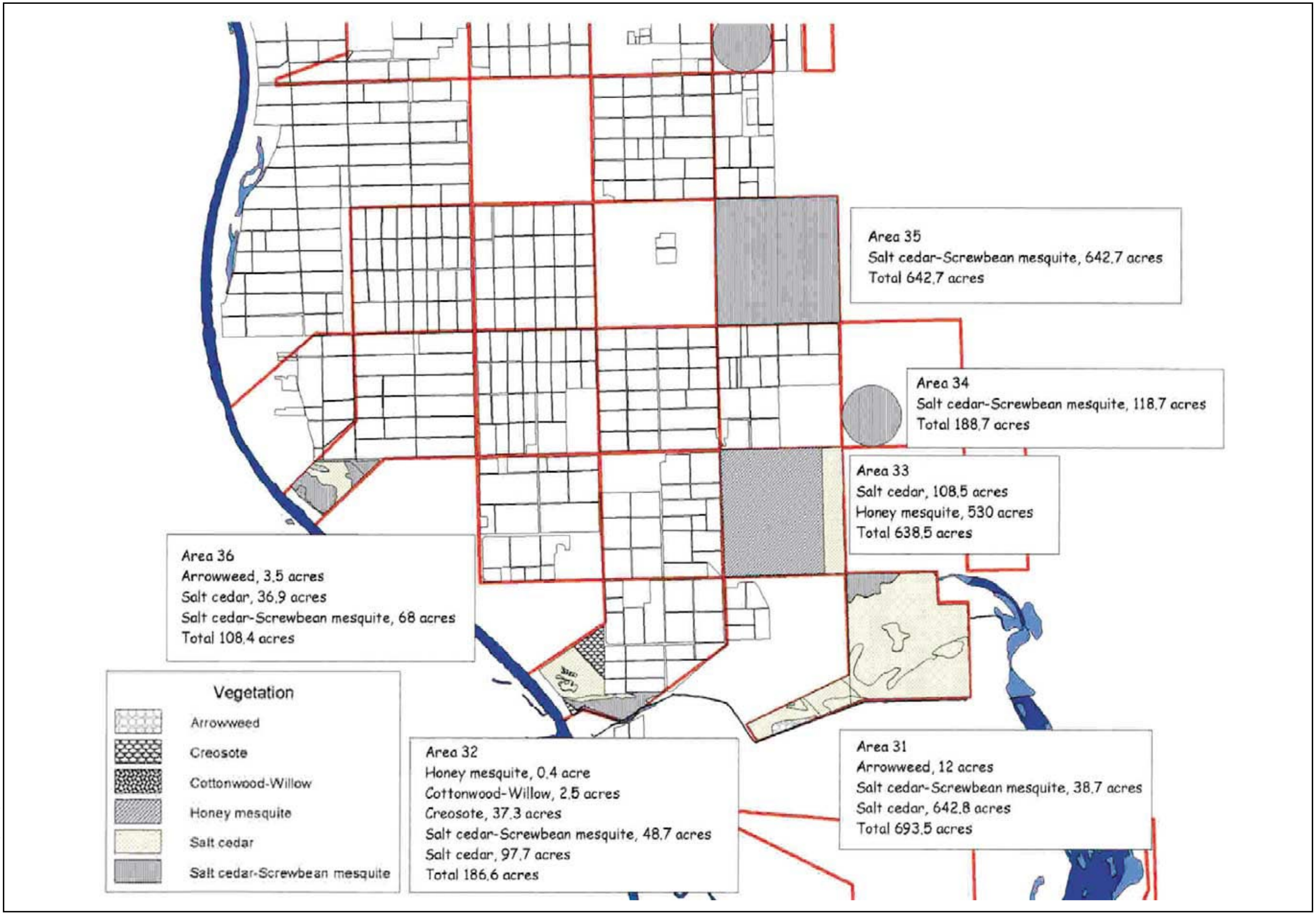

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Figure 2-14
Potential Agricultural Development in Areas 31, 32, 33, 34, 35, and 36 — Fort Mojave Indian Reservation

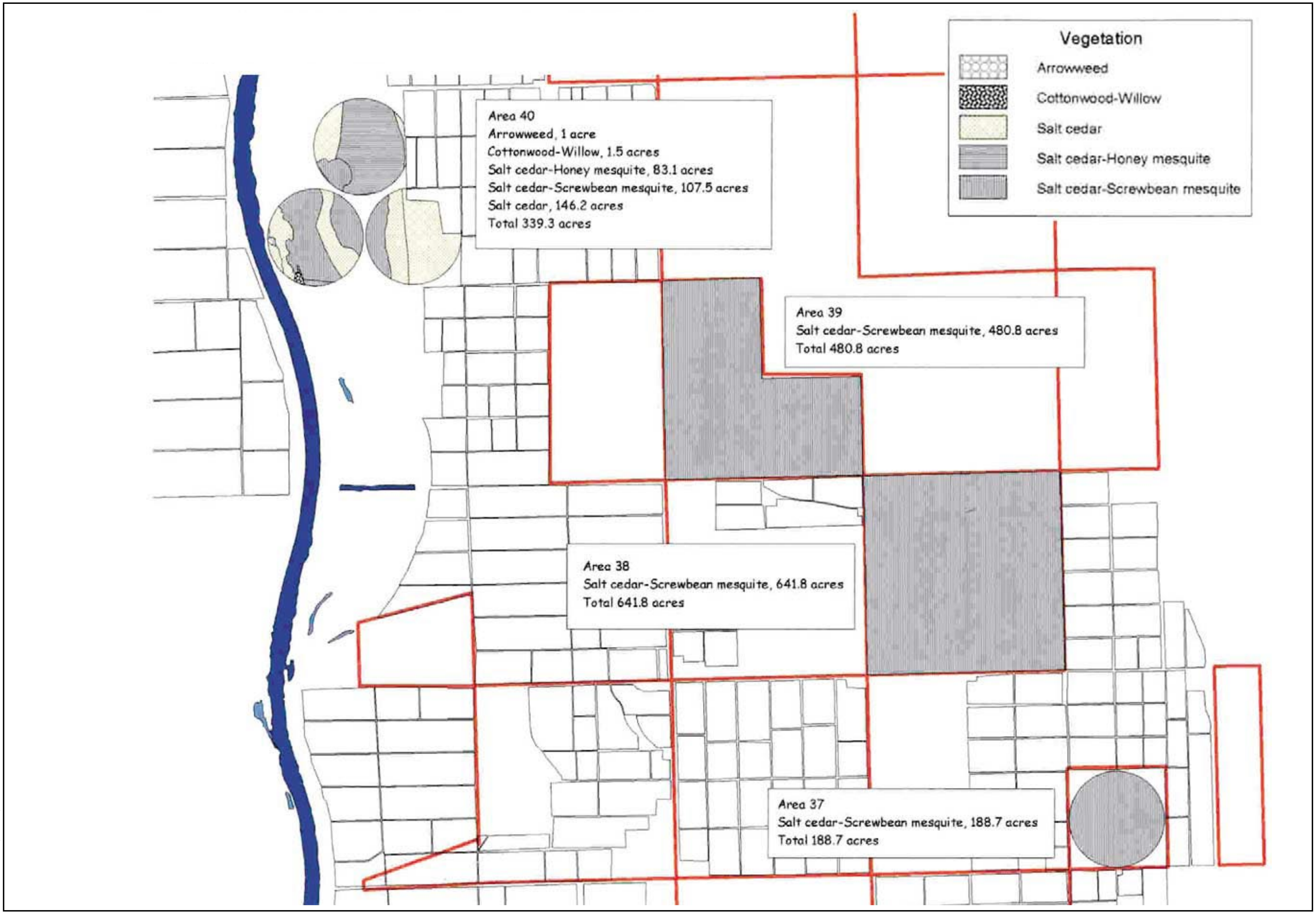

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Figure 2-15
Potential Agricultural Development in Areas 37, 38, 39, and 40 — Fort Mojave Indian Reservation

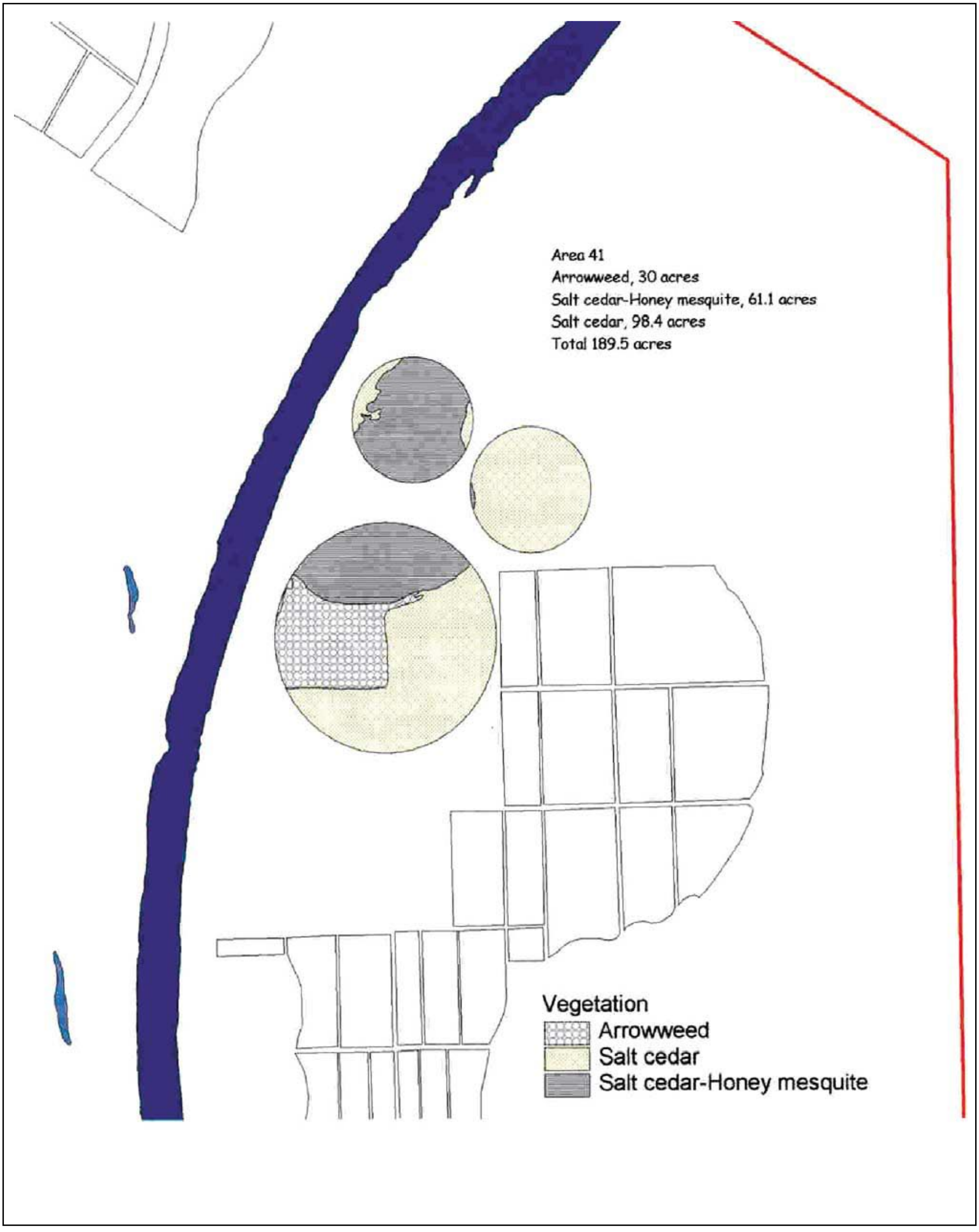

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Figure 2-16
Potential Agricultural Development in Area 41 — Fort Mojave Indian Reservation

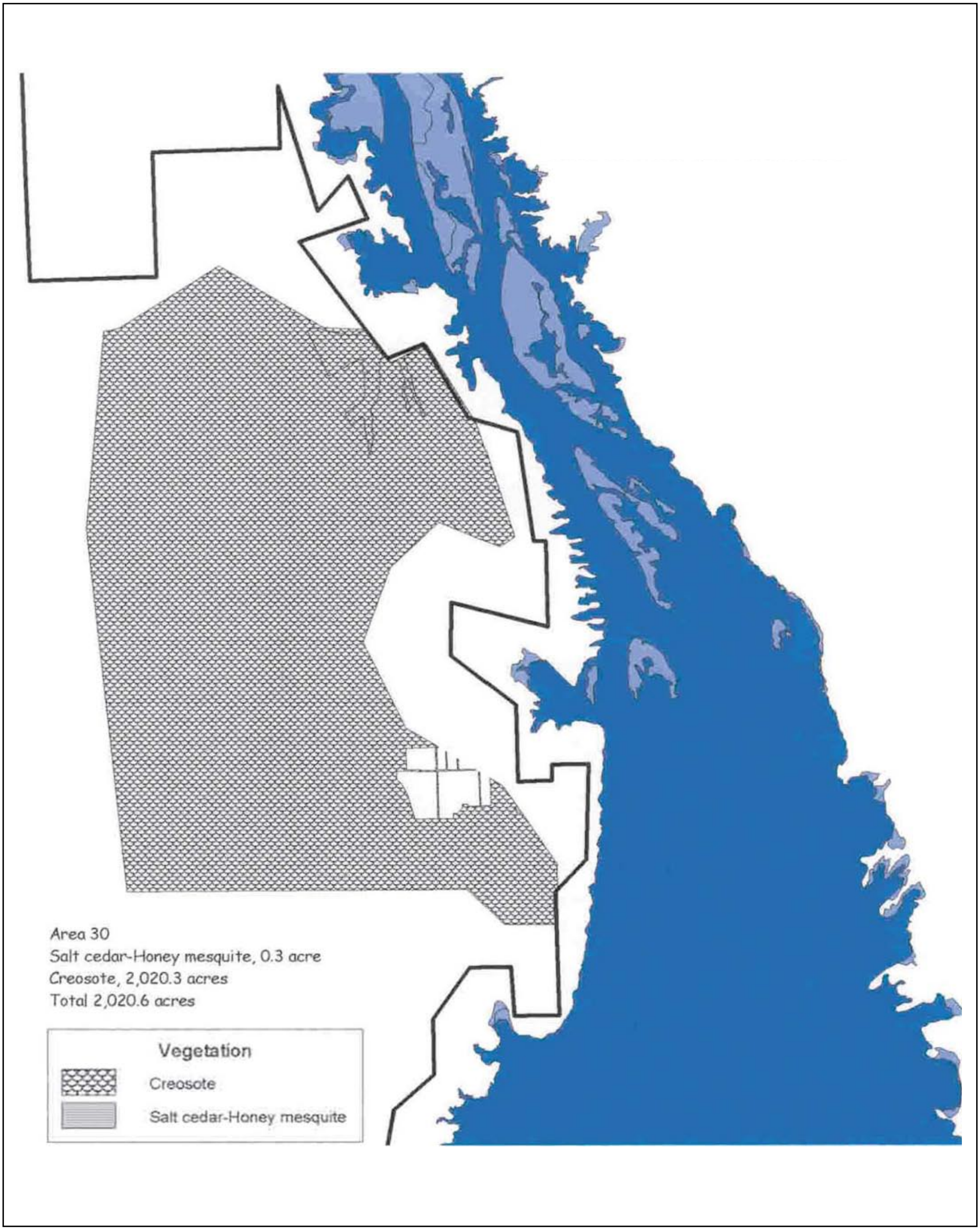

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Figure 2-17
Potential Agricultural Development in Area 30 —
Chemehuevi Indian Reservation

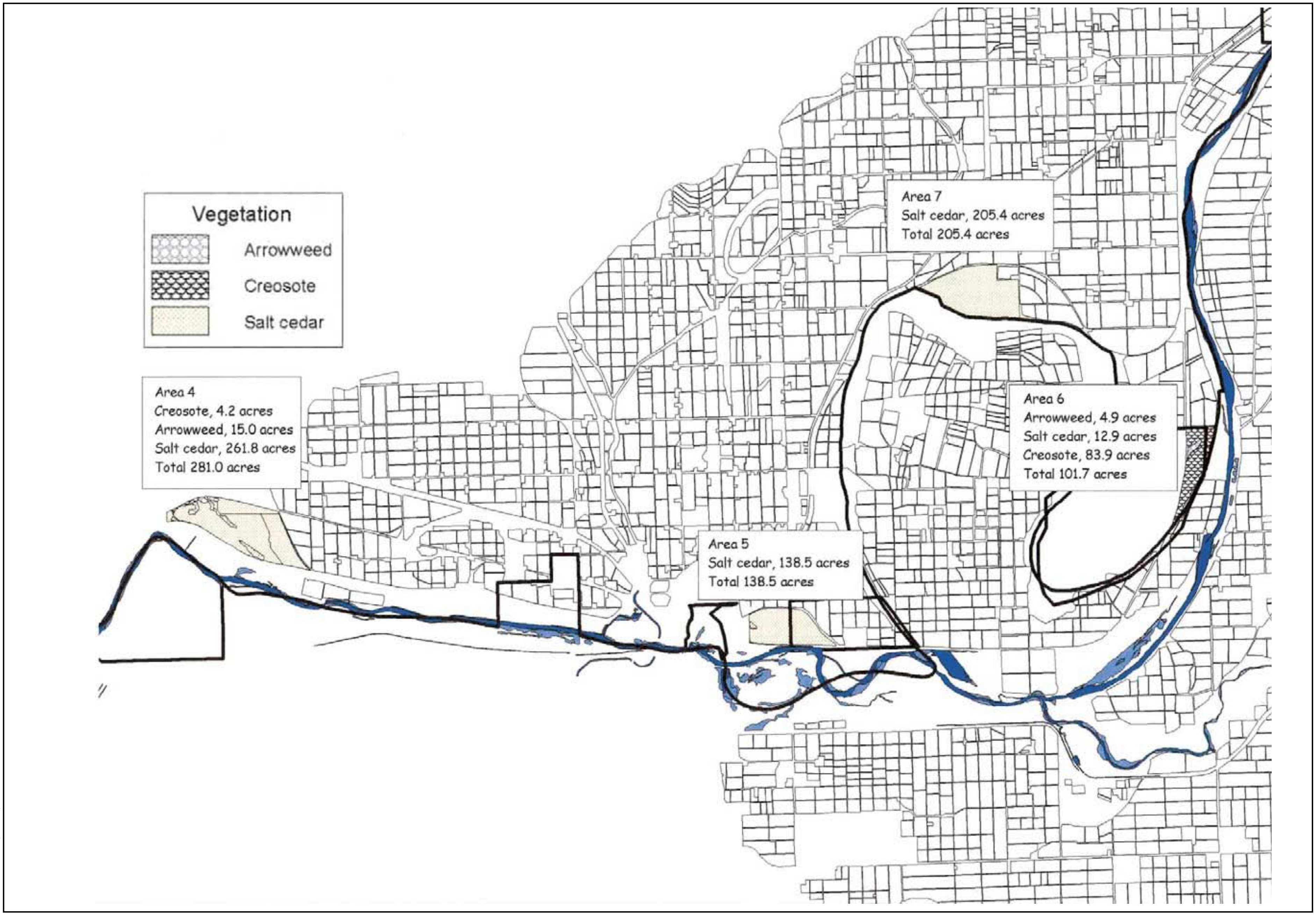

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Figure 2-18
Potential Agricultural Development in Areas 4, 5, 6, and 7 — Fort Yuma Indian Reservation

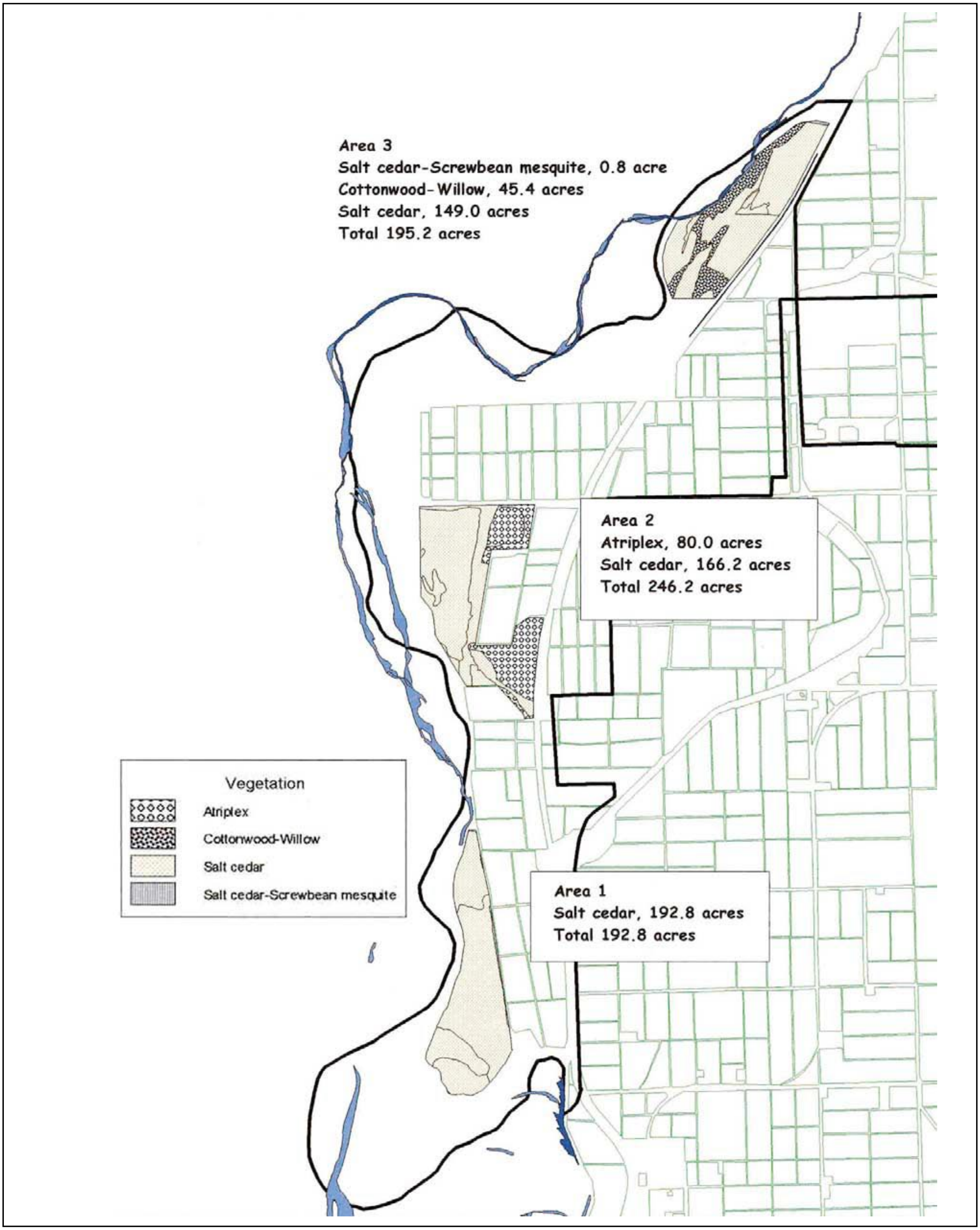

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Figure 2-19
Potential Agricultural Development in Areas 1, 2, and 3 — Cocopah Indian Reservation

and Maps IX-1 to IX-5 of the Cooper report). The locations of the proposed irrigation development sites and affected vegetation are illustrated in Figures 2-14–2-16.

Chemehuevi Irrigation Project

The Tribe may develop up to 1,855 acres of land, including the 300 acres already referenced (Table 2-50). The current pump station will service only up to 500 acres. Additional like facilities would be constructed in and from Catfish Bay because it is central to the total agricultural area and best suited for water extraction without infringing seriously on wildlife habitat. Figure 2-17 shows the location of the proposed irrigated agriculture development and acres of habitat affected. With needed infrastructure to support the new development, approximately 2,020 acres will be affected (Table 2-50).

Fort Yuma Agency

The location of the proposed 650-acre irrigation development project and acres of affected habitat are illustrated in Figure 2-18 (Table 2-50). Vegetation communities are mostly saltcedar, with a very few mesquite trees on undisturbed areas. At Fort Yuma, about 400 acres have been cleared by Reclamation for dredge spoil deposition.

Using a water duty of 5.0 af per acre, the Fort Yuma project will need 5,000 afy. New farm ditches will be constructed, usually by farmer/lessees, as potential farming areas are developed on the Fort Yuma Reservations, with tie-ins to the existing irrigation system, or new wells drilled.

Cocopah Indian Reservation

Three Cocopah sites are proposed for 500 acres of irrigated agriculture development (Figure 2-19). With needed infrastructure, 635 acres of habitat will be impacted (Table 2-50). It is anticipated 2,500 af will be needed to make these sites productive. New farm ditches will be constructed, usually by the farmer/lessees, as potential farming areas are developed on the West Cocopah Reservation, with tie-ins to the existing irrigation system, or new wells drilled.

2.5.3.4 Riparian Habitat Rehabilitation and Restoration

Through the process of site evaluation and planning by the LCR MSCP Program Manager, the sites or situations referenced herein for the two Tribes will be screened for inclusion as conservation areas to be selected, developed, and managed under the LCR MSCP Conservation Plan. The screening and evaluation process will be a multiparty undertaking, involving all jurisdictional entities.

Fort Yuma Reservation

The Quechan Tribe intends to continue with its Woodland Rehabilitation and Restoration Plan (Quechan Tribe 2000).

Cocopah Reservations

The Cocopah Tribe intends to implement its Habitat Enhancement Concept Plan (Jones & Stokes Associates 1999).

2.5.3.5 Headgate Rock Dam Operation and Maintenance

Water and Power Operations

Headgate Rock Dam was completed in 1941 and is a diversion dam and part of CRIIP. It controls the surface elevation of a 16-mile stretch of the river, reaching almost to the tail water of Parker Dam. There is very little daily fluctuation in the water levels upstream of Headgate Rock Dam. Downstream levels reflect the releases from Parker Dam. Irrigation water is diverted from above the dam almost 12 months out of the year. When water is being diverted, the upstream elevation is kept at or around 364.4 feet msl. When water is not being diverted, the upstream lake can be lowered by opening the spillway gates, and the water level is kept at or around 363.4 feet msl. When the power plant is operational, power is generated through up to three 6.5-megawatt turbine units depending on water release through Parker Dam. The power is used for the irrigation project, BIA s needs, power sales, and exchanges off reservation.

CRIIP's main canal is 18 miles long and includes six major control or diversion structures, as well as minor delivery, drainage, and highway structures. CRIIP operates the diversion on a demand basis. Water users must place their order at least 48 hours in advance, and the irrigation office usually provides that water within 48 hours from the posted end-of-order time each day. Accumulated daily water orders are relayed to the Dam, so that gates on the dam and main canal intake structure are raised or lowered to divert the correct quantity into the irrigation system.

The CRIIP Irrigation Office prepares and submits an annual report that provides the annual projected water use to the River Operations Branch of Reclamation. This report estimates the monthly flow to be diverted for CRIIP use in the next crop year.

2.5.3.6 Wildland Fire Management

The BIA Colorado River and Fort Yuma Agency offices are currently working with the five LCR Tribes to develop wildland fire management plans for each of the reservations. The Wildland Fire Management Plan for the Hualapai Reservation has been completed by the Truxton Canyon BIA Agency office. The BIA is completing fire management planning on every burnable acre, as mandated by the Congressional 1995 and 2001 Federal Wildland Fire Policies. BIA and Tribal staff, coordinating with other Federal agencies, are planning to conduct wildland fire fuel hazard reduction and hazardous fuels reduction in the wildland/urban interface. The completed plans include programmatic EAs. Project-specific EAs will tier from the programmatic EAs. They will be conducted prior to any fuel hazard reduction activity to ensure that the project meets Tribal goals and objectives, complies with existing Tribal environmental and legal codes, and are guided by Federal statue.

BIA wildland fire management objectives provide for firefighter and public safety as the first priority in every wildland fire management activity. Another objective is to provide effective wildland fire protection, fire use and hazardous fuels management, and timely rehabilitation on Indian lands held in trust by the United States, based on management plans approved by the Indian land owner. Preparedness is based on the most efficient level of meeting Tribal goals and objectives for the program. It uses resources and cooperative, interagency approaches to meet local, regional, and national resource needs. It strives for an effective fire prevention program focusing on human-caused fires. Implementation of Tribal management of the program will be facilitated with a self-determination contract, as requested by Tribal government.

Fuels/hazardous vegetation will be managed through the use of mechanical treatments, prescribed fire, wildland fire use, and/or chemical treatments, as approved by the local Tribal leadership.

Colorado River Reservation

Approximately 400 acres of this 270,000-acre reservation have proposed fuels management projects.

Fort Mojave Reservation

Approximately 100 acres of this 42,000-acre reservation have proposed fuels management projects.

Fort Yuma Reservation

Approximately 45 acres of old fuel breaks and hazardous fuels in communities are planned to be cleared on this 52,000-acre reservation.

Cocopah and Fort Yuma Homesteads Reservation

Fuel breaks and hazardous fuels around homes and businesses are planned to be cleared on this 600-acre agricultural and residential reservation.

Hualapai Reservation

Fuels management activities will occur around communities and in areas of high-hazard fuels. They tend to be distant from the Colorado River corridor. It is unlikely that planned reservation fuels management activities will greatly affect the area of concern.

2.6 U.S. Fish and Wildlife Service

2.6.1 Introduction

In managing the four NWRs along the LCR, the USFWS makes decisions regarding the temporal and spatial diversion (i.e., diverting surface flows or pumping) of its Colorado River water rights and, in some situations, return flows to the river. Recent deliveries and return flows are provided in Appendix Q (Article V Decree Accounting Report for 2000). Water rights for use of Colorado River water by Havasu, Cibola, and Imperial NWRs were granted in the Decree and by Secretarial reservation. These waters are regulated and managed by Reclamation. Bill Williams River NWR uses waters regulated and managed by the Corps. Water rights are granted by Arizona for the Bill Williams River, a tributary of the Colorado River, and thus, this water is not considered Colorado River water until it commingles at the mainstem.

2.6.2 Havasu National Wildlife Refuge

Havasu NWR has an entitlement in annual quantities reasonably necessary to fulfill the purposes of the refuge, not to exceed 41,839 af of water diverted from the Colorado River mainstem or 37,339 af of consumptive use of mainstem water, whichever is less. Consumptive use means diversions from the river less such return flow thereto as is available for consumptive use in the United States or in satisfaction of the 1944 Water Treaty obligation. Consumptive use of the mainstem includes all consumptive uses of water of the mainstem, including water drawn from the mainstem by underground pumping, and including, but not limited to, consumptive uses by persons, agencies of that state, and the United States for the benefit of Indian reservations and other Federal establishments within the state, i.e., Havasu, as well as Cibola and Imperial NWRs. The priority date for Havasu NWR entitlement is January 22, 1941, for lands reserved by Executive Order 8647, and a priority date of February 11, 1949, for lands reserved by Public Land Order 559.

2.6.3 Cibola National Wildlife Refuge

Cibola NWR has an entitlement that was established by a Secretarial reservation in the FR on December 8, 1982, as follows:

> Consistent with the 2/9/44 contract between the United States and the State of Arizona, notice is given that the following amount of Colorado River water is reserved for the United States for use on the Cibola NWR in Arizona: (1) The diversion of 27,000 af

annually from the mainstem or the consumptive use of 16,793 af annually from the mainstem, whichever is less, with a priority date of 8/21/64."

Additionally, Cibola has a diversionary right for 7,00 af annually for the purpose of circulation through Cibola Lake.

2.6.4 Imperial National Wildlife Refuge

Imperial NWR has an entitlement in annual quantities reasonably necessary to fulfill the purposes of the refuge not to exceed 28,000 af of water diverted from the mainstem or 23,000 af consumptive use of mainstem water, whichever is less, with a priority date of February 14, 1941.

2.6.5 Bill Williams River National Wildlife Refuge

Bill Williams River NWR does not receive Colorado River water. (Technically the refuge does withdraw less than 2 af of Colorado River water from its headquarters' well, but it is under Havasu NWR's water rights).

2.7 Bureau of Land Management

BLM makes decisions regarding the temporal and spatial diversion (i.e., whether to divert surface flows or pump) of its Colorado River water rights and, in some situations, return flows to the river. Recent deliveries and return flows are identified in Appendix Q (Article V Decree Accounting Report for 2000). BLM has a consumptive use entitlement of 4,010 cfs under Secretarial Reservations dated August 30, 1973, September 29, 1981, and April 27, 1987, and under Contract No. 8-07-30-W0373, dated June 13, 2000. BLM also has surplus diversion entitlement of 1,000 cfs under Secretarial Reservation, dated August 30, 1973, and Contract No. 8-07-30-W0374, and 1,150 cfs under Contract No. 6-07-30-W0351, dated August 26, 1999.

BLM is not seeking coverage for any additional actions. It completed a previous section 7 consultation on its discretionary actions along the LCR. Lands managed by BLM may be selected, through cooperative planning between the LCR MSCP Program Manager and BLM, for the use in implementation of LCR MSCP–sponsored conservation projects along the LCR.

2.8 LCR MSCP Conservation Plan

2.8.1 LCR MSCP Conservation Plan Implementation

The LCR MSCP Conservation Plan, as described in the LCR MSCP HCP, is a robust approach to covered species conservation that addresses all adverse effects of the covered actions, projects, and activities described in Chapters 2 and 3 of this BA and Chapter 2 of the LCR MSCP HCP. All elements of the Conservation Plan, as described in the LCR MSCP HCP, are part of the Federal actions covered by this BA.

The LCR MSCP Conservation Plan, as described Chapter 5 of the HCP, is incorporated by reference in its entirety into this BA. Tables 2-54–2-56 provide a summary of the goals, conservation measures, and expected outcomes for covered species with implementation of the LCR MSCP that are described in the LCR MSCP Conservation Plan. Figures 2-20 and 2-21 illustrate how LCR MSCP-created cottonwood-willow and marsh land cover will be designed and distributed among reaches to provide habitat and achieve LCR MSCP goals for each of the associated covered species. In addition to the conservation measures identified in Tables 2-54–2-56, other key conservation measures in the HCP include:

- establishing a $25 million fund for maintaining important existing habitat areas,
- augmentation of razorback sucker populations with 660,000 hatchery-raised and reared fish (at least 300 millimeters [mm] long),
- augmentation of bonytail populations with 620,000 hatchery-raised and reared fish (at least 250 mm long),
- funding of $500,000 to the Glen Canyon Dam Adaptive Management Workgroup to support conservation programs for humpback chub,
- funding of $400,000 for conservation measures in support of flannelmouth sucker in the LCR, and
- Funding of $10,000 per year until 2030 to the MSHCP Rare Plant Workgroup to support unfunded conservation measures for sticky buckwheat and threecorner milkvetch.

2.8.2 Implementing Agreement and Funding and Management Agreement

Implementation of the LCR MSCP Conservation Plan will be undertaken by Reclamation, in cooperation with the other Federal and non-federal LCR MSCP participants. In order to assist in establishing the structure for implementation of the LCR MSCP the parties have developed a draft final Implementation Agreement (IA), which is published as Exhibit B to the Final LCR MSCP HCP (see Volume III).

Table 2-54. 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]	Contribute to Recovery of Listed Species[b]	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.

Table 2-55. 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]

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.

Table 2-56. 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]	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[b]
Bonytail	399	0	399	360[c]
Humpback chub	ND[d]	0	ND[d]	ND[d]
Razorback sucker	399	0	399	360[c]
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	71	71	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[e]	2,983[e]	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[f]
Relict leopard frog	0[g]	0[g]	0[g]	0[g]
Flannelmouth sucker	85	0	85	85
MacNeill’s sootywing skipper	172	50	222	222
Sticky buckwheat	ND[h]	0	ND[h]	ND[h]
Threecorner milkvetch	ND[h]	0	ND[h]	ND[h]
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 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 to be habitat . These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. With implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), removal of these low-quality habitats, however, is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of covered or evaluation species.

[a] From Table 5-5.

[b] Net loss in habitat is fully mitigated by protecting 230 acres of desert tortoise habitat in accordance with mitigation requirements in the document entitle “Compensation for Desert Tortoise” (Desert Tortoise Compensation Team 1991).

[c] 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.

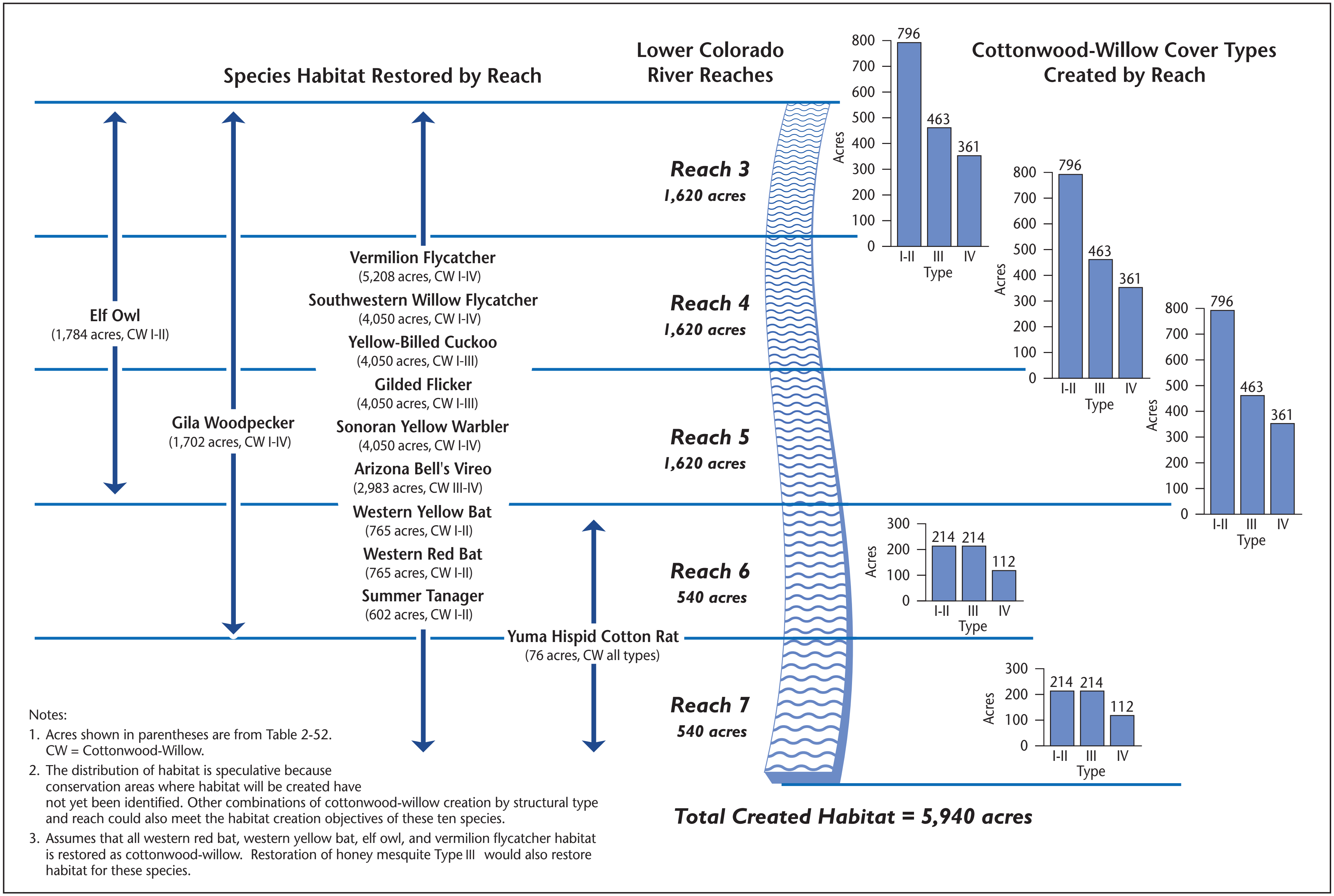
[d] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in reservoir elevations associated with implementation of flow-related covered activities, however, could result in the establishment of up to 62 miles of transitory Colorado River channel when the reservoir pool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

[e] 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.

[f] 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 (Foreman 1997).

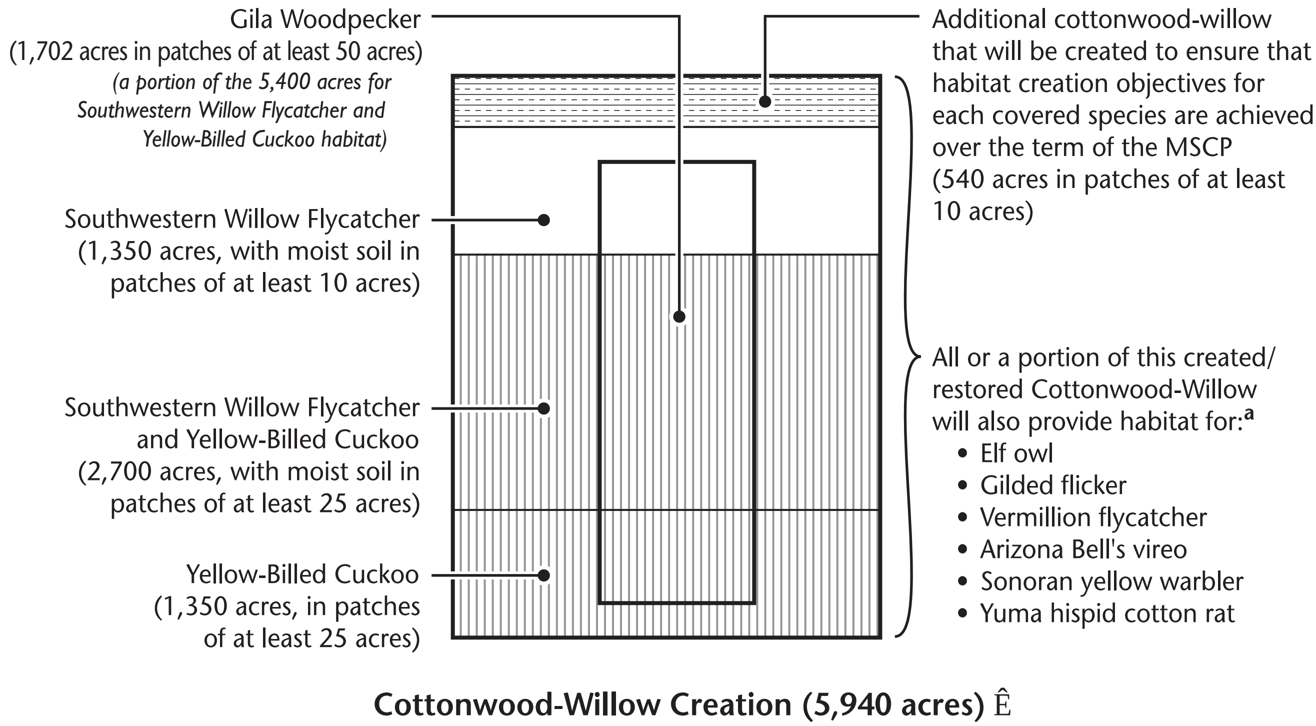
[g] Implementation of covered activities will not result in removal of this species habitat but could result in temporary disturbance of habitat or affect movement of individuals.

[h] 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.



00450.00-303 (11/04)

Figure 2-20
Hypothetical Distribution of Cottonwood-Willow Creation That Would Meet Habitat Requirements for All Covered Species Associated with Cottonwood-Willow



[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 2-52).

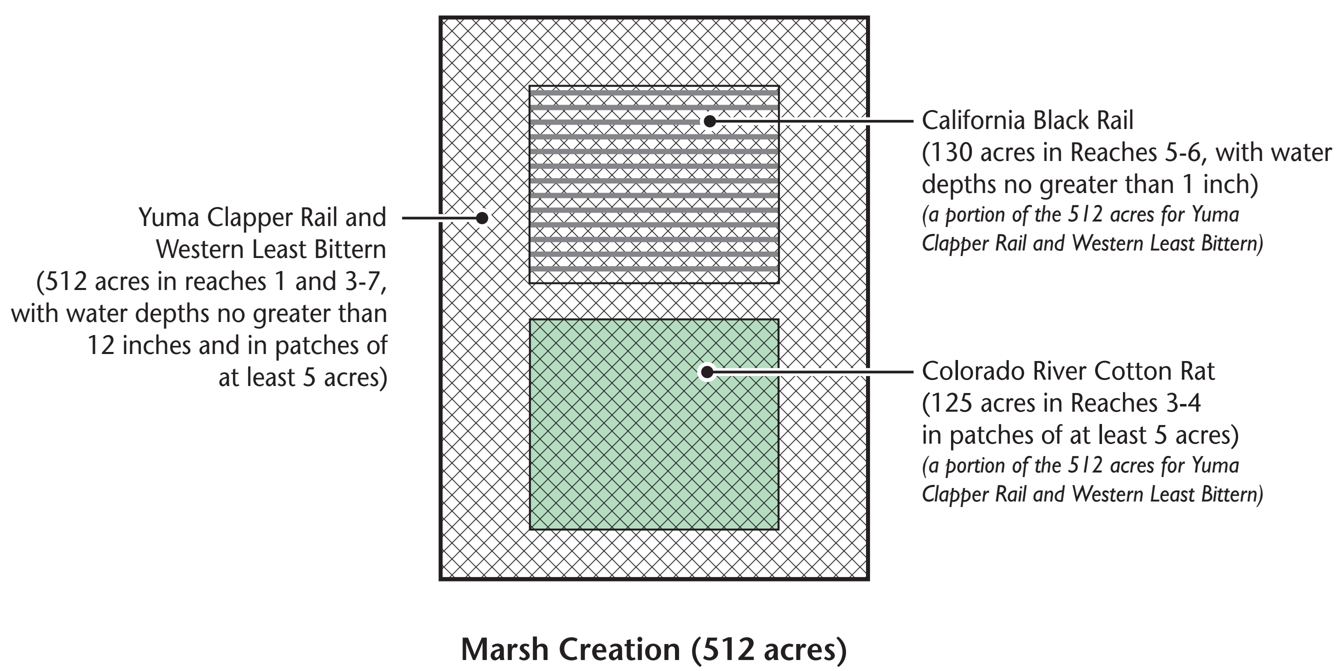


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Figure 2-21
Proportion of Created Cottonwood-Willow and Marsh That Will Provide Habitat for Selected Covered Species

In addition, with respect to assuring funding for the LCR MSCP, letters of financial commitment from representatives of the States of Arizona, California and Nevada were received by the Secretary of the Interior on August 17, 2004 during the public comment period on the Draft LCR MSCP program documents. These letters provide a commitment to "share in the agreed upon LCR MSCP costs equally with the United States on a 50/50 Federal/non-Federal basis." The commitments contained in the August 17th letters from Arizona, California and Nevada have been incorporated into a draft final FMA which has been developed during negotiations between the Federal and non-federal parties to the LCR MSCP and is published as Exhibit A to the Final LCR MSCP HCP (see Volume III).

These Agreements will be presented to the relevant approving officials and respective boards following publication of this Final BA, the Final EIS/EIR and other program documents. No final decisions have been made by the Federal or non-federal parties with respect to the financial commitments set forth in the August 17th letters and the draft final FMA, or with respect to the provisions in the draft final IA. Appropriate revisions, if any, will be included at such time as a draft final FMA and IA are executed. Appropriate information regarding the issues addressed in the FMA and the IA for the LCR MSCP will also be included in any Record of Decision issued by the Secretary with respect to this program.

Chapter 3
Non-Federal Covered Activities: Ongoing and Future

3.1 Introduction

Although BAs are not required to describe activities outside of the Federal actions proposed for consultation, this BA describes the non-Federal activities proposed in the LCR MSCP in order to provide a complete description of the collaborative program.

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 covered species is a discretionary action by the USFWS under section 10(a)(1)(B) of the ESA. All of the covered activities would be implemented within the LCR MSCP planning area. The section 10(a)(1)(B) Permit Applicants have prepared a companion LCR MSCP HCP that contains this same description of State covered activities. 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 specific Colorado River water and power contractors are described below.

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. 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 maf 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 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 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.

3.1.1 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.

3.1.2 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.

3.2 Arizona Covered Activities

Arizona covered projects and activities for all reaches described below include the diversion of up to 2.8 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 (Figures 4-3–4-8), 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; operation and maintenance 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.

3.2.1 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.

3.2.1.1 Reach 1

- PPRs[1], 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.

3.2.1.2 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.

3.2.1.3 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.

3.2.1.4 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.

3.2.1.5 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.

3.2.1.6 Reach 6

- return flows of Colorado River water into this reach that was diverted in Reach 5, as identified in Section 3.2.1.5 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.

3.2.1.7 Reach 7

- return flows of Colorado River water into this reach that was diverted in this Reach and also diverted within Reaches 5 and 6, as identified in Section 3.2.1.5, Section 3.2.1.6, 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.

3.2.1.8 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).

3.2.2 Future Flow-Related Covered Activities

3.2.2.1 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 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 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 af yearly and approximately 1,000 af yearly, 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.

3.2.2.2 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.

3.2.3 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),
- the facilities and equipment through which electric power is generated and transmitted, and
- the appurtenant works that support these facilities in the historical floodplain (Figures 4-3–4-8), 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 3.2.1, "Ongoing Flow-Related Covered Activities." Additional ongoing non-flow-related activities for AGFD are described below.

3.2.3.1 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" 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.

3.2.4 Future Non-Flow-Related Covered Activities

In addition to the OM&R of facilities described in Section 3.2.1, future non-flow-related activities include the AGFD programs and activities described below.

3.2.4.1 Arizona Game and Fish Department Programs and Activities

Future projects by AGFD covered by the HCP include ongoing projects identified in Section 3.2.3.1 and AGFD projects related to implementation of the LCR MSCP.

3.3 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 (Figures 4-4–4-7), 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; operation and maintenance 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).

3.3.1 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.

3.3.1.1 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.

3.3.1.2 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.

3.3.1.3 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.

3.3.1.4 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.

3.3.1.5 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;
- 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.

3.3.1.6 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;
- 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.

3.3.1.7 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).

3.3.2 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 (i.e., 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 af of water per year from Imperial Dam to Lake Havasu pursuant to the Agreement for Transfer of Conserved Water by and between the Imperial Irrigation District and the San Diego County Water Authority, 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 af of water per year from Imperial Dam to Lake Havasu transferred to the San Diego County Water Authority, as described in the Allocation Agreement among the United States of America, the Metropolitan Water District of Southern California, Coachella Valley Water District, Imperial Irrigation District, San Diego County Water Authority, 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 ISC/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 5.2, 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.

3.3.2.1 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.

3.3.3 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 (Figures 4-4–4-7), 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 3.3.1, "Ongoing Flow-Related Covered Activities."

3.3.4 Future Non-Flow-Related Covered Activities

The locations and entities involved in future non-flow-related maintenance and replacement activities are listed in Section 3.3.1, "Ongoing Flow-Related Covered Activities."

3.4 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 (Figures 4-2–4-4), 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; operation and maintenance 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.

3.4.1 Ongoing Flow-Related Covered Activities

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

3.4.1.1 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 Nevada Department of Wildlife) diversion at Saddle Island, Lake Mead;
- Pacific Coast Building Products diversion at Gypsum Wash, Lake Mead (diversion through well[s]);
- Southern Nevada Water Authority 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.

3.4.1.2 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.

3.4.1.3 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.

3.4.1.4 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).

3.4.2 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. Consumptive use 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 consumptive use.

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.

3.4.2.1 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.

3.4.3 Ongoing Non-Flow-Related Covered Activities

In addition to the OM&R of facilities described in Section 3.4.1, ongoing non-flow-related activities include the NDOW programs and activities described below.

3.4.3.1 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 National Park Service 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. 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.

3.4.4 Future Non-Flow-Related Covered Activities

In addition to the OM&R of facilities described in Section 3.4.1, future non-flow-related activities include the NDOW programs and activities described below.

3.4.4.1 Nevada Department of Wildlife Programs and Activities

Future projects by NDOW covered under the HCP would include those ongoing projects identified in Section 3.4.3.1, 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 4
Environmental Baseline and Resources of the LCR

4.1 Introduction

This chapter describes the LCR MSCP BA environmental baseline and the past and present environmental conditions of the LCR MSCP planning area. Past ecological conditions within the LCR MSCP planning area are described in Section 4.2, “Historical Conditions.” Section 4.3, “Environmental Baseline,” describes the environmental baseline and present ecological conditions from which potential effects of implementing the covered activities and LCR MSCP on covered species are assessed. Section 4.4, “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 critical habitat are described in Section 4.5, “Status of Species Evaluated in the LCR MSCP BA,” and Section 4.6, “Status of Designated Critical Habitat and Other Covered Species Habitat.” Other Federal consultations are described in Section 4.7, “Consultation History: Previous and Ongoing Section 7 Consultations.”

4.2 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 4-1). 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 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 woody 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 4-1 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.

4.2.1 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

Table 4-1. 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).

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.

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.

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.

undergone. These facilities altered the natural hydrologic regime, which in turn altered biological communities within the system.

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, 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 created 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. Where the roots of riparian vegetation could reach to the lowered water table, the vegetation survived; 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.)

4.2.2 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.

4.2.3 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.)

4.2.4 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.

4.2.5 Water Quality Changes

Water quality changes within the LCR system have occurred because of irrigation return flows, municipal and industrial 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.

4.3 Environmental Baseline

This section describes the regulatory context for the environmental baseline 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).

4.3.1 Regulatory Context

The environmental baseline includes past and present impacts of all Federal, state, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 C.F.R. §402.02). The environmental baseline for this LCR MSCP BA includes all effects of actions taken in the past, even if effects of some of those actions have not yet been fully manifested. This definition of the environmental baseline is used because the current environmental conditions are derived in large measure from permanent artificial facilities (e.g., dams, jetties, training structures, protected banklines, and 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 Federal action covered under the LCR MSCP BA. The continuation of river operations may result in the perpetuation of degraded habitat conditions for covered species. The quantification of such an effect is speculative but is not expected to make a measurable additional impact on the existing baseline condition.

The environmental baseline for the LCR MSCP BA includes:

- state, Tribal, local, and private actions already affecting covered species in the LCR MSCP planning area or that will contemporaneously affect covered species during the LCR MSCP consultation and Federal actions affecting covered species and critical habitat that have completed formal, informal, or early consultation;
- 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 within the LCR MSCP planning area; and
- existing facilities, ongoing operations and maintenance activities, the existing extent of land cover types, and the existing species abundance and distribution described in this chapter.

Reclamation and the USFWS engaged in section 7 consultation in 2001 regarding potential effects to Yuma clapper rail, southwestern willow flycatcher, bonytail, and razorback sucker from a change in point of diversion totaling 400 kaf. This change in point of diversion is being included for coverage under the LCR MSCP as part of the 1.574 mafy total. This BA relies on the 2001 section 7 consultation for the analysis of effects to Yuma clapper rail, southwestern willow flycatcher, bonytail, and razorback sucker from the 400 kaf change in point of diversion. Accordingly, this BA analyzes the effect of additional changes in point of diversion of 1.174 mafy on these four species. For the remaining 23 covered species, however, this BA provides an analysis of the potential effects resulting from the total annual flow reduction of 1.574 maf.

4.3.2 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 resulting in reduced natural backwaters and periods of inundation in adjacent floodplain lowlands.

The present condition consists of approximately 126,000 acres of woody riparian vegetation 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. 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 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

[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.

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 upstream 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 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, 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.

4.4 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 4.6.2.1, “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 4-2). 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 4-2. 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

4.4.1 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 4-3. 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 4-1 and Table 4-4 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 4-3. 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	*P. glandulosa* constituting at least 10 percent of total trees; rarely found to constitute more than 40 percent of total trees
Saltcedar–screwbean mesquite	*P. 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.

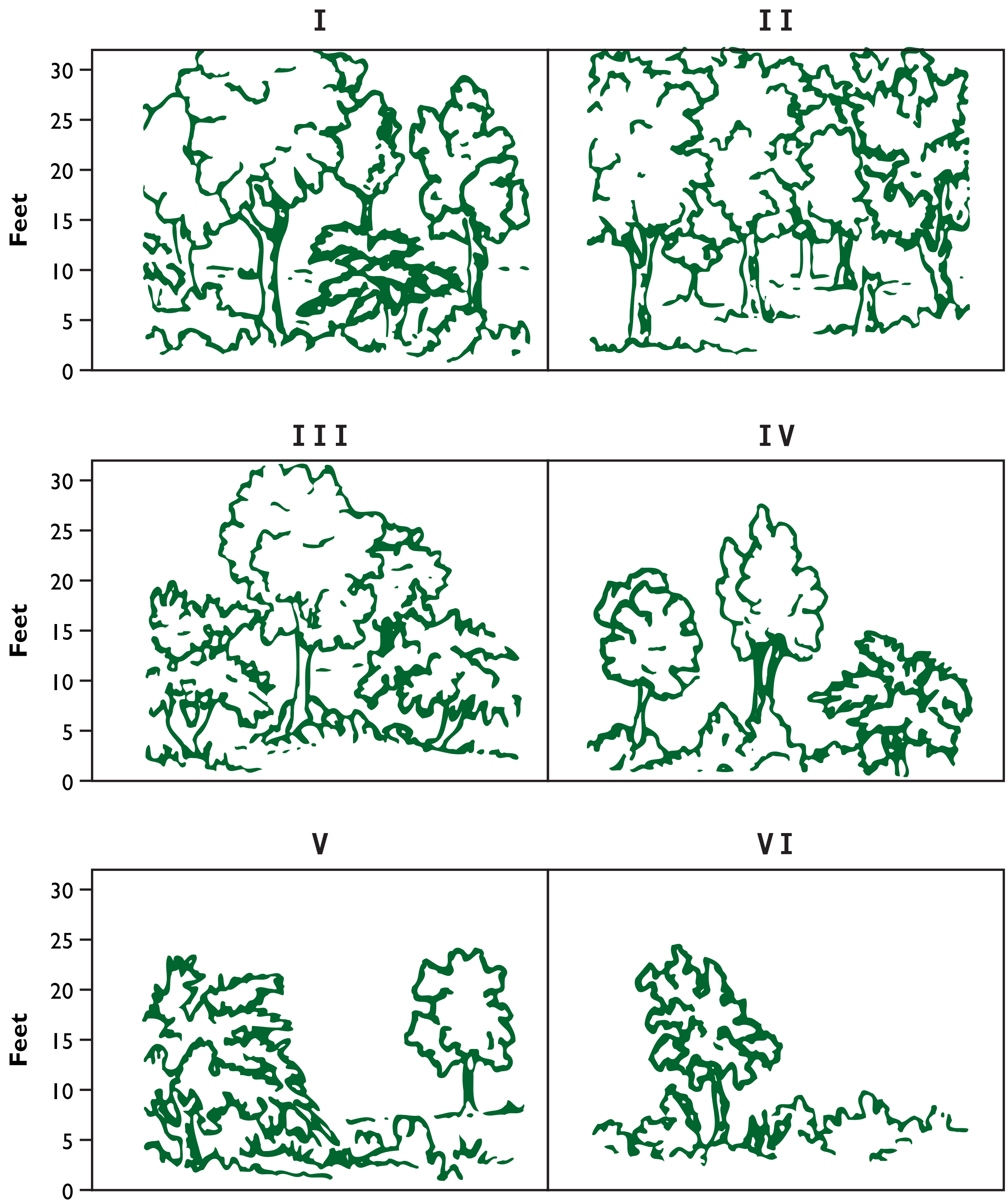
Table 4-4. Description of Woody Riparian Land Cover Structural Types

Type	Characteristics
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
II	Overstory is more than 15 feet tall and constitutes more than 50 percent of the trees; little or no intermediate class present
III	Largest proportion of trees is 10–20 feet tall; few trees above 20 feet or below 5 feet tall
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
V	60–70 percent of the vegetation is 0–2 feet tall, the remainder is 5–15 feet tall
VI	75–100 percent of the vegetation is 0–2 feet tall

Source: Anderson and Ohmart 1984b.

4.4.1.1 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



Adapted from Anderson and Ohmart (1984).

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Figure 4-1
Examples of Woody Riparian Land Cover Structural Types

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.

4.4.1.2 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 chinensis*, *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 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.

4.4.1.3 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 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 which 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.

4.4.1.4 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 10 percent, 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.

4.4.1.5 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.

4.4.1.6 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).

4.4.1.7 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.

4.4.2 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 4-5). 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 4-5. 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 *P. 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 *P. australis*; little open water
7	Open marsh (75 percent water) adjacent to sparse marsh vegetation; sandbars and mudflats visible when the 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).

4.4.3 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.

4.4.3.1 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.

4.4.3.2 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.

4.4.3.3 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.

4.4.4 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.

4.4.4.1 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.

4.4.4.2 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.

4.4.4.3 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.

4.4.5 GIS Land Cover Database

The land cover 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 4.6.2.1, "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 2001b), and
- LCRAS phreatophyte inventory (Bureau of Reclamation 2001c).

The dates and precision of the mapping efforts described above are presented in Table 4-6. 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 4-6. 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 4-2–4-8. 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 4-7) and do not include woody riparian land cover structural type categories or marsh land cover subtypes. Table 4-8 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 4-7. Land Cover Type Legend for Figures 4-2–4-8

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

LCRAS = Lower Colorado River Accounting System.

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

Table 4-8. 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**

	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
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**

	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
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 4.6.2.1. The analysis of the effects of covered activities in Chapter 5, 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 effects of covered activities on covered species habitats presented in Chapter 5 of this BA.

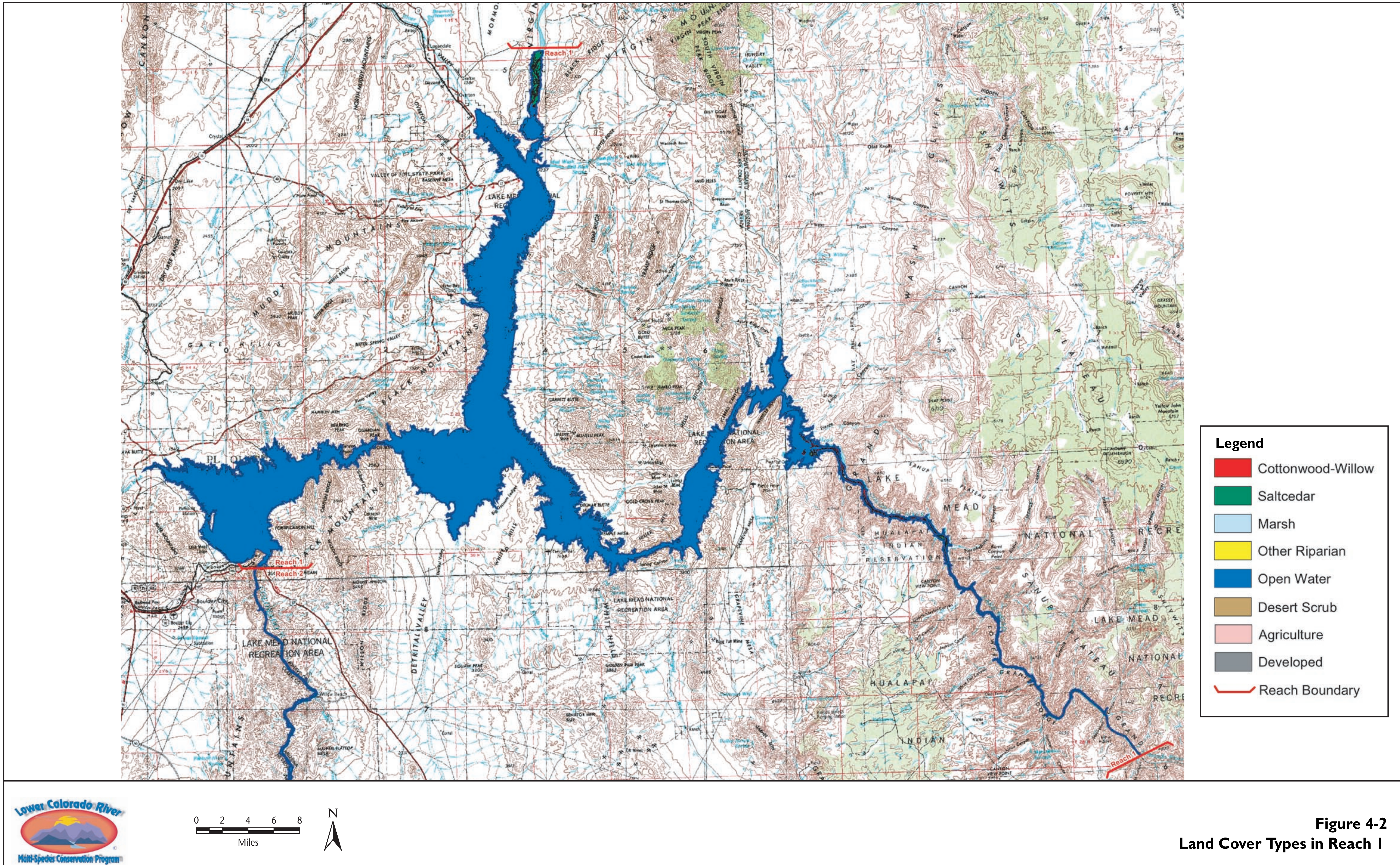


Figure 4-2
Land Cover Types in Reach 1

00450.00-303

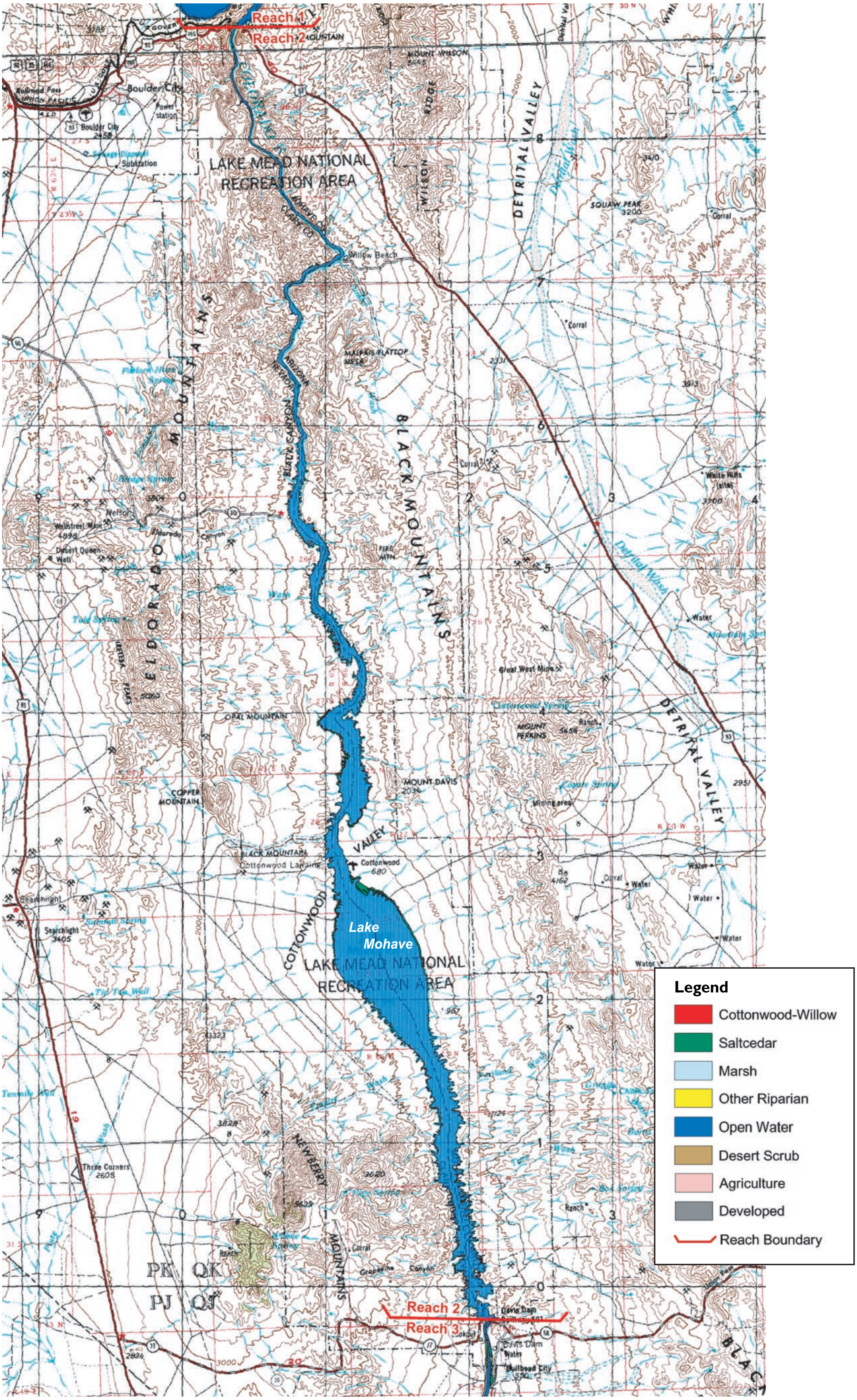


Figure 4-3
Land Cover Types in Reach 2

00450.00-303

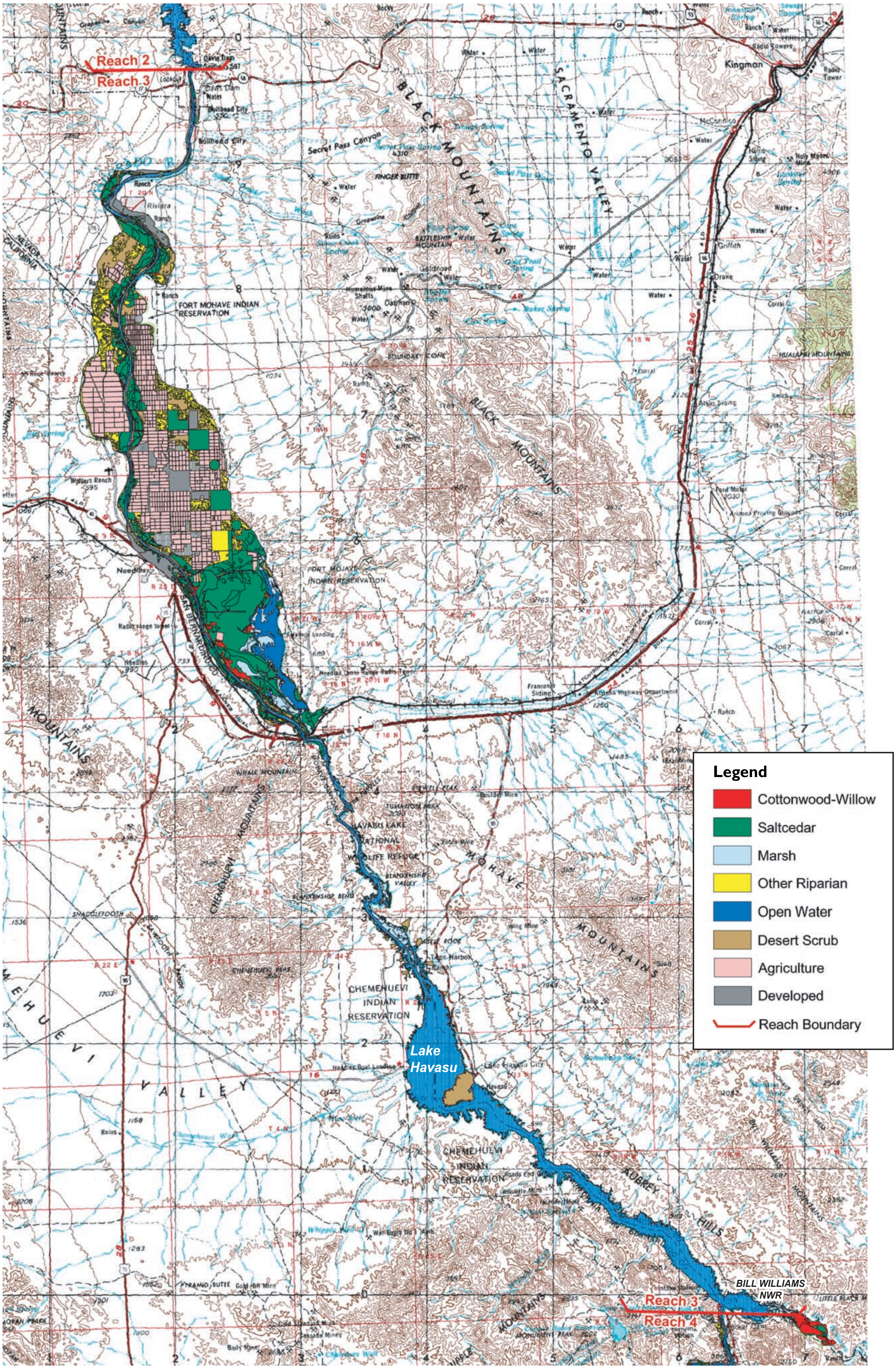
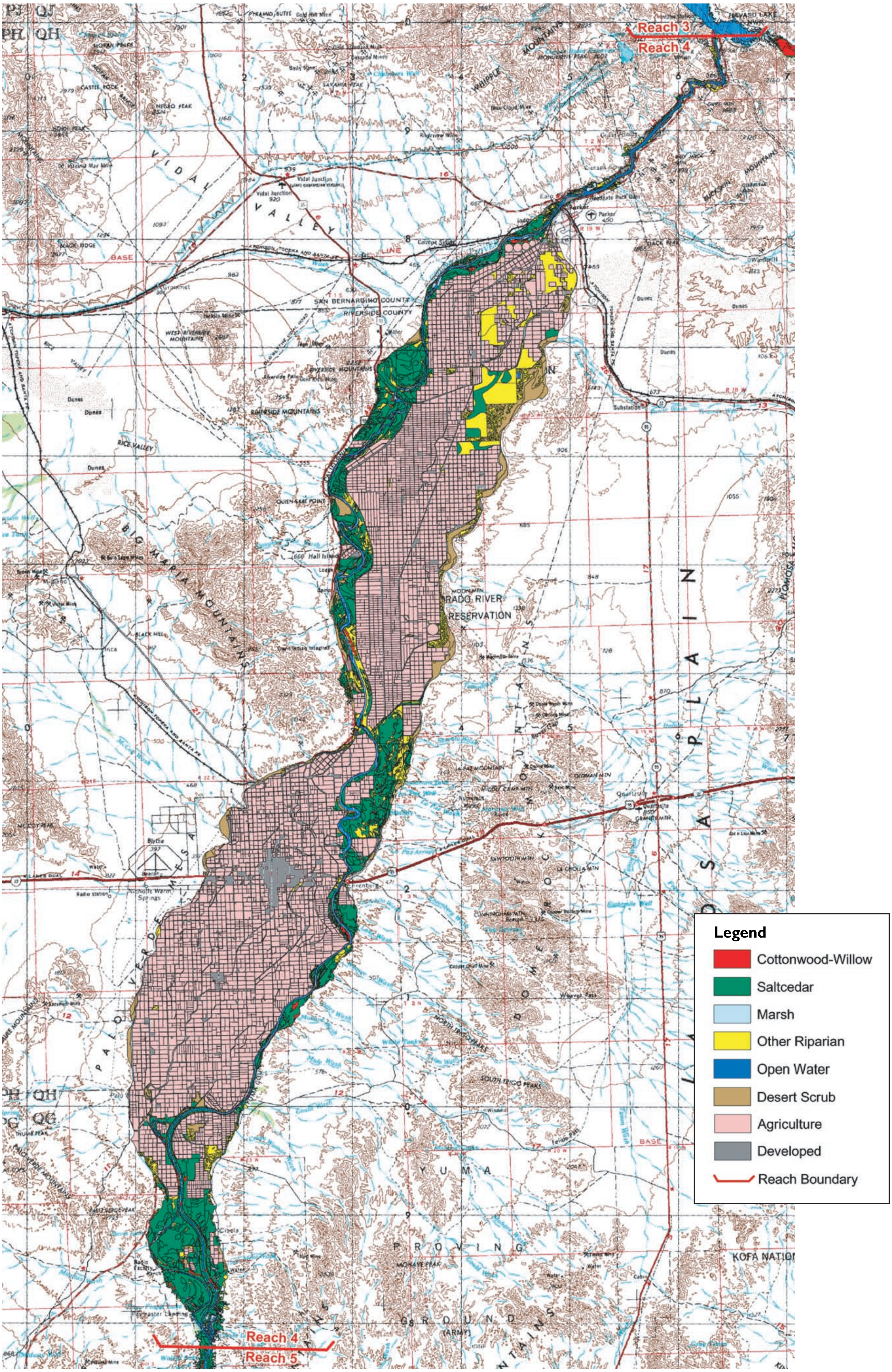


Figure 4-4
Land Cover Types in Reach 3



Lower Colorado River Multi-Species Conservation Program

0 3 6 9 12
Miles

N

Figure 4-5
Land Cover Types in Reach 4

00450.00-303

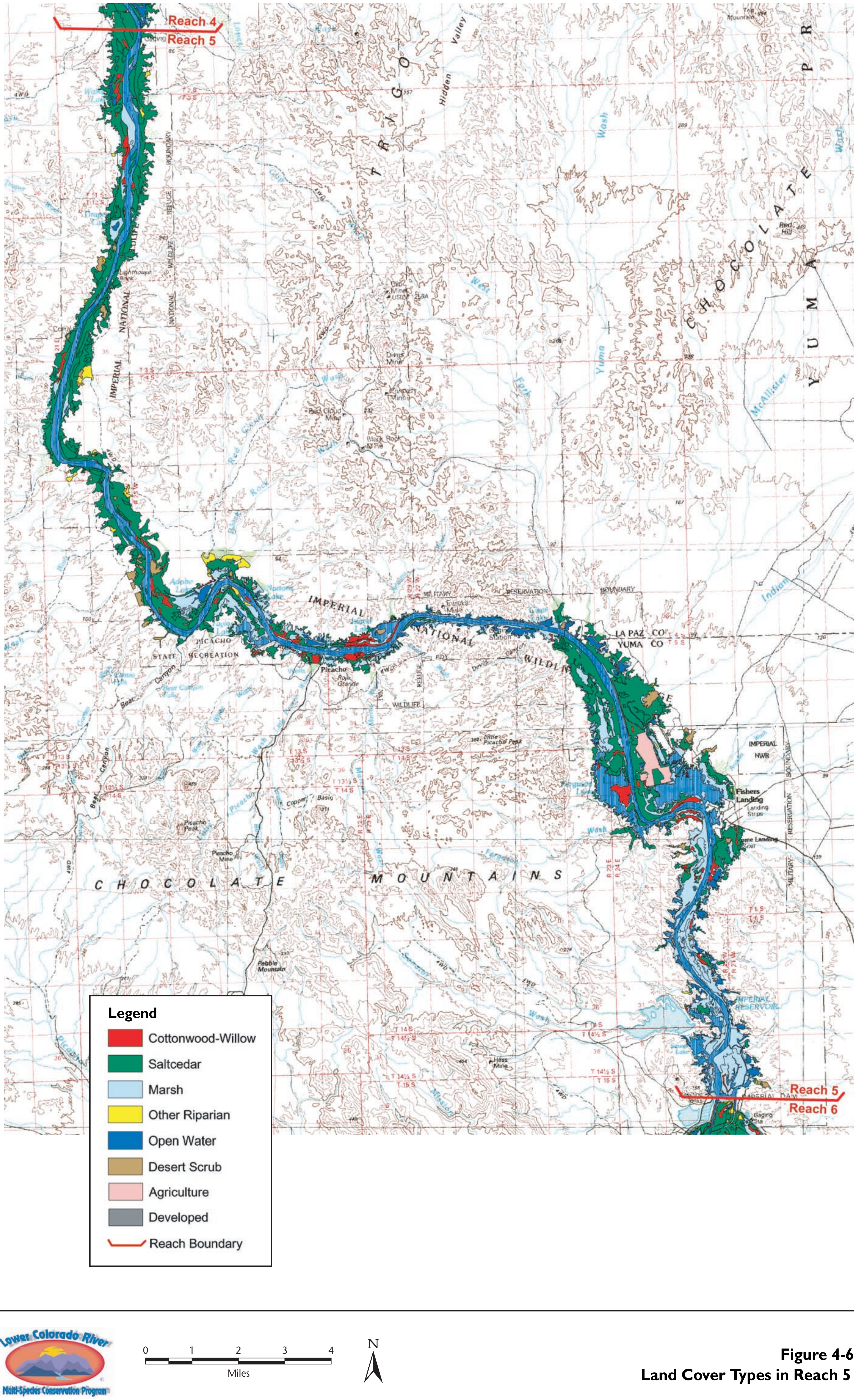


Figure 4-6
Land Cover Types in Reach 5

00450.00-303

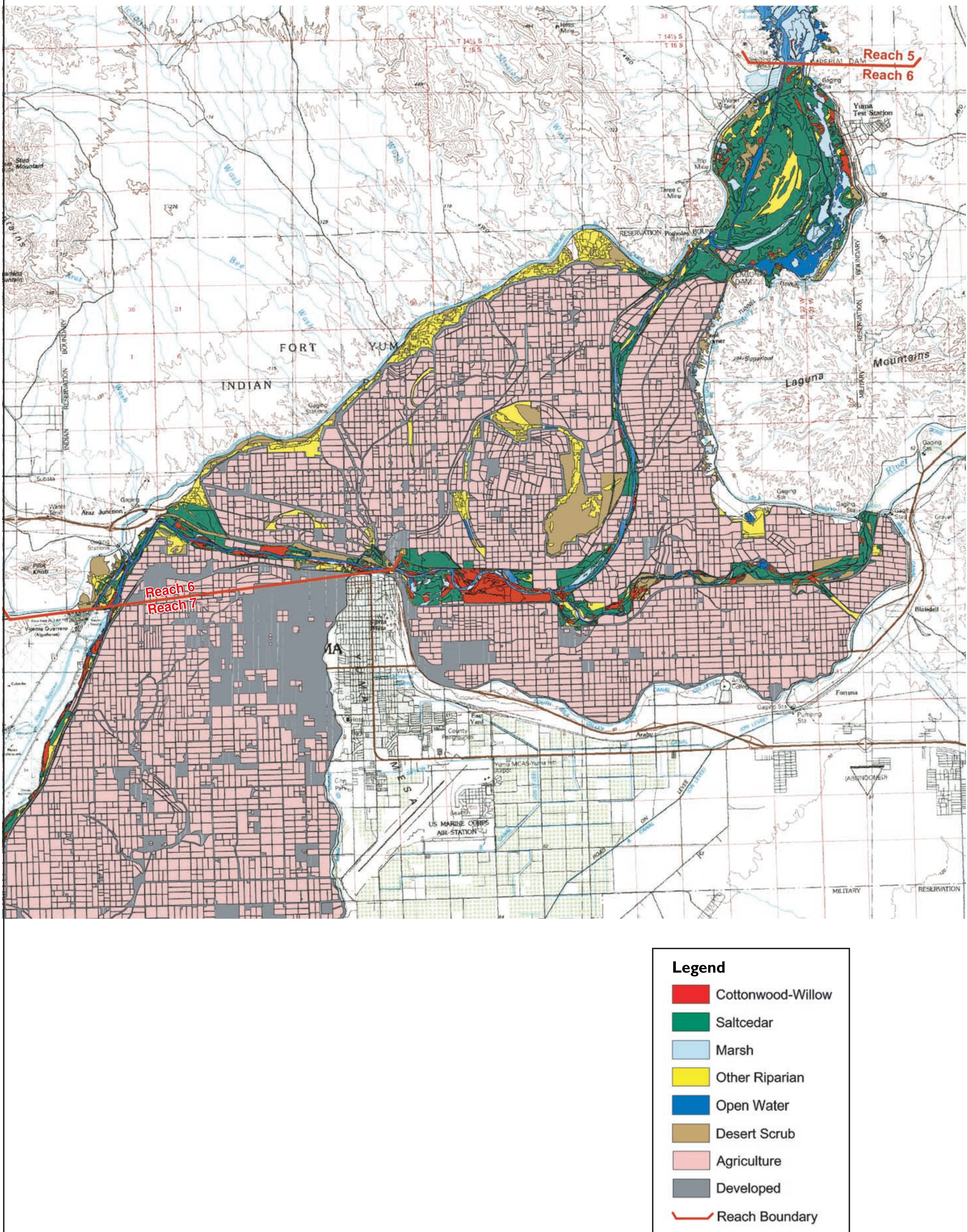
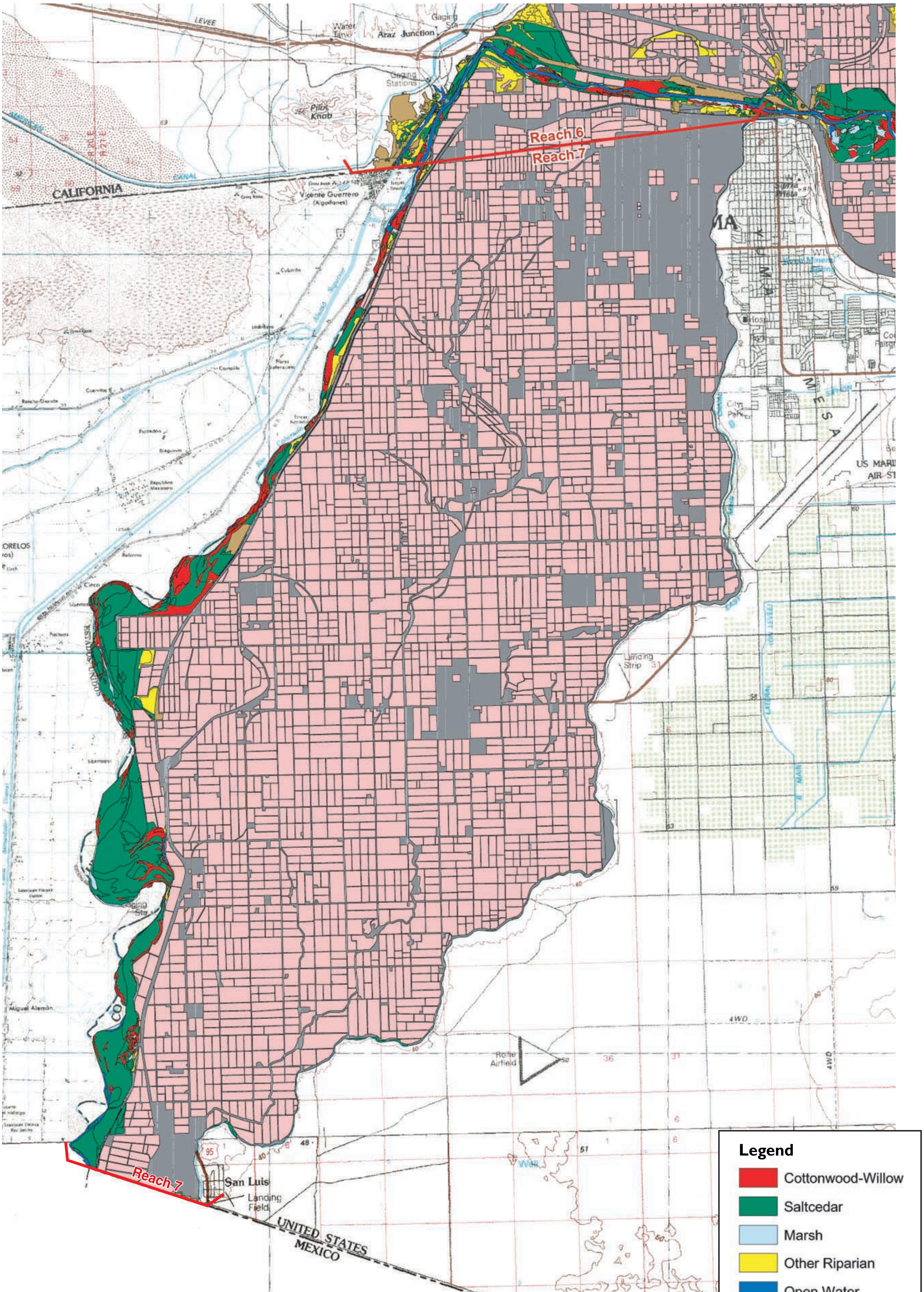


Figure 4-7
Land Cover Types in Reach 6

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.

0 1 2 3 4
Miles

N

Figure 4-8
Land Cover Types in Reach 7

00450.00-303 (9/04)

4.5 Status of Species Evaluated in the LCR MSCP BA

As described in Chapter 1, "Introduction," the LCR MSCP BA addresses 27 covered species for which incidental take authorization for implementing the covered activities described in Chapter 2, "Description of Federal Actions (Covered Actions)," is sought under the ESA. In addition, the LCR MSCP BA addresses four evaluation species (Table 1-2). The bald eagle is not covered under the LCR MSCP. The LCR MSCP BA, however, evaluates the effects of the Federal actions described in Chapter 2 on the bald eagle. Detailed descriptions of the ecological requirements and status of covered species are provided Appendix I.

4.6 Status of Designated Critical Habitat and Other Covered Species Habitat

4.6.1 Designated Critical Habitat

ESA-designated critical habitat for the bonytail, razorback sucker, and desert tortoise (Mojave population), and proposed critical habitat for the southwestern willow flycatcher 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 from the northern boundary of Havasu NWR to Parker Dam (Reach 3) (including Lake Havasu to its full-pool elevation) (Figure 4-9a).

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 4-9b).

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 Arizona, 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 4-9c). 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.

4.6.2 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:

- 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).

4.6.2.1 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 BA, 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 4.4, "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 4-9. The calculated extent of existing habitat for each species by land cover type and by river reach in the LCR MSCP planning

Covered Species	Assumed Distribution by River Reach[a, b] 1	2	3	4	5	6	7	Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
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] 1	2	3	4	5	6	7	Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
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 4.4. Riparian land cover structural types are described in Table 4-4 and marsh types are described in Table 4-5.

[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 (LCR MSCP HCP, 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.

Covered Species	Assumed Distribution by River Reach[a, b] 1	2	3	4	5	6	7	Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
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.

Table 4-9. LCR MSCP Habitat Models for Selected Species

Covered Species	Assumed Distribution by River Reach[a, b] 1	2	3	4	5	6	7	Summary Habitat Description[a]	LCR MSCP Land Cover Types Assumed to Support Species Habitat[c]
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].

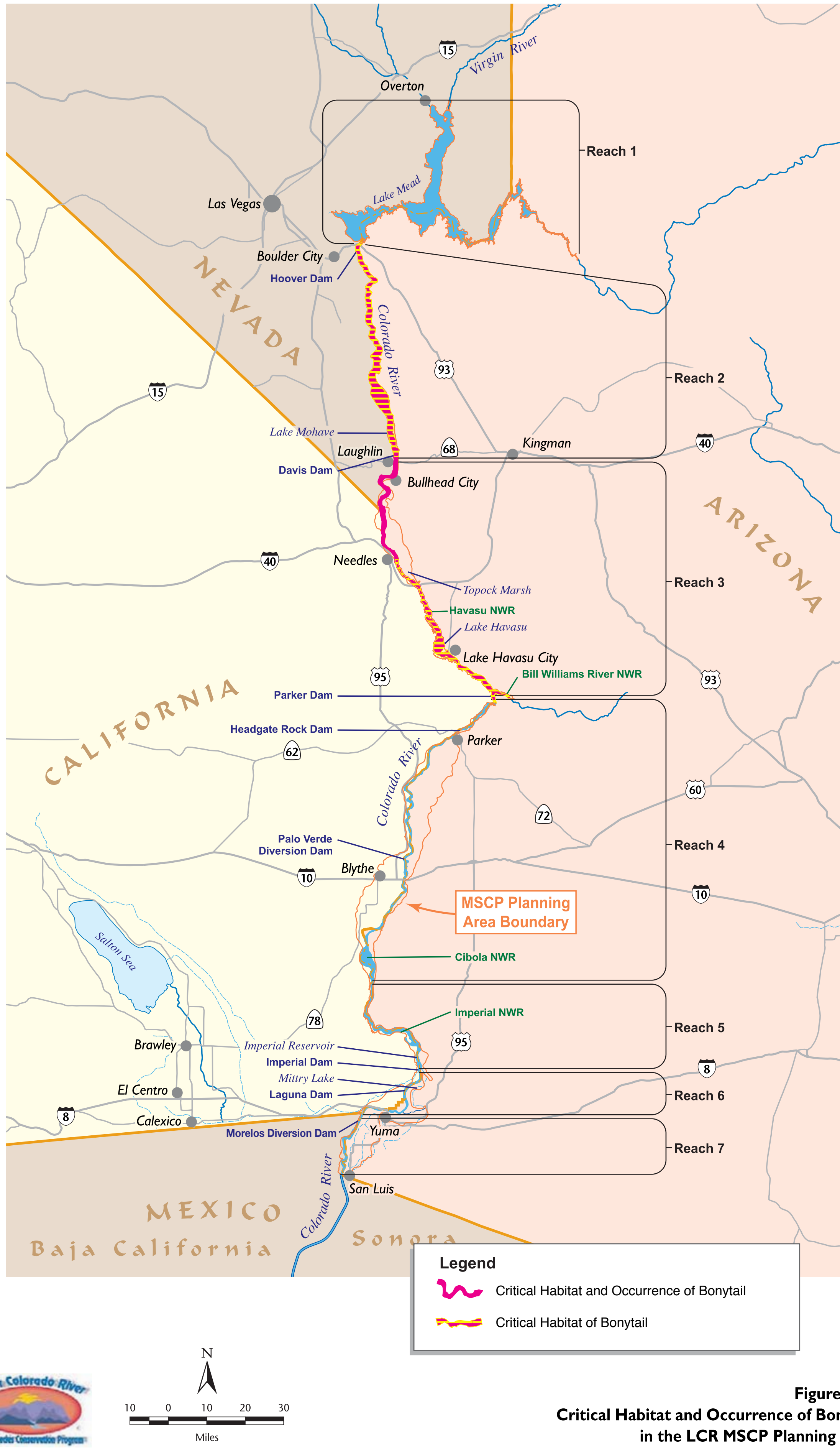


Figure 4-9a
Critical Habitat and Occurrence of Bonytail in the LCR MSCP Planning Area

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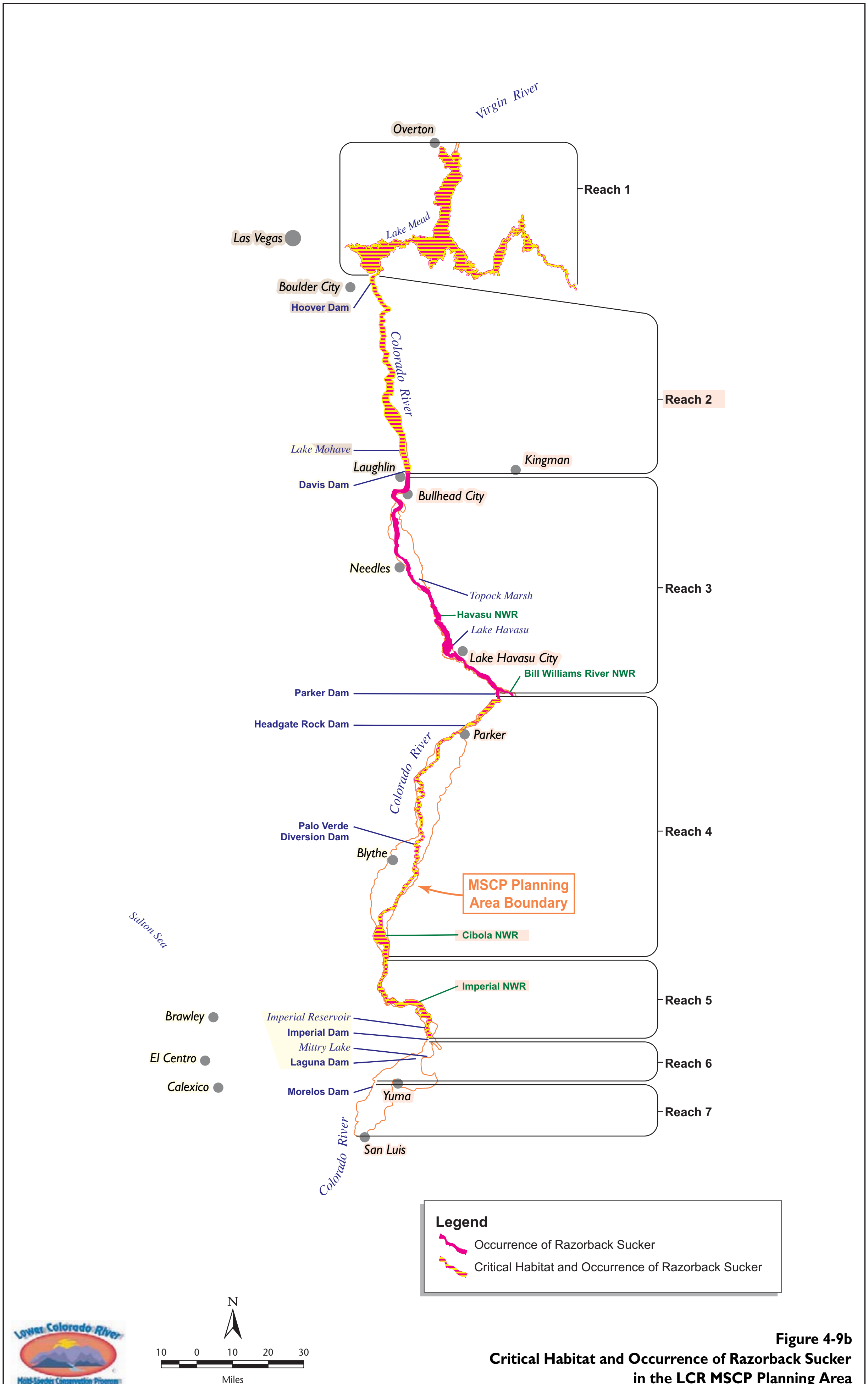


Figure 4-9b
Critical Habitat and Occurrence of Razorback Sucker in the LCR MSCP Planning Area

00450.00-303

Figure 4-9c
Proposed Critical Habitat for Southwestern Willow Flycatcher in the LCR MSCP Planning Area

00450.00-303 (9/04)

area is presented in Tables 4-10 and 4-11, respectively. Recent occurrences of these species in the LCR MSCP planning area are presented on Figures 4-10a–d; critical habitat and occurrence of bonytail and razorback sucker are presented in Figures 4-9a and 4-9b.

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 8). 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 4-3) 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.

4.6.2.2 Southwestern Willow Flycatcher

The LCR MSCP BA 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.

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 4-10 and 4-11). 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 4-11.

4.6.2.3 Other Covered and Evaluation 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 BA 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

Table 4-10. 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								Desert	Agricultural	Undetermined		Total
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]	Scrub	Lands	Riparian	Developed	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]	[i] 2	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 4-9, and the extent of land cover types providing habitat for each species is derived from Table 4-8.

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 4-5).

[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 4-12.

[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 4-11. Extent of Existing Habitat for Selected Species Habitat by River Reach Based on LCR MSCP Habitat Models

Covered Species	Extent of Existing Habitat by River Reach (acres)[a, b]							Total
	1	2	3	4	5	6	7	
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
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]	[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 1	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] 1	2	3	4	5	6	7	Total
MacNeill's sootywing skipper	0	0	0	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
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 4-9. The extent of land cover types providing habitat for each species by river reach is derived from Table 4-8.

[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 4-12.

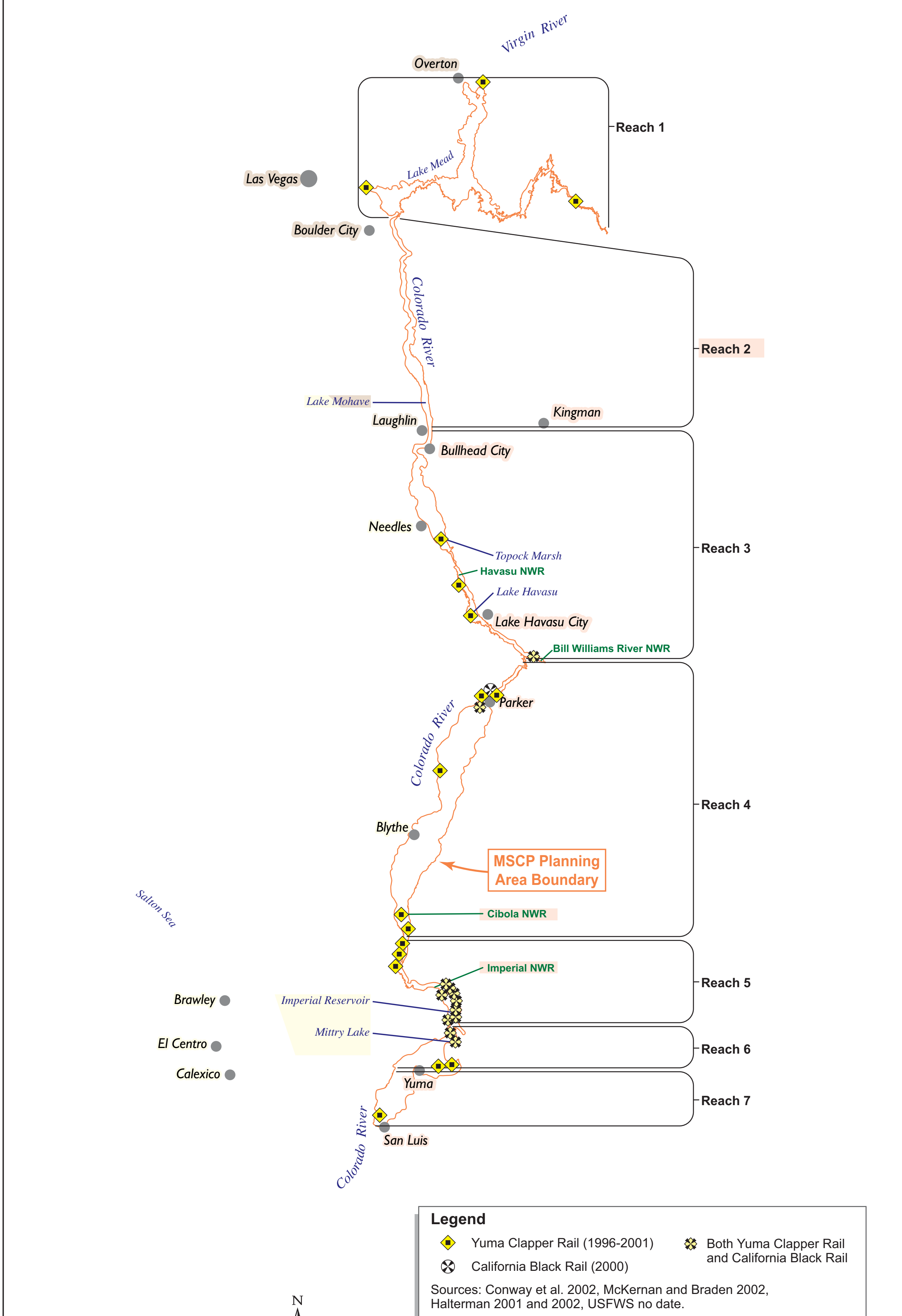
[g] The extent of habitat has not been determined for specific river reaches but has been determined for the entire LCRMSCP planning area.

[h] Derived from the extent of cottonwood-willow types I–IV in Table 4-8 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.

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.

j



Lower Colorado River Multi-Species Conservation Program

Figure 4-10a
Recent Observations of Selected Covered Species in the LCR MSCP Planning Area

00450.00-303

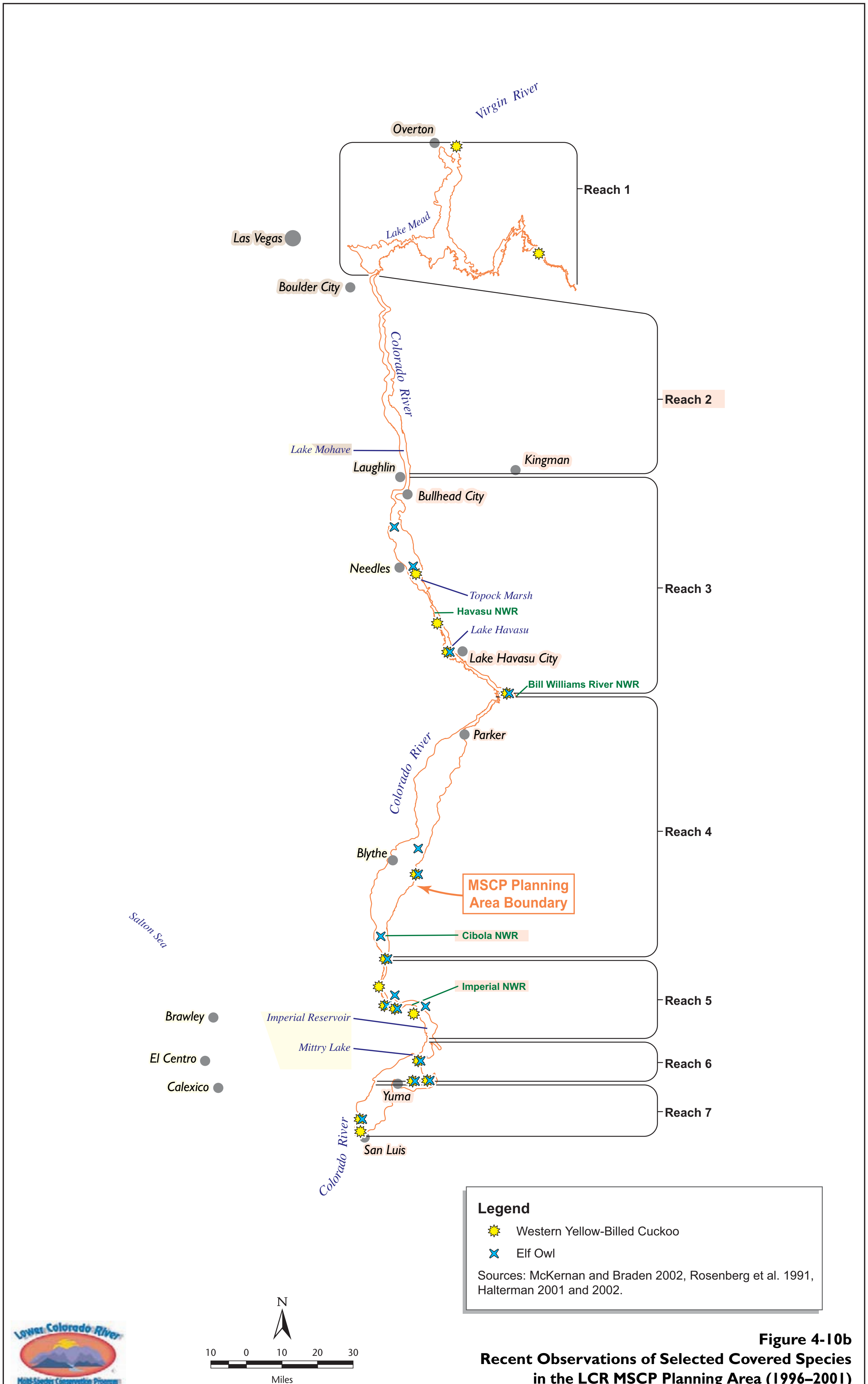


Figure 4-10b
Recent Observations of Selected Covered Species in the LCR MSCP Planning Area (1996–2001)

00450.00-303

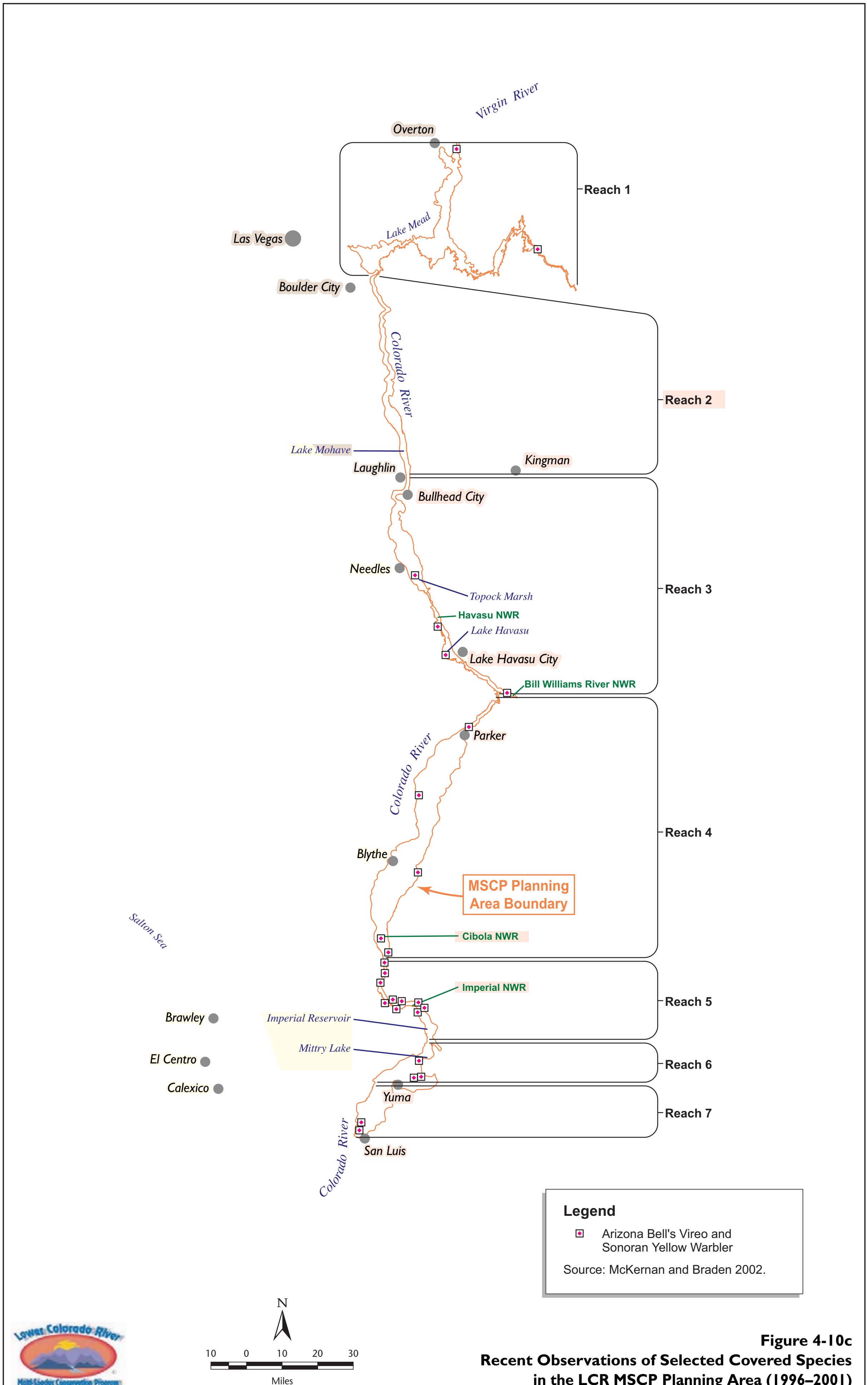


Figure 4-10c
Recent Observations of Selected Covered Species in the LCR MSCP Planning Area (1996–2001)

00450.00-303

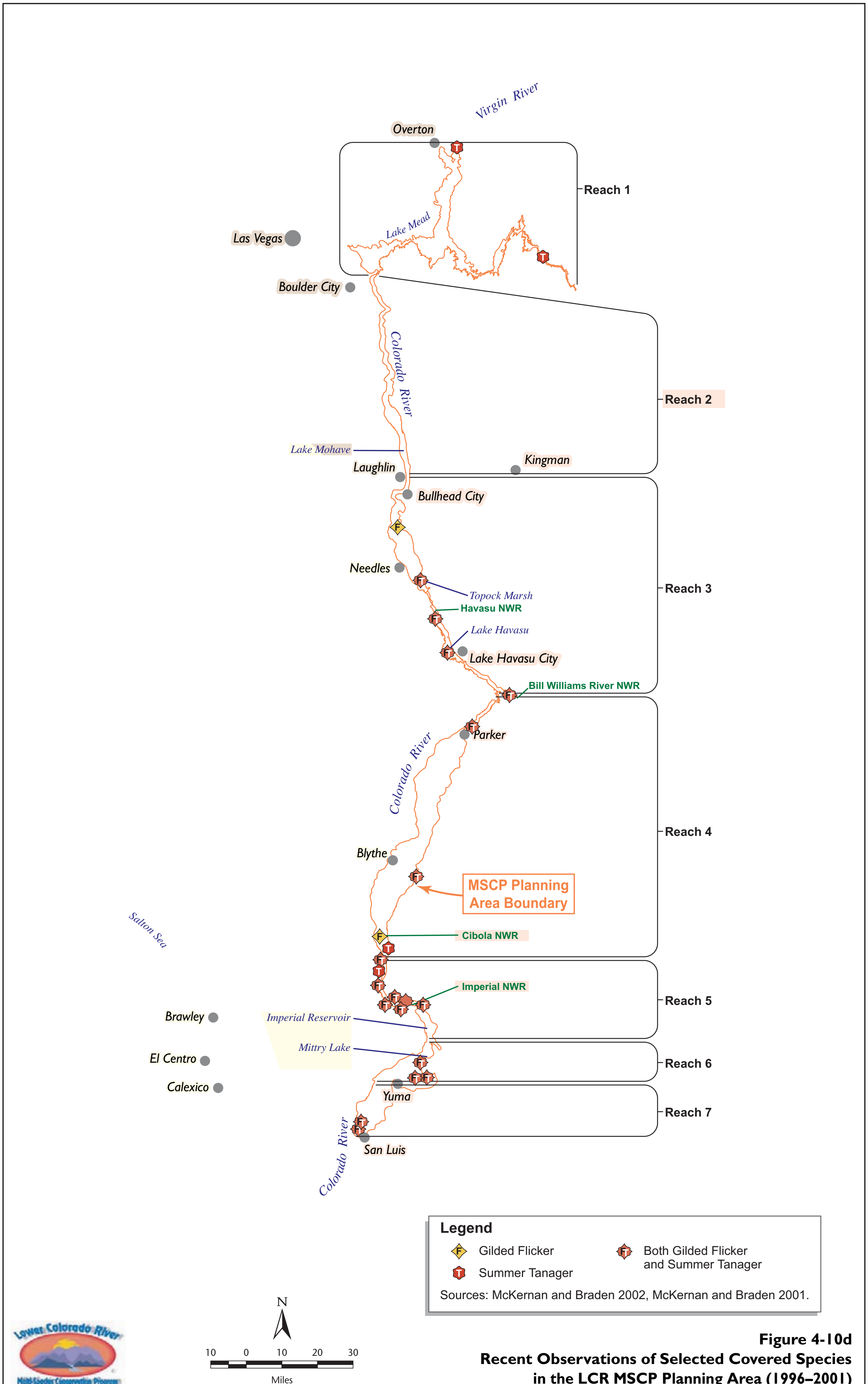


Figure 4-10d
Recent Observations of Selected Covered Species in the LCR MSCP Planning Area (1996–2001)

00450.00-303

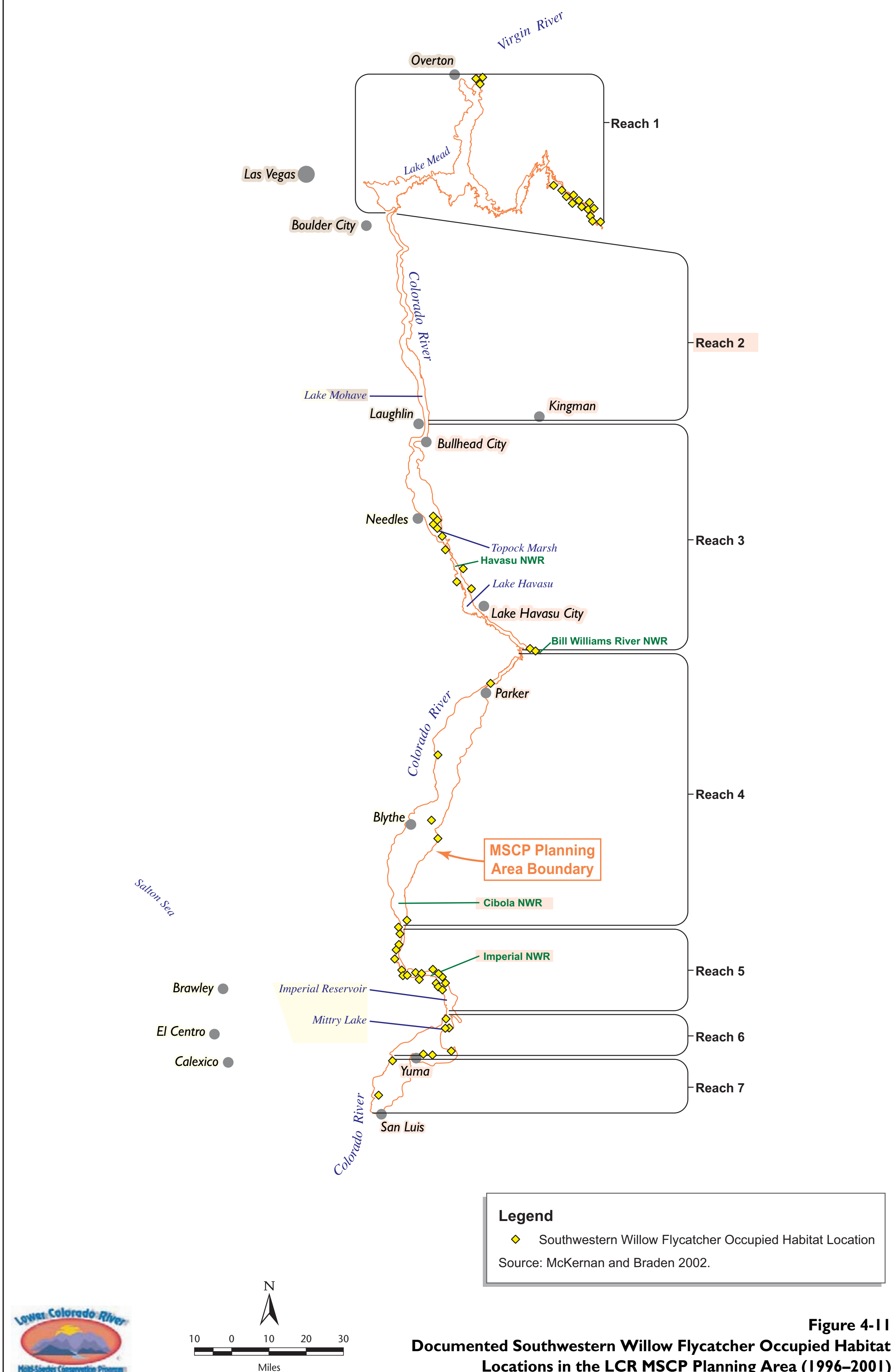


Figure 4-11
Documented Southwestern Willow Flycatcher Occupied Habitat Locations in the LCR MSCP Planning Area (1996–2001)

00450.00-303

implemented to determine if the desert pocket mouse is present before covered activities are implemented. The LCR MSCP effects assessment (Chapter 5) 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 4-12.

4.7 Consultation History: Previous and Ongoing Section 7 Consultations

Since 1973, Reclamation has both informally and formally consulted with the USFWS under section 7 of the ESA for various projects that potentially may have had direct or indirect effects on listed threatened and endangered species and designated critical habitat within the LCR planning area (Table 4-13). Although the projects have varied substantially, as have the impacts, the USFWS has concluded either that the projects would not jeopardize the continued existence of any species or adversely modify designated critical habitat or that jeopardy and adverse modification could be avoided through RPAs. These consultations are included in the environmental baseline. Reclamation consultations on major water projects are summarized below and other Reclamation consultations are listed in Table 4-13.

4.7.1 Central Arizona Project Havasu Diversion

CAP was constructed to provide a long-term, nongroundwater source of water for municipal, industrial, and both Indian and non-Indian agricultural users in Arizona. The CAP was authorized for construction under the CRBPA, Public Law 90-537 (82 Stat. 885), approved September 30, 1968. An approximately 330-mile-long series of open canals, inverted siphons, pumping plants, and tunnels convey water diverted from Lake Havasu on the Colorado River east through Phoenix and then south to the southern boundary of the San Xavier Indian Reservation southwest of Tucson. Under normally expected water supply conditions, project diversions from the Colorado River are expected to be about 1.5 mafy of Arizona's basic annual entitlement of 2.8 maf.

Reclamation has consulted formally and informally on over 50 CAP-associated projects. In April of 1994, after 3 years of intensive formal consultation with Reclamation, the USFWS issued a final BO on the Transportation and Delivery of Central Arizona Water to the Gila River Basin (Hassayampa, Aqua Fria, Salt, Verde, San Pedro, middle and upper Gila Rivers, and associated tributaries) in Arizona and New Mexico. The BO found that deliveries of CAP water would likely jeopardize the continued existence of the spikedace, loach minnow, Gila topminnow, and razorback sucker and would adversely modify the critical habitat of the spikedace, loach minnow, and razorback sucker. The BO developed RPAs to ensure the action would not be likely to jeopardize the listed species. Reclamation is now in the process of implementing the RPAs presented in the opinion. Reclamation's Phoenix area office is also preparing a BA on the delivery of water into the Santa Cruz River Basin.

The Havasu Intake and Pumping Plant is located at the lower end of Lake Havasu downstream of the Bill Williams Delta and within the Bill Williams River NWR.

4.7.2 Southern Nevada Water System (Robert B. Griffith Water Project)

An environmental assessment was prepared in 1992 to obtain a contract for the uncontracted remainder of Nevada's 300,000 acre-feet per year consumptive use apportionment. Section 7 compliance was concluded through informal consultation. By memorandum dated February 21, 1992, the USFWS concurred with Reclamation's determination that the proposed action was not likely to adversely affect the threatened desert tortoise.

Improvements to the SNWS were identified in the 1994 Final Environmental Assessment of the Colorado River Commission's Proposed SNWS Facilities Improvement Project. The improvements are associated with existing facilities. Reclamation entered into formal section 7 consultation with the USFWS on August 31, 1994, for the Mojave desert tortoise, a Federally listed threatened species. On December 6, 1994, the USFWS rendered its BO that the SNWS Improvement Project is not likely to jeopardize the continued existence of the threatened Mojave population of the desert tortoise and no proposed critical habitat will be destroyed or adversely modified. Incidental take was issued with RPMs to minimize take.

A draft EIS for the proposed SNWA Treatment and Transmission Facility was provided for public review and comment in November 1995. A final EIS was issued in 1997. Reclamation initiated formal consultation on the desert tortoise on August 15, 1995, and received a draft BO on December 18, 1995. Because of a number of project refinements, Reclamation requested a number of extensions to incorporate these changes into the final BO. The additional information and comments were provided to the USFWS on June 26, 1996, and a final BO was issued in 1996. The final BO found that the proposed project is not likely to jeopardize the continued existence of the threatened Mojave population of the desert tortoise and that no critical habitat will be destroyed or adversely modified. Incidental take was proposed with RPMs to minimize take.

4.7.3 LCR Operations and Maintenance—Lake Mead to Southerly International Boundary

In late 1995, following the designation of critical habitat for the big river native fish, Reclamation, through the Lower Colorado Regional Office, entered into consultation with the USFWS under section 7 of the ESA. In 1996, Reclamation completed a BA of the potential effect of their routine LCR operations and maintenance activities on 34 listed or candidate species and/or designated critical habitats.

The USFWS issued a BO regarding Reclamation's LCR operations and routine maintenance activities on April 30, 1997. The BO concluded that Reclamation's actions were likely to jeopardize the continued existence of the bonytail, the razorback sucker,

Table 4-12. 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] 1	2	3	4	5	6	7	Summary Habitat Description and Known Occurrences[a]
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] 1	2	3	4	5	6	7	Summary Habitat Description and Known Occurrences[a]
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.”

Table 4-13. Bureau of Reclamation Section 7 Consultations with U.S. Fish and Wildlife Service under the Endangered Species Act on the LCR

Project Name	Species Involved	USFWS Consultation Results	USFWS Written Determination
Quarries	Yuma clapper rail Peregrine falcon Bald eagle California brown pelican	"No effect"[a]	EA/FONSI 06/03/1983
Dredge RM 30.6–35.0	Yuma clapper rail	"No effect"[a]	04/18/1984
Bank Stabilization Parker II Critical Areas	Yuma clapper rail	Reclamation BA concluding" No effect" (NEPA = CE)	Letter to USFWS 09/13/1984
Topock Marsh Dike Construction	Yuma clapper rail Peregrine falcon Bald eagle	"Non-jeopardy" with RPMs	09/13/1984
Senator Wash Reservoir Vegetation Removal	Yuma clapper rail	CE-50-85	1985
Havasu Division Dredging RM 217.6–218.5	Yuma clapper rail	"No effect"[a]	EA written 05/13/1985
Nevada Levee Extension	No listed species	–	11/14/1985
Title I, A-22 Disposal Site	None	–[b]	EA written 12/26/1985
Parker II Division Channel Modification	Bald eagle Yuma clapper rail	"Non-jeopardy" with RPMs	01/27/1986
Lower Colorado Water Supply Project	None	–[b]	EA/FONSI written 07/1986
Mittry Lake Mitigation Title I	Yuma clapper rail	"No effect"	07/16/1986
Mittry Lake Water Delivery System	Yuma clapper rail	"Non-jeopardy" with RPMs	10/29/1987
Yuma Division Channel Modification and Levee Project	Yuma clapper rail Bald eagle	"Non-jeopardy" with RPMs	07/07/1988
White amur stocking	Yuma clapper rail	"No effect"	05/09/1990
Backwater restoration C-5 and A-7	Yuma clapper rail Bald eagle	"Not likely to adversely affect"[a]	EA 01/1991
Black Canyon Bridge Crossing (Project Cancelled)	Peregrine falcon Desert tortoise	"May affect"	06/19/1991
	Bonytail Razorback sucker Bald eagle	"Will not affect"	
Nevada's Full Water Allocation	Desert tortoise	"Not likely to adversely affect"	02/21/1992
Mittry Lake - Florida Largemouth Bass Stocking	Yuma clapper rail Razorback sucker	"Will not likely affect"	05/07/1992

Project Name	Species Involved	USFWS Consultation Results	USFWS Written Determination
Backwaters Dredging Restoration A-10	Yuma clapper rail	“Will not likely affect”	05/08/1992
	Bald eagle		
	Razorback sucker		
	Peregrine falcon		
Havasu Pumping Plant Recreation	Yuma clapper rail	“No effect”	07/14/1992
	Bald eagle		
	Razorback sucker		
Backwaters Dredging Restoration C-10	Yuma clapper rail	“Will not likely affect”	09/17/1992
	Bald eagle		
	Razorback sucker		
No name lake	Razorback sucker	“Not likely to adversely affect”	01/14/1994
Parker II Channel Modification (Project continuation)	Razorback sucker	“Will not adversely affect”	08/09/1994
Backwater Restoration C-8	Yuma clapper rail	“Not likely to adversely affect”	10/14/1994
	Bald eagle		
	Razorback sucker		
Management of Lake Mohave Water Elevations	Bonytail	“Not likely to adversely affect”	12/28/1994
	Razorback sucker		
Hoover Dam Powerplant Uprating	Razorback sucker	“Not likely to adversely affect”	03/10/1995
	Bonytail		
	Bald eagle		
	Peregrine falcon		
	Desert tortoise		
Southern Nevada Water Authority Treatment and Transmission Facility	Bonytail	“No effect”	Informal 06/05/1995
	Southwestern willow flycatcher		
	California brown pelican		
	California least tern		
	Bald eagle	“Not likely to adversely affect”	
	Peregrine falcon		
	Razorback sucker		
	Mojave Desert tortoise	“Likely to affect”	09/03/1996
Lower Colorado River Operations and Maintenance	Bonytail	“Not likely to result in jeopardy when RPA is fully implemented”	04/30/1997
	Razorback sucker		
	Southwestern Willow Flycatcher		
	Yuma Clapper Rail	“Not likely to result in jeopardy”	
	Flat-tailed horned lizard		

Project Name	Species Involved	USFWS Consultation Results	USFWS Written Determination
43 C.F.R. Part 414, Off-stream Storage of Colorado River Water; Development and Release for Internationally Created Unused Apportionment in the Lower Division States; Final Rule	Bald eagle California brown pelican Colorado pikeminnow Desert tortoise Flat-tailed horned lizard Peregrine falcon	"Not likely to adversely affect"	08/19/1998
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	Bonytail Razorback Sucker Southwestern Willow Flycatcher	"Not likely to result in jeopardy when RPA is fully implemented"	01/12/2001
	Yuma Clapper Rail	"Not likely to result in jeopardy"	01/12/2001
Expansion of the Yuma Area Water Resource Management Group Drainage Project	None	–[b]	CE written 3/16/2001[c]
Lower Colorado River Operations and Maintenance	Bonytail Razorback sucker Southwestern Willow Flycatcher	"Not likely to result in jeopardy when RPA is fully implemented"	04/30/2002
	Yuma Clapper Rail Flat-tailed horned lizard	"Not likely to result in jeopardy"	04/30/2002
Storage and Interstate Release Agreement among the United States, acting through the Secretary of the Interior; Arizona Water Banking Authority; the Southern Nevada Water Authority; and the Colorado River Commission of Nevada	Same as programmatic document	Reclamation determined and informed USFWS by letter dated August 1, 2001 that no further consultation was necessary as action was within the scope of the consultation on 43 C.F.R. Part 414	June 2002
Dredge Imperial National Wildlife Refuge	Yuma clapper rail Bald eagle	"No effect"[a]	Provided
Yuma Division Project	Cancelled	Cancelled	Cancelled
Quarries	Desert tortoise and others	Ongoing	

Notes:

CE = Categorical Exclusions.
FONSI = Finding of No Significant Impact.
EA = Environmental Assessment.
NEPA = National Environmental Policy Act.
Reclamation = Bureau of Reclamation.
RPMs = Reasonable and Prudent Measures.
USFWS = U.S. Fish and Wildlife Service.

[a] Biological assessment written in EA. Reclamation concludes no effect, with no negative comments by the USFWS after reviewing EA and FONSI.

[b] Reclamation concluded in EA no endangered/threatened species inhabited area.

[c] On September 7, 2003, the CE was supplemented by an analysis entitled Effects on Riparian and Marsh Communities along the Colorado River Due to Water Table Reduction in the Yuma Valley.

and the southwestern willow flycatcher. Additionally, the USFWS determined that Reclamation's actions were likely to adversely modify critical habitat for the two endangered fish. The BO developed an RPA to ensure that Reclamation's actions would not be likely to jeopardize the species or adversely modify critical habitat. Through implementation of the RPA, Reclamation could ensure that operation and maintainance of facilities in the Lower Basin would not be likely to jeopardize the species or adversely modify critical habitat for the term of the BO (April 30, 1997 to April 30, 2002). Two components of the RPA have been carried into the LCR MSCP and are an integrated part of the conservation measures developed for the LCR MSCP. Reinitiation of Consultation for LCR Operations and Maintenance–Lake Mead to Southerly International Boundary

On March 29, 2002, Reclamation requested reinitiation of formal section 7 Consultation with the USFWS on LCR Operations and Maintenance because some of the RPA provisions were not completed during the term of the 1997 BO. The USFWS provided coverage for an additional three years for Reclamation's discretionary activities on the LCR, from April 30, 2002, to April 30, 2005. This 2002 BO incorporates by reference information contained Reclamation's 1996 BA and the 1997 BO and extends the time period for development of the LCR MSCP.

4.7.4 Interim Surplus Criteria, Secretarial Implementation Agreements, and Conservation Measures on the LCR—Lake Mead to the Southerly International Boundary

In December 2000 and January 2001, Reclamation consulted with the USFWS on adoption of the Colorado River ISC/SIA.

The USFWS issued a BO on January 12, 2001. The species considered were the razorback sucker, bonytail, desert pupfish, Yuma clapper rail, brown pelican, southwestern willow flycatcher, the threatened desert tortoise, and bald eagle, and designated critical habitat for the razorback sucker and bonytail. After reviewing the current status of the bonytail, razorback sucker, Yuma clapper rail, and southwestern willow flycatcher, the environmental baseline for the action area, the effects of ISC, including conservation measures, and cumulative effects, the USFWS concluded that adoption of the ISC/SIA would not be likely to jeopardize the continued existence of the bonytail, razorback sucker, Yuma clapper rail, and southwestern willow flycatcher or result in the destruction or adverse modification of critical habitat for the razorback sucker in the LCR.

Although the LCR MSCP does not supersede the 2001 section 7 consultation, the effects of the 400 kaf and accompanying conservation measures will be credited in the Conservation Plan for the LCR MSCP. The LCR MSCP conservation measures (see Chapter 5 of the LCR MSCP HCP) will provide coverage for all 27 covered species identified in the LCR MSCP.

4.7.5 Expansion of the Yuma Area Water Resource Management Group Drainage Project

The YAWRMG (see Section 2.2.3.2) installed six new drainage wells in the Yuma Valley to augment the existing pumping capacity for the system. The purpose of the wells was to increase drainage pumping in the Yuma Valley by about 40,000-50,000 acre-feet for five years beginning in 2003, to return the groundwater levels in the Yuma Valley to levels simlar to those that existed in the 1970s. The pumping would then be reduced to maintain those groundwater levels in the future. A categorical exclusion was prepared for *Repairs and Modifications to the Yuma Mesa Conduit (YMC) Drainage System* (YAO-CE No. 2001-02) on March 16, 2001. On September 7, 2003, the categorical exclusion was supplemented by an analysis entitiled *Effects on Riparian and Marsh Communities along the Colorado River Due to Water Table Reduction in the Yuma Valley*.

4.7.6 National Park Service Consultations

The NPS has completed consultation with the USFWS on the Native Fish Rearing Program (consultation number 2-21-94-F-0262) and received a non-jeopardy biological opinion on May 3, 1994. Consultation on the Lake Management Plan (consultation number 2-21-01-F-0263) was completed and a non-jeopardy biological opinion was issued on October 7, 2002. Formal consultation on the Lake Mead NRA Fire Plan (consultation number 02-21-02-F-0509) is in process. NPS also consults as needed with the USFWS on individual projects.

4.7.7 U.S. Fish and Wildlife Service

All USFWS management or operational actions that may affect Federally listed or proposed species undergo intra-Service section 7 consultation prior to implementation.

4.7.8 Bureau of Land Management Consultations

The BLM has completed consultation with the USFWS on BLM actions that may affect the LCR MSCP planning area. The Kingman Resource Area Resource Management Plan (consultation number 2-21-91-F-0089) received a non-jeopardy biological opinion on March 8, 1991 and an amended non-jeopardy biological opinion on January 8, 1998. The Yuma District Resource Management Plan (consultation number 2-21-97-F-0082) received a non-jeopardy biological opinion on March 26, 1998. BLM also consults as needed with the USFWS on individual projects within the LCR MSCP planning area.

Chapter 5
Effects of the Covered Activities

5.1 Introduction and Approach

The LCR MSCP BA impact assessment describes the effects on covered species and critical habitat from implementing the covered activities described in Chapter 2, and Chapter 3 and the LCR MSCP Conservation Plan described in Chapter 5 of the LCR MSCP HCP. The effects of implementing the covered activities and the LCR MSCP Conservation Plan are compared against baseline conditions described in Chapter 4. The focus of the impact assessment is to identify effects of the covered activities and the LCR MSCP conservation measures on covered and evaluation species and their habitats.

The LCR MSCP BA 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 impact mechanisms are described.

Implementation of the covered activities and LCR MSCP conservation measures could result in the incidental take (take) of all covered species. When applicable, the level of incidental take and changes in critical habitat are identified. 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 effect 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 4.6.2.1). This "worst-case" assumption is a conservative approach that results in an overestimation of the actual effects on the species.

5.2 Assessment of Flow-Related Covered Activities on Hydrologic Conditions

Flow-related covered activities are described in Chapter 2, "Description of Federal Actions (Covered Activities)," and non-Federal flow-related covered activities are described in Chapter 3, "Non-Federal Covered Activities: Ongoing and Future." 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 and shortage. Reclamation has completed hydrologic modeling 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 Federal flow-related activities addressed in the LCR MSCP BA cannot be separated from the effects of non-Federal flow-related activities addressed in the LCR MSCP HCP. Therefore, the impact analysis for flow-related activities encompasses both Federal and non-Federal flow-related activities, and the analysis and results are the same in the LCR MSCP BA and the LCR MSCP HCP.

The LCR MSCP analyzes and provides mitigation for the potential impacts resulting from changes in point of diversion and consequent annual reductions in flow totaling 1.574 mafy on the 27 covered species. As described in Chapter 4, Reclamation and USFWS completed a section 7 consultation in 2001 regarding potential effects to Yuma clapper rail, southwestern willow flycatcher, bonytail, and razorback sucker from operations under ISC through 2016 and a change in point of diversion totaling 400,000 afy. This change in point of diversion is being included for coverage under the LCR MSCP as part of the 1.574 mafy total. This BA relies on the ISC/SIA BO for the analysis of potential effects to Yuma clapper rail, southwestern willow flycatcher, bonytail, and razorback sucker from the 400,000 afy changes in point of diversion. Accordingly, this BA analyzes the effect of additional changes in point of diversion of 1.174 mafy on these four species. For the remaining 23 species, however, this BA provides an analysis of the effects resulting from the total annual flow reduction of 1.574 mafy. 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. The LCR MSCP conservation measures (see

Chapter 5 of the LCR MSCP HCP) 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 5.2.1); results of the hydrological modeling (see Section 5.2.2); 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 5.2.3.1); and the subsequent potential effects of hydrologic changes as indicated in the modeling results on habitat conditions (see Sections 5.2.3.2 to 5.2.3.6).

5.2.1 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 5.2.1.1 below and in Appendix J (Section 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 5.2.1.2 below and in Appendix J (Section 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].

5.2.1.1 Description of Colorado River System Simulation Hydrologic Model

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, 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

[1] The use of the phrase "Baseline scenario" in this BA and the LCR MSCP HCP 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 BA and the LCR MSCP HCP regarding hydrologic modeling refers to the future operations of the LCR. See Appendix J for further details on the modeling assumptions.

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 5.2.2.1 and on Reach 7 in Section 5.2.2.2.

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 this 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 natural flows using the Index Sequential Method (Bureau of Reclamation 2000c). Starting conditions for all system reservoirs are based on actual

[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: 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.

water-level elevations for December 31, 2002[3]. A detailed description of all modeling assumptions are presented in Appendix J, Section J.6.1.

5.2.1.2 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 5.2.1.1. 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 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 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.

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[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.

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 (Section 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, 4, and 5.

These cross-section locations were selected to represent typical river stretches. These locations were distributed throughout Reaches 3–5 River 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.

5.2.2 Effects of Implementing the Flow-Related Covered 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.

5.2.2.1 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 5.2.1.1. 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

[4] As more fully described in 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.

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 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 5-1.

Table 5-1. 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 5-1, 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.

5.2.2.2 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 5.2.1.2 and presented in Table 5-2.

Table 5-2. 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						
		Median	April		August		December	
Reach	River Mile	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

		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	167.6	-1.23	-2.46	-1.59	-2.19	-0.23	-0.39	-0.31
4	160.9	-1.20	-2.65	-1.46	-2.09	-0.23	-0.39	-0.33
4	149.5	-1.22	-2.58	-1.32	-2.01	-0.25	-0.42	-0.42
4	146.9	-0.95	-2.60	-1.02	-1.56	-0.19	-0.32	-0.33
4	135.8	-0.13	-2.01	-0.32	-0.31	-0.02	-0.04	-0.02
4	119.7	-1.17	-0.31	-1.16	-1.68	-0.87	-0.72	-0.73
4	116.5	-1.55	-1.54	-1.52	-2.23	-1.16	-0.98	-1.00
4	114.6	-1.45	-2.03	-1.39	-2.06	-1.09	-0.93	-0.96
4	109.1	-1.44	-1.87	-1.44	-2.08	-1.07	-0.89	-0.90
4	103.1	-1.22	-1.90	-1.28	-1.79	-0.91	-0.74	-0.72
4	96.7	-1.43	-1.65	-1.48	-2.09	-1.06	-0.87	-0.85
5	86.1	-1.16	-1.92	-1.17	-1.55	-1.04	-0.81	-0.84
5	80.4	-0.96	-1.43	-1.03	-1.31	-0.86	-0.63	-0.63
5	72.2	-1.02	-1.23	-1.12	-1.40	-0.91	-0.65	-0.64
5	70.3	-1.04	-1.32	-1.12	-1.42	-0.92	-0.67	-0.66
5	66.1	-1.03	-1.34	-1.21	-1.44	-0.91	-0.61	-0.58
5	56.0	-0.88	-1.39	-1.03	-1.05	-0.94	-0.55	-0.55
5	53.6	-0.49	-1.08	-0.72	-0.61	-0.53	-0.23	-0.22
5	50.8	-0.08	-0.73	-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 5-2, 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 5-2. 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 5-2, 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 flows 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 actions are likely inconsequential (see Appendix L). Mexico has the capacity to divert up to 200,000 af above its normal monthly water order, minimizing excess flow downstream of 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.

5.2.2.3 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 4, 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 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 5.3 and 5.5). These covered activities are described in Chapter 2 (Sections 2.2.3 and 2.2.4) and consist of: bankline stabilization and maintenance, levee maintenance, and sediment control. This section also 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. As described below, a quantitative analysis of the indirect effects of ongoing OM&R and OM&R that could occur in the future cannot be performed because the indirect effects resulting from those actions are confounded by similar effects resulting from the existence of the Facilities and past OM&R 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 5.5, 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.

5.2.3 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 5.5.

5.2.3.1 Key Assumptions Related to Groundwater Effects on Land Cover Types and Covered Species Habitat

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 4.6.2.1) 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 included as an effect of the non-flow-related covered activities and are not included as an effect of the flow-related covered activities (see Table 5-5).
- 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 effects 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 effects on those species and would contribute to the recovery of those species.

- Effects 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 effects that will be avoided by maintaining water deliveries to Topock Marsh is presented in Table 5-3. Maintaining water deliveries to Topock Marsh will also avoid effects 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 5-2 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 5-2).

- 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).

- Reclamation is involved with the operation and maintenance of wells that maintain groundwater levels in the Yuma area. The future operation of these wells will not have additional effects to groundwater levels in Reaches 6 and 7 over the existing condition.

Table 5-3. Extent of Effects 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 Effects Avoided (acres)
Threatened and Endangered Species	
Yuma clapper rail	16[a]
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.

5.2.3.2 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 4-9) 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 baseline 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 5.2.2.2, 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 baseline conditions.

5.2.3.3 Marsh along the LCR

Marsh is present in all river reaches in the LCR MSCP planning area and provides habitat for 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 5.2.1.1, 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 on 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

- desiccation 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.

5.2.3.4 Lake Mead Conditions

The analysis of effects of flow-related covered activities on river flow and Lake Mead reservoir elevations in this section 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 5.2.2.1, "Lake Mead Elevation," implementation of future flow-related covered activities may affect Lake Mead reservoir elevations from baseline 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 moist 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 lower Colorado River. 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 that are exposed when Lake Mead water surface elevations are below full-pool elevation and that have the soil characteristics required by each species. 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.

5.2.3.5 River Conditions

Reach 2

As described in Section 5.2.1.2, river channel and Lake Mohave reservoir conditions in Reach 2 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'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., 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 baseline 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 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 would 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 are from Lake Havasu, including the Metropolitan and CAWCD diversions. 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 baseline 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 baseline 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 baseline 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's 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 baseline 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 existing conditions and with implementation of flow-related covered activities.

Reach 6

As described in Section 5.2.1.2, 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 5.2.2.2, 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).

5.2.3.6 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 these river processes. 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 5.2.2.2, "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 baseline conditions, so that the future flow-related activities in reservoirs will not cause effects to backwaters (see Section 5.2.1.1).

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 5-2) 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 baseline 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 baseline conditions. Therefore, no additional effects to backwaters due to future flow-related covered activities are anticipated.

5.3 Assessment of Non-Flow-Related Covered Activities

Federal non-flow-related covered activities are described in Chapter 2 and non-Federal non-flow-related covered activities described in Chapter 3. Non-flow-related activities primarily affect species and their habitat within the footprint of the activity. 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 5.2.2.3.

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.

5.3.1 Impact Mechanisms

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

5.3.1.1 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, “Description of Federal Actions (Covered Activities),” and the assumptions below in Section 5.3.2, physical disturbance associated with Federal non-flow-related covered activities that could affect covered species primarily could result from operation of equipment to:

- maintain the stable location and slope of the river channel, including dredging; bank maintenance; and maintenance of levees, jetties, and training structures;
- maintain desilting basins, boat ramps, gaging stations, and other facilities described in Chapter 2;
- implement habitat restoration projects; and
- implement projects to convert natural land cover types to agricultural uses.

Based on the description of the covered activities in Chapter 3, "Non-Federal Covered Activities: Ongoing and Future," and the assumptions below in Section 5.3.2, physical disturbance associated with non-Federal 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 with artificial fish habitat structures, could alter river and reservoir structure, but the area affected by these activities would likely be only a fraction of an acre individually and only a few acres cumulatively.

Indirect effects of physical disturbances that could be associated with implementing non-flow-related covered activities include:

- temporary removal of food organisms and cover from the dredged areas of river channel and backwaters;
- reduction in channel-edge complexity, with a subsequent reduction of cover used by covered fish species to hide and escape from predators and of the production of invertebrates that are food for fish (Hicks et al. 1991), resulting from placement of riprap and the removal of shoreline vegetation;
- movement and potential accumulation of selenium and other metals due to channel maintenance, dredging, and dredge spoil placement; and
- potential sedimentation of covered fish species' spawning habitat, resulting from increased turbidity caused by channel dredging activities and construction and maintenance of fish grow-out coves, fishing docks, fish attraction structures, and boat ramps in Lake Mead and Lake Mohave.

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.

5.3.1.2 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 (e.g., entrainment of fish in dredge intakes), and noise and visual disturbances associated with operation of equipment could cause covered wildlife and fish species to move from the area of disturbance. These disturbances may also physically affect the individual organisms, for example through the bio-accumulation of selenium.

5.3.2 Assumptions

The non-flow-related covered activities described in Chapter 2, "Description of Federal Actions (Covered Activities)," and in Chapter 3, "Non-Federal Covered Activities: Ongoing and Future," identify the types of Federal and non-Federal non-flow-related activities, respectively, that may be undertaken over the term of the LCR MSCP. The assessment of non-flow-related impacts is based on the extent of species habitat that would be removed with implementation of the non-flow-related covered activities and a qualitative assessment of the likelihood that implementation of covered activities will result in harassment or direct mortality of covered species. The timing of implementation of the proposed non-Federal 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. In addition, ongoing and future non-Federal 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 BA.

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

- Ground-disturbing activities associated with maintaining and restoring habitats will avoid effects on the sticky buckwheat and threecorner milkvetch.
- A total of 1,146 miles of existing and planned drains and canals on Tribal lands is maintained such that emergent vegetation does not become established and, therefore, does not support Yuma clapper rail, western least bittern, and California black rail habitat. Consequently, these activities will not affect these species and avoidance of maintenance activities during the breeding season is not required.
- Habitat restoration projects will avoid removing desert pocket mouse habitat to restore habitat for other species.
- 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 restoration projects will avoid take of individual desert tortoises and their burrows.
- Implementation of the non-flow-related covered activities would result in the removal of land cover types that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types on dry upland sites) by individuals of one or more covered species, but are not considered to be habitat . Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

The assessment of non-Federal 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 honey mesquite, type IV (type III will not be removed).
- Implementation of the non-Federal 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 described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), 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 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.

5.4 Assessment of LCR MSCP Implementation Effects

LCR MSCP conservation measures are described in Chapter 5, “Conservation Plan” of the companion LCR MSCP HCP. 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 the LCR MSCP 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.

5.4.1 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 effects of physical disturbance and biological disturbance are the same as described for non-flow-related activities (see Section 5.3.1).

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, 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.

5.4.2 Assumptions

The LCR MSCP conservation measures described in the LCR MSCP Conservation Plan (see Chapter 5 of the LCR MSCP HCP) 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 Permit Applicants to replace covered species habitat potentially affected by covered activities in advance of the implementation of covered activities.

LCR MSCP activities related to conducting species surveys and capturing and handling species will be undertaken, at the direction of the LCR MSCP 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 BA. 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 BA.

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 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

5.5 Effects on Covered Species

Effects 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 5-4 identifies the covered activities that could adversely affect the covered species. Table 5-5 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. The following sections describe the effects of implementing the Federal non-flow- and flow-related covered activities and LCR MSCP conservation measures on each of the covered and evaluation species. The effects of implementing non-Federal non-flow-related covered activities are described in Section 5.6, “Effects of Non-Federal Non-Flow-Related Covered Activities.”

5.5.1 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 through implementation of LCR MSCP avoidance and minimization measures and creation of habitat to replace affected habitat. Creation of habitat in addition to that required to replace lost habitat, through implementation of the LCR MSCP Conservation Plan, is expected to contribute to recovery of the Yuma clapper rail. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Yuma clapper rail.

5.5.1.1 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 5-5) 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 the potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3). Lowering groundwater elevations could cause direct loss of these habitats by desiccating, fragmenting, or reducing the extent of habitat patches.

As described in Section 5.2.3.3, 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, 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 Yuma clapper rail over the term of the LCR MSCP.

As described in Section 5.2.2.3, 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.

5.5.1.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) may result in take of Yuma clapper rail. Noise, artificial lighting, and dust may have indirect effects well beyond the construction areas on nesting Yuma clapper rails. Effects may include displacement of nesting pairs or decreased reproductive success. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. These activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 70 acres of Yuma clapper rail habitat could be removed to maintain channel functions (e.g., dredging desilting basins) (see Table 5-5). Activities associated with

Table 5-4. Covered Activities that could Adversely Affect Covered Species

Common and Scientific Name	Flow-Related Covered Activities: Ongoing	Flow-Related Covered Activities: Future	Non-Flow-Related Covered Activities: Ongoing	Non-Flow-Related Covered Activities: Future	LCR MSCP
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

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 5-5. 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)

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

Covered Species	Impacts on Species Habitat			
	Degraded (Flow-Related)	Federal Non-Flow-Related Activities	State Non-Flow- Related Activities	Total[a]
Sonoran yellow warbler	2,929	183	10[g]	3,122
Summer tanager	161	14	0	175
Flat-tailed horned lizard	0	128	0	128
Relict leopard frog	0[j]	0	0[j]	[h]
Flannelmouth sucker	85	0	0	85
MacNeill's sootywing skipper	172	50	0	222
Sticky buckwheat	ND[k]	0	0	ND[k]
Threecorner milkvetch	ND[k]	0	0	ND[k]
Evaluation Species				
California leaf-nosed bat	0	0	0	0
Pale Townsend's big-eared bat	0	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 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 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 the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

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

[b] 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.

[c] 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.

[d] 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.

[e] 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.

[f] 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.

[g] 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.

[h] 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 type IV that provide habitat could be removed by Federal non-flow-related activities; however, these activities and resultant impacts are not covered under the LCR MSCP.

[i] Assumes that up to 10 acres of degraded cottonwood-willow and 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] Implementation of covered activities will not result in removal of this species’ habitat but could temporarily disturb habitat or affect movement of individuals.

[k] 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.

removal of habitat during the breeding season could result in mortality of eggs or young. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. As described in Section 5.2.2.3 , indirect effects of ongoing non-flow-related covered activities in Reaches 2–7 could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

The creation of Yuma clapper rail habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of Yuma clapper rail in the LCR MSCP planning area. Consequently, the number of Yuma clapper rails exposed to disturbances caused by these types of non-flow-related activities is expected to increase in future years.

5.5.1.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining 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 would avoid removing 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan, 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 would avoid removing 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 of 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 undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create 512 acres of Yuma clapper rail habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 269 acres. In addition, the LCR MSCP Conservation Plan will maintain existing important Yuma clapper rail habitat areas in the LCR MSCP planning area.

5.5.2 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 avoidance and minimization measures 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities and the LCR MSCP is likely to adversely affect the southwestern willow flycatcher. Implementation of the covered activities could impact proposed southwestern willow flycatcher critical habitat. These impacts, however, are not expected to appreciably diminish the value of the proposed critical habitat for species conservation.

5.5.2.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of 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 5-6). Lowering groundwater elevations will affect breeding habitat primarily through the loss of moist soil surface conditions during the breeding season. The LCR MSCP will avoid the potential effects of lowering groundwater elevations on an additional 2,135 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh and thereby maintaining water levels and existing conditions (see Table 5-3). Southwestern willow flycatcher nesting habitat is assumed to be lost if the predicted reduction of groundwater elevation caused by changes in points of diversion is sufficient to result in the loss of surface water or moist soil surface conditions in nesting habitat during the breeding season.

Table 5-6. Reduction in Extent of Southwestern Willow Flycatcher 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 5.2.3.3, 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 draw downs 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. Reclamation has already consulted on the effects of the loss of southwestern willow flycatcher habitat within the influence of Lake Mead (U.S. Fish and Wildlife Service 1997) and provided replacement habitat to offset the periodic loss of this area. Thus, the southwestern willow flycatcher may obtain a temporary benefit from having this habitat occasionally available.

As described in Section 5.2.2.3, 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.

5.5.2.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gauge station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) near occupied southwestern willow flycatcher nesting territories could result in harassment of individuals. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting southwestern willow flycatchers. Effects may include displacement of nesting pairs or decreased reproductive success. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. These activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 59 acres of southwestern willow flycatcher habitat could be removed and converted to agriculture at the Cocopah Indian Reservation in Reach 7 (see Table 5-5). Activities associated with removal of occupied habitat during the breeding season could result in mortality of eggs or nestlings. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. These activities are expected to result in some low level of take over the term of the LCR MSCP. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3 indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of habitat degradation in Reaches 2–7 over the term of the LCR MSCP.

The creation of southwestern willow flycatcher habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increased number and distribution of southwestern willow flycatchers in the LCR MSCP planning area. Consequently, the number of southwestern willow flycatchers exposed to disturbances caused by non-flow-related activities is expected to increase in future years.

5.5.2.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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, as well as 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 4,050 acres of southwestern willow flycatcher habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of available nesting habitat by 2,197 acres. LCR MSCP–created yellow-billed cuckoo habitat that maintains wet soil conditions during the southwestern willow flycatcher breeding season could provide additional habitat for the species. In addition, the LCR MSCP Conservation Plan will maintain baseline important southwestern willow flycatcher habitat areas in the LCR MSCP planning area.

5.5.2.4 Effects on Proposed Critical Habitat

On October 12, 2004, the USFWS proposed critical habitat for the southwestern willow flycatcher (69 FR §60706). This section describes the areas proposed for critical habitat and the effects of covered activities and the LCR MSCP on proposed critical habitat. The analysis of effects on critical habitat does not rely on USFWS's regulatory definition of "destruction or adverse modification" of critical habitat found at 50 C.F.R. §402.02. Instead, this BA relies upon the analysis set forth in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, F.3d (9^{th} Circuit 2004)[5]

Critical habitat has been proposed within Reaches 1 and 3–6. Distinct reaches within the planning area include: 1) Reach 1: lower Grand Canyon from Separation Canyon to Pierce Ferry, including a small portion of upper Lake Mead, a small portion of the Virgin River Delta, and a small portion of the Muddy River Delta as it enters Lake Mead; 2) Reach 3 and 4: Davis dam to Parker Dam including Lake Havasu and Topock Marsh, a portion of the Bill Williams River as it enters Lake Havasu, and Parker Dam to Upper end of the Colorado River Indian Tribe reservation; and 3) entire length of Reach 5 and a portion of Reach 6 extending to a point 3.5 miles north of the Gila/Colorado River confluence.

Implementation of the covered activities and the LCR MSCP will not result in an appreciable diminishment of the value of the proposed critical habitat for conservation of the southwestern willow flycatcher for reasons listed below.

The first distinct reach affected by flow related covered activities is the lower Grand Canyon from Separation Canyon to Pierce Ferry and the Virgin River. This area supports the majority of woody riparian vegetation found within Reach 1 when reservoir elevations are below the full pool elevation of Lake Mead.

Southwestern willow flycatcher breeding has been documented intermittently within the lower Grand Canyon and Pierce Ferry section of Lake Mead since 1996. In 1997, 981 acres of occupied or surveyed but unoccupied habitat were delineated within Reach 1

[5] The 9^{th} circuit indicated that the statute requires that effects on critical habitat be evaluated in light of recovery of the species, and not just survival of the species.

(see Table 4-11). Potential willow flycatcher habitat has not been delineated in the Lake Mead delta since that time. Recent declines in reservoir elevations have subsequently resulted in the loss of newly created habitat as a result of desiccation.

The extent and composition of the riparian vegetation at any point in time is highly dependent on Lake Mead reservoir fluctuations. Consequently, southwestern willow flycatcher habitat conditions provided by riparian vegetation that establishes within the full pool elevation of Lake Mead are directly related to Lake Mead elevations. Historically, riparian vegetation has been created, destroyed, or altered within the full pool elevation of Lake Mead intermittently, depending on external factors, including inflow from the Upper Basin. High water levels at Lake Mead can eliminate habitat within the lake proper but may improve habitat within portions of Grand Canyon below Separation Canyon. Conversely, low lake levels can create conditions suitable for the establishment of habitat below the full pool elevation of Lake Mead; however, habitat quality is highly variable and dependent upon many factors including timing and extent of reservoir drawdowns.

The second distinct reach includes all of Reach 3 of the LCR MSCP planning area, including Topock Marsh, which is one major stronghold of the species along the LCR where breeding pairs have been located every year since 1996. A total of 3,489 acres of occupied and surveyed but unoccupied willow flycatcher habitat has been estimated to occur in Reach 3 (see Table 4-11). Approximately a 17 mile section of Reach 4 south of Parker Dam is also proposed for critical habitat. Little habitat currently exists in the northern section of this reach; however, 55 acres of occupied habitat have been identified and proposed as critical habitat on CRIT lands near Parker.

Flow-related covered activities are expected to affect a total of 180 acres (168 acres of occupied and 12 acres of unoccupied habitat) (see Table 5-6) of proposed critical habitat in Reach 3 and 55 acres in Reach 4, because lower groundwater levels associated with water diversions could increase the desiccation of existing habitat. The LCR MSCP will avoid the potential effects of lowering groundwater elevations on an additional 2,135 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh and thereby maintaining water levels and existing conditions (see Table 5-3). Any drop in groundwater elevation under the proposed critical habitat area is assumed to result in the degradation or loss of the vegetation that characterizes the constituent elements of the proposed critical habitat (see Section 5.2.1.3).

The third distinct reach proposed for critical habitat designation along the LCR is the entire length of Reach 5 and a portion of Reach 6 extending to a point 3.5 miles north of the Gila/Colorado River confluence. No nests have been located in this area, but sites are heavily used for migration. An estimated 1,315 acres (1,288 acres of occupied habitat and an additional 27 acres of unoccupied habitat) are expected to be affected by flow-related covered activities, within Reach 5 (see Table 4-11), and an additional 97 acres of occupied and unoccupied habitat within the portion of Reach 6. Estimated effects of flow-related covered activities on occupied and unoccupied but surveyed southwestern willow flycatcher habitat are described in Section 5.5.2.1. Effects to the habitat within areas proposed as critical habitat include the degradation of native vegetation and loss of moist surface soil conditions as a result of the lowering of groundwater elevations, removal of habitat as a result of conversion to agriculture, and desiccation or inundation of habitat that establishes within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevations.

The proposed critical habitat designation also stresses the importance of the LCR as a migration corridor for southwestern willow flycatchers. Lower portions of the river below Parker are heavily used during migration as shown by surveys conducted since 1997. For example, in 2003, 244 migrant willow flycatchers (all subspecies of *Empidonax trailii*) were detected between Parker Dam and the SIB at the south end of Reach 7 (Koronkiewicz 2004), and over 240 migrant flycatchers were observed in these same reaches in 2004 (Koronkiewicz pers. comm.).

While willow flycatchers have been observed during migration in many areas within the LCR MSCP planning area, including backyards, important stopover habitat may be more restricted. Flow-related effects are unlikely to adversely affect marginal stopover migration habitat, such as that that may be provided by upland stands of saltcedar and saltcedar-mesquite land cover types. High value migration stopover habitat is provided by areas with the same vegetative and soil moisture characteristics that provides southwestern willow flycatcher habitat (e.g., dense woody vegetation riparian, moist surface soil conditions that produce an abundance of flying insects). Potential effects of implementing the covered activities on these habitat areas are the same as those described in Sections 5.5.2.1, 5.5.2.2, and 5.5.2.3).

The LCR MSCP includes conservation measures specific to creating and managing habitat for the southwestern willow flycatcher within the proposed critical habitat. The created habitat will be managed to provide higher value than the affected proposed critical habitat it will replace (e.g., the habitat will be managed to provide moist soils and nesting substrate of sufficient density structure).

Implementation of the LCR MSCP conservation measures would have a beneficial effect on the areas proposed for critical habitat in reaches below Davis Dam. The LCR MSCP will create 4,050 acres of cottonwood-willow land cover that will be managed specifically to provide the constituent elements of southwestern willow flycatcher breeding and migration habitat Preliminary data indicate that willow flycatchers can be relatively abundant during migration in restored riparian areas, especially if soil moisture conditions are adequate. For example, flycatcher surveys indicate that migratory flycatchers are using riparian restoration sites that were initiated in 1999 (i.e., the Pratt Restoration site near Yuma Arizona and the Cibola Nature Trail Restoration site on Cibola NWR; Bureau of Reclamation unpublished data 2004). Implementation of the LCR MSCP will enhance areas included in the critical habitat proposal and will not result in an appreciable diminishment of the value of the proposed critical habitat for conservation of the southwestern willow flycatcher.

In conclusion, implementation of the covered activities and the LCR MSCP will not diminish capacity of the proposed critical habitat present within the LCR MSCP planning area to a level that will preclude future achievement of the southwestern willow flycatcher recovery goals (U.S. Fish and Wildlife Service 2002b). In addition, the LCR MSCP provides for the continued adaptive implementation of the LCR MSCP conservation measures to further ensure that implementation of the covered activities will not diminish the value of critical habitat for conservation.

5.5.3 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. For the reasons described below, implementation of the non-flow-related covered activities and the LCR MSCP is likely to adversely affect the desert tortoise.

5.5.3.1 Effects of Federal Non-Flow-Related Covered Activities

Proposed activities related to conversion of lands to agricultural uses may result in take of the desert tortoise. Conversion of creosote-dominated desert scrub land cover to agricultural land in Reaches 4 and 6 would remove 192 acres of desert tortoise habitat (see Table 5-5), but would not affect designated critical habitat. Activities associated with conversion of habitat (ground-disturbing activities) could result in injury or mortality of individuals. These activities are expected to result in a low level of take over the term of the LCR MSCP. Ongoing non-flow related covered activities are not expected to result in indirect effects on the desert tortoise.

5.5.3.2 Effects of LCR MSCP Implementation

Activities associated with establishing and managing LCR MSCP–created covered species habitat may result in take of 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 tortoise habitat would likely be unsuitable for creation of covered species habitat. However, depending on existing infrastructure associated with conservation areas established in the desert tortoise range, 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 is necessary to establish and maintain the conservation areas. Such activities could result in removal and disturbance of 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, would be avoided. Over the term of the LCR MSCP, however, these activities (operation of vehicles and equipment in habitat) are expected to result in some low level of take (i.e., mortality) of individuals.

Implementation of the LCR MSCP Conservation Plan will protect 230 acres of unprotected occupied desert tortoise habitat to mitigate the loss of up to 192 acres of desert tortoise habitat as a result of implementing covered activities. The acquired habitat will be transferred to an appropriate management agency for permanent protection of habitat for the species.

5.5.3.3 Effects on Critical Habitat

In 1994, the USFWS proposed critical habitat for the desert tortoise. This BA does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat found at 50 C.F.R. §402.02. The definition of "destruction or adverse modification" found in this BA relies upon the ESA and the analysis found in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, F.3d, (9th Circuit 2004).

The Mojave population of desert tortoise is present in the LCR MSCP planning area in Reaches 1–6. Designated critical habitat for this subspecies is present in Reaches 1–4 of the planning area. Implementation of flow-related and Federal and non-Federal non-flow-related covered activities and LCR MSCP conservation measures will not affect designated critical habitat for desert tortoise.

5.5.4 Bonytail

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.

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 flow-related and non-flow-related covered activities and the LCR MSCP is likely to adversely affect the bonytail. Implementation of the covered activities could impact bonytail critical habitat. These impacts, however, are not expected to appreciably diminish the value of critical habitat for species conservation.

5.5.4.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of bonytail. Changes in flow in Reaches 3–5 would 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 5-5). Although bonytail is known to exist only in the mainstem and connected backwaters of

Reaches 2 and 3 and in 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 would avoid the potential effects of lowering groundwater elevations on an additional 225 acres of bonytail habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining 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 5.2.1.3), 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 5-2. 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 end 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.

Implementing future flow-related covered activities would reduce river depth during the spawning period. The lower 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 refuge from predators. Reduced flow, and the consequent 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 bonytail. There are relatively few diversions directly from the river segment of Reach 3, although large diversions (i.e., Metropolitan and the CAWCD) are made 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 its low population numbers. Entrainment of bonytail under implementation of flow-related covered activities will be similar to existing conditions (based on the area with measurable velocity toward the diversion intake).

Despite this, the number of bonytail that could be entrained in Reach 3 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 their flow from the river. Large diversions at Headgate Rock Dam and Palo Verde Diversion Dam could coincide with 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. 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.

5.5.4.2 Effects of Federal Non-Flow-Related Covered Activities

Non-flow-related covered activities to maintain the stable location and slope of the river channel include dredging, bank maintenance, and maintenance of levees, jetties, and training structures. These activities may result in take of bonytail in Reaches 3–5. Bonytail is currently present only in Reaches 2 and 3, but could be reintroduced in Reaches 4 and 5 in future years. Effects on bonytail would be temporary, generally encompassing the period of construction. Dredging may remove potential spawning and rearing habitat associated with wash fans. Dredging and maintenance activities would temporarily remove food organisms and cover from the dredged areas of river channel and backwaters. Placement of riprap and the removal of shoreline vegetation could reduce channel-edge complexity, thereby reducing cover from predator species and production of invertebrates that are food for fish (Hicks et al. 1991). Increased turbidity caused by dredging and maintenance activities could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in some low level of take over the term of the LCR MSCP. As described in Sections 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of the river channel and backwaters that provide habitat over the term of the LCR MSCP.

In addition to causing effects on habitat, dredging and maintenance of banks, levees, jetties, and training structures could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from entrainment into the dredge intake or physical trauma to the organisms. Adult and juvenile fish may move away from affected habitat. These activities are expected to result in a low level of take over the term of the LCR MSCP.

Dredging backwaters and the areas surrounding jetties and training structures would maintain flow continuity between the backwaters and the river and maintain the backwater area and depth. Bonytail may benefit from maintenance of backwaters because backwaters along the LCR provide habitat (Bradford et al. 1998). Improved flow continuity in the backwaters would improve access and maintain water quality.

Construction and maintenance of fish grow-out coves, fishing docks, fish attraction structures, and boat ramps in Lake Mohave would disturb and cover up the reservoir bottom. The construction-related removal of potential spawning and rearing habitat would affect a small area and is not expected to adversely affect bonytail. Temporary adverse effects could be associated with the increased turbidity and contaminants that are contributed by construction and maintenance activities and that could affect spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in a low level of take over the term of the LCR MSCP.

In addition to causing effects on habitat, construction and resulting recreational activities associated with fishing docks, artificial fish habitats, and boat ramps at Lake Mohave could cause direct mortality of fish or cause fish to temporarily avoid using affected habitat. Direct mortality could result from physical trauma to individual fish during construction or through capture by recreational anglers. Adult and juvenile fish may move away from affected habitat. In addition, these artificial habitats designed for nonnative fish species may adversely affect bonytail by increasing local predator density. These activities are expected to result in a low level of take over the term of the LCR MSCP.

Augmentation of the existing bonytail population through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of bonytail in the LCR MSCP planning area. Consequently, the number of bonytail exposed to disturbances caused by non-flow-related activities is expected to increase in future years.

5.5.4.3 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 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 the production and availability of food organisms; and
- accidentally discharge contaminants or resuspend contaminants from disturbed sediments, which could adversely affect the survival, growth, and reproduction of bonytail.

Although construction and maintenance activities could adversely affect 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 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, the use of modern fish culture practices that strive to minimize disease and parasite spread through enhancement of fish health, best management practices (BMPs), and other means would minimize the risk. In addition, transporting and handling 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. However, establishing and maintaining LCR MSCP–created habitats is not expected to increase contaminant concentrations above existing levels. Establishing and maintaining LCR MSCP habitats is 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 in no net change for nonagricultural sites. Runoff/return flow from habitat creation sites would be minimized to the greatest extent possible. Therefore, contaminants associated with runoff from LCR MSCP habitats are unlikely to adversely affect bonytail.

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

Implementation of the LCR MSCP conservation measures, including creation of 360 acres of habitat and stocking of up to 620,000 subadult bonytail over the term of the LCR MSCP will fully mitigate effects of covered activities and help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained. Stocking subadult bonytail and the attendant monitoring and research conducted for the bonytail under the LCR MSCP Conservation Plan will contribute to attainment of the recovery goals established for the species (U.S. Fish and Wildlife Service 2002c).

5.5.4.4 Effects on Critical Habitat

In 1994, the USFWS proposed critical habitat for the bonytail. This BA does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat found at 50 C.F.R. §402.02. The definition of "destruction or adverse modification" found in this BA relies upon the ESA and the analysis found in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, F.3d, (9th Circuit 2004).

Designated critical habitat for bonytail in the LCR MSCP planning area consists of:

- the Colorado River from Hoover Dam to Davis Dam, including Lake Mohave up to its full-pool elevation (i.e., Reach 2); and
- the Colorado River from the northern boundary of Havasu NWR to Parker Dam, including Lake Havasu up to its full-pool elevation (i.e., Reach 3).

Implementation of flow-related covered activities would not affect environmental conditions in Reach 2, including Lake Mohave. Therefore, critical habitat in Reach 2 would not be affected. Flow-related covered activities would affect environmental conditions in Reach 3, by changing river flow in the segment upstream of Lake Havasu and changing diversion in Lake Havasu, and would result in the loss of 77 acres of habitat. Implementation of non-flow-related activities and LCR MSCP conservation measures could also affect environmental conditions in Reaches 2 and 3, but is not expected to result in the loss of habitat.

Effects on critical habitat for the bonytail are confined to Reach 3 from the upper end of Lake Havasu to the upper end of Havasu NWR. Lake Havasu operations are not expected to change with the implementation of the covered activities. Implementation of covered activities would reduce river depth during the spawning period. The reduced depth could reduce potential spawning habitat area and associated backwaters. 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. Reduced flow may also increase stranding losses where daily flow variability isolates and subsequently desiccates occupied habitat. Increasing stranding relative to the existing conditions depends on site-specific channel morphology and the relationship of reduced depth in association with ongoing daily flow fluctuation. Although the flow-related covered activities may have impacts on bonytail critical habitat, the factor limiting the abundance of bonytail and other LCR native fish species is competition from non-native fish species. Effects on bonytail critical habitat and predation are not expected to increase the threat from competition from non-native fish species. The possibility, therefore, of impacts on critical habitat resulting from the covered activities is not expected to appreciably diminish the value of critical habitat for species' conservation, affect the survival of the species, nor appreciably diminish the value of critical habitat for survival of the species. For the following reasons, there is not an appreciable diminishment of the *value* of critical habitat for bonytail conservation.

1. The LCR MSCP includes conservation measures specific to constructing or managing critical habitat for the bonytail within its designated critical habitat. The created habitat within designated critical habitat will be managed to provide higher value for the bonytail than the affected critical habitat it will replace (e.g., the habitat will be maintained free of nonnative competitors/predator fishes to the greatest extent practicable).

2. The implementation of the covered activities and the conservation measures will not diminish capacity of bonytail critical habitat present within the LCR MSCP planning area to a level that will preclude future achievement of the razorback sucker recovery goals (U.S. Fish and Wildlife Service 2002c).

In addition, the LCR MSCP provides for the continued adaptive management of conservation measures to ensure that implementation of the covered activities will not diminish the value of critical habitat for conservation.

Based on the understanding that the definition of adverse modification found at 50 C.F.R. §402.02 has been found to not comport with the ESA, this BA does not consider "survival" in the context of "survival and recovery". The survival of bonytail, however, will not be compromised by the possible effects on critical habitat resulting from Federal covered activities because: 1) the stocking of bonytail under the LCR MSCP will maintain and increase the abundance of bonytail; 2) the construction and management of backwaters within designated critical habitat to provide high value bonytail habitat will replace the value of affected habitat; and 3) the development of successful bonytail rearing methodology will ensure the availability of bonytail for re-introduction by ongoing and future programs.

5.5.5 Humpback Chub

Based on efforts to recover humpback chub in the Colorado River upstream of Lake Mead, humpback chub may occur in up to an estimated 62 miles of the Colorado River, in transitory river segments 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 flow-related covered activities and LCR MSCP conservation measures on the distribution and status of humpback chub are expected to be minor. These covered activities and conservation measures could affect a relatively small number of individuals that may periodically move into and use transitory river segments when they are present in Lake Mead. Critical habitat has been designated, but none is located in the LCR MSCP planning area; therefore, designated critical habitat will not be affected by covered activities and LCR MSCP implementation.

Federal non-flow-related covered activities and LCR MSCP implementation are not expected to result in take of humpback chub. For the reasons described below, implementation of the flow-related covered activities is likely to adversely affect humpback chub.

5.5.5.1 Effects of Flow-Related Covered Activities

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

5.5.6 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 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 over the term of the LCR MSCP in numbers sufficient to fully mitigate effects and contribute to the recovery of the species. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the razorback sucker. Implementation of the covered activities could impact razorback sucker critical habitat. These impacts, however, are not expected to appreciably diminish the value of critical habitat for species conservation.

5.5.6.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of razorback sucker. Flow-related covered activities that change flow in Reaches 3–5 would result in the loss of 399 acres of habitat, including designated critical habitat (see Table 5-5). The LCR MSCP would avoid the 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, thereby maintaining water levels and existing conditions.

The spawning habitat for razorback sucker in Lake Mead may be affected by changes in reservoir operations (see Appendix M). The known spawning elevations that may be important for razorback sucker are 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 that razorback suckers would successfully move their spawning location to 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 therefore 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 from January through April/May (Langhorst and Marsh 1986). Implementing 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 refuge from predators. Reduced flow, and the resulting 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 5.2.1.3), 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 5-2. 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 end 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 that they were entrained with water diverted from the LCR. Alternatively, razorback suckers observed in the reservoir may 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, although large diversions are made 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 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. Implementation of LCR MSCP conservation measures to augment the existing population is expected to result in a low level of take associated with entrainment.

5.5.6.2 Effects of Federal Non-Flow-Related Covered Activities

Non-flow-related covered activities to maintain the stable location and slope of the river channel include dredging, bank maintenance, and maintenance of levees, jetties, and training structures. These activities could result in take of razorback sucker in Reaches 3–5. Effects on razorback sucker would be temporary, generally encompassing the period of construction. Dredging may remove potential spawning and rearing habitat associated with wash fans. Dredging and maintenance activities would temporarily remove food organisms and cover from the dredged areas of the river channel and backwaters. Placement of riprap and the removal of shoreline vegetation could reduce channel-edge complexity, reducing cover from predator species and production of invertebrates that are food for fish (Hicks et al. 1991). Increased turbidity caused by dredging and maintenance activities could result in sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in some low level of take over the term of the LCR MSCP. As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of the river channel and backwaters that provide habitat as a result of the potential for further degradation from baseline conditions of the geomorphic processes that contribute to the maintenance and regeneration of habitat over the term of the LCR MSCP.

In addition to causing effects on habitat, dredging and maintenance of banks, levees, jetties, and training structures could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from entrainment into the dredge intake or physical trauma to the organisms. Adult and juvenile fish may move away from affected habitat. These activities are expected to result a low level of take over the term of the LCR MSCP.

Dredging the areas surrounding jetties and training structures, as well as dredging backwaters, would maintain flow continuity between the backwaters and the river and maintain the backwater area and depth. Razorback sucker may benefit from maintenance of backwaters because backwaters along the LCR provide habitat (Bradford et al. 1998). Improved flow continuity in the backwaters would improve access and maintain water quality.

Construction and maintenance of fish grow-out coves, fishing docks, fish attraction structures, and boat ramps in Lake Mead and Lake Mohave would disturb and cover up the reservoir bottom. The removal of potential spawning and rearing habitat associated with construction would affect a small area and is not expected to adversely affect razorback sucker. Increased turbidity and contaminants contributed by construction and maintenance activities could cause temporary adverse effects by affecting spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in a low level of take over the term of the LCR MSCP.

In addition to effects on habitat, construction and resulting recreational activities associated with fishing docks, aritificial fish habitats, and boat ramps at Lake Mead and Lake Mohave could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from physical trauma to individual fish during construction or through capture by recreational anglers. Adult and juvenile fish may move away from affected habitat. In addition, these artificial habitats designed for nonnative fish species may adversely affect razorback sucker by increasing local predator density. These activities are expected to result in a low level of take over the term of the LCR MSCP.

Augmentation of the existing razorback sucker population through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of razorback sucker in the LCR MSCP planning area. Consequently, the number of razorback suckers exposed to disturbances caused by non-flow-related activities is expected to increase in future years.

5.5.6.3 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 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 the local production and availability of food organisms; and
- accidentally discharge contaminants or resuspend contaminants from disturbed sediments, which could adversely affect the 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 razorback suckers may also inadvertently capture, injure, or result in mortality of individual razorback sucker.

Stocking razorback suckers to augment the existing population could introduce and spread diseases and parasites and could adversely affect the genetic and ecological distinctiveness of the existing razorback sucker population. However, the use of modern fish culture practices that strive to minimize disease and parasite spread by enhancing fish health, implementing best management practices, and using other means would minimize the risk. Genetic monitoring and management would also be incorporated.

The transport and handling of razorback sucker during activities supporting augmentation may result in direct mortality of individual fish. Stocking bonytail to augment the existing bonytail 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 suckers in the Green River. However, establishing and maintaining LCR MSCP–created habitats is not expected to increase contaminant concentrations above existing levels. Establishing and maintaining LCR MSCP habitats is 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 in no net change for nonagricultural sites. Runoff/return flow from habitat creation sites would be minimized to the greatest extent possible. Therefore, contaminants associated with runoff from LCR MSCP habitats are unlikely to adversely affect razorback sucker.

Implementation of the LCR MSCP conservation measures, including creation of 360 acres of habitat and stocking of up to 660,000 subadult razorback sucker will fully mitigate effects of covered activities and help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained. Stocking subadult razorback sucker and the attendant monitoring and research conducted for the razorback sucker under the LCR MSCP Conservation Plan will contribute to attainment of the recovery goals established for the species (U.S. Fish and Wildlife Service 2002e).

5.5.6.4 Effects on Critical Habitat

In 1994, the USFWS proposed critical habitat for the razorback sucker. This BA does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat found at 50 C.F.R. §402.02. The definition of "destruction or adverse modification" found in this BA relies upon the ESA and the analysis found in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service* (9th Circuit 2004).

Designated critical habitat for razorback sucker in the LCR MSCP planning area consists of:

- Lake Mead up to its full-pool elevation (i.e., Reach 1);
- the Colorado River and its 100-year floodplain from Hoover Dam to Davis Dam, including Lake Mohave up to its full-pool elevation (i.e., Reach 2); and

- the Colorado River and its 100-year floodplain from Parker Dam to Imperial Dam, including Imperial Reservoir to the full-pool elevation or 100-year floodplain, whichever is greater (i.e., Reaches 4 and 5).

Implementation of flow-related covered activities would affect environmental conditions in Reach 1. Reductions in Lake Mead lake levels with the implementation of flow-related covered activities may result in impacts on critical habitat. Implementation of flow-related covered activities would not affect environmental conditions in Reach 2, including Lake Mohave. Therefore, critical habitat in Reach 2 would not be affected. Flow-related covered activities would affect environmental conditions in Reaches 4 and 5, by changing river flow and the proportion of flow diverted, and would result in the loss of 214 acres of habitat. Implementation of non-flow-related activities and LCR MSCP conservation measures could affect environmental conditions in Reaches 1, 2, 4, and 5, but are not expected to result in the loss of habitat.

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 at Echo Bay, during the spawning seasons of 1997–2001, razorback sucker spawned at or near the cliff spawning site at the back of the 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 (BIO-WEST 2003). These changes in spawning location 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 have determined that it is unlikely that sediment accumulation over available spawning substrate will affect spawning habitat area (see Appendix M).

Adverse effects on razorback sucker critical habitat that may occur in the riverine reaches of the LCR would result from stranding and desiccation from daily water delivery operations and the gradual lowering of water surface elevations in the main channel and backwaters. 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 suckers 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 are in the river and backwaters. Reduced flow may also increase the incidence of stranding where daily flow variability isolates and subsequently desiccates habitat. Increased stranding relative to the existing conditions depends on site-specific channel morphology and the relationship with reduced depth in association with ongoing daily flow fluctuation.

The factor limiting the abundance of razorback sucker and other LCR native fish species is competition and predation from non-native fish species. If impacts on razorback sucker critical habitat results from implementation of Federal covered activities, it is not expected to increase the threat from competition from non-native fish species. The possibility, therefore, of impacts on critical habitat resulting from the covered activities is not expected to appreciably diminish the value of critical habitat for species' conservation, affect the survival of the species, nor appreciably diminish the value of critical habitat for survival of the species. For the following reasons, there is not an appreciable diminishment of the *value* of critical habitat for razorback sucker conservation:

1. The LCR MSCP includes conservation measures specific to constructing or managing critical habitat for the razorback sucker within its designated critical habitat. The created habitat within designated critical habitat will be managed to provide higher value for the razorback sucker than the affected critical habitat it will replace (e.g., the habitat will be maintained free of nonnative competitors/predator fishes to the greatest extent practicable).
2. The implementation of the covered activities and the conservation measures will not diminish capacity of razorback sucker critical habitat present within the LCR MSCP planning area to a level that will preclude future achievement of the razorback sucker recovery goals (U.S. Fish and Wildlife Service 2002e).

In addition, the LCR MSCP provides for the continued adaptive management of conservation measures to ensure that implementation of the covered activities will not diminish the value of critical habitat for conservation.

Based on the understanding that the definition of adverse modification found at 50 C.F.R. §402.02 has been found to not comport with the ESA, this BA does not consider "survival" in the context of "survival and recovery". The survival of razorback sucker, however, will not be compromised by the possible effects on critical habitat resulting from Federal covered activities, because: 1) ongoing programs conducted by the Lake Mohave Native Fish Work Group which are incorporated within the LCR MSCP will ensure a strong diverse genetic source to ensure survival of razorback sucker into the future; 2) the stocking of razorback sucker under the LCR MSCP will maintain and increase the abundance of razorback sucker; 3) the construction and management of backwaters within designated critical habitat to provide high value razorback sucker habitat will replace the value of affected habitat; and 4) the development of successful razorback sucker rearing methodology will ensure the availability of razorback suckers for re-introduction by ongoing and future programs.

5.5.7 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the western red bat.

5.5.7.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of 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 land cover types I and II that provide western red bat habitat (see Table 5-5). Lowering of groundwater elevations could reduce the production and abundance of insect prey by changing 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 enough to affect western red bat. For purposes of this assessment, 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 5.2.3.3, 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 5.2.2.3, 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.

5.5.7.2 Effects of Federal Non-Flow-Related Covered Activities

Conversion of lands to agricultural uses and operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) could result in take of western red bat. Converting lands to agricultural uses could result in the loss of 604 acres of roosting habitat (see Table 5-5). Disturbances associated with implementing other non-flow-related covered activities (e.g., operation of equipment) could result in the direct removal of trees that provide roosting habitat and in harassment of individuals if these activities are undertaken near roosts. These activities could result in a low level of take over the term of the LCR MSCP. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-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.

5.5.7.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of western red bat. To the extent practicable, habitat creation–related activities would avoid removing 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., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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.

Implementation of the LCR MSCP Conservation Plan will create at least 765 acres of western red bat roosting habitat to replace habitat that could be lost as a result of covered activities.

5.5.8 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the western yellow bat.

5.5.8.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of western yellow bat in Reaches 3–5. Changes in points of diversion in Reaches 3–5 would reduce groundwater sufficiently in these reaches to reduce the extent or quality of 161 acres of cottonwood-willow land cover types I and II that provide western yellow bat habitat (see Table 5-5). Lowering of groundwater elevations could affect the production of insect prey by changing 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 enough to affect western yellow bat. For purposes of this assessment, 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 5.2.3.3, 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 5.2.2.3, 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.

5.5.8.2 Effects of Federal Non-Flow-Related Covered Activities

Conversion of lands to agricultural uses and operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) could result in take of western yellow bat. Converting lands to agricultural uses could result in the loss of 604 acres of roosting habitat (see Table 5-5). Disturbances associated with implementing other non-flow-related covered activities (e.g., operation of equipment) could result in the direct removal of trees that provide roosting habitat and in harassment of individuals if these activities are undertaken near roosts. These activities could result in a low level of take over the term of the LCR MSCP. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-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.

5.5.8.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of western yellow bat. To the extent practicable, habitat creation–related activities would avoid removing 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., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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.

Implementation of the LCR MSCP Conservation Plan will create at least 765 acres of western yellow bat roosting habitat to replace habitat that could be lost as a result of covered activities.

5.5.9 Desert Pocket Mouse

Desert pocket mouse inhabits fluvial soil in the transitional zone between desert riparian 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. For the reasons described below, implementation of the non-flow-related covered activities and the LCR MSCP is likely to adversely affect the desert pocket mouse.

5.5.9.1 Effects of Federal Non-Flow-Related Covered Activities

Proposed restoration of up to 600 acres of native riparian vegetation in Reaches 1 and 2 in the Lake Mead NRA (see Chapter 2, "Description of Federal Actions (Covered Activities)") may result in take of desert pocket mouse if implemented in the species' habitat. 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 desert pocket mouse habitat (e.g., mixed mesquite and desert scrub vegetation). To the extent practicable, these activities would be designed to avoid desert pocket mouse habitat. These activities, however, could inadvertently result in some low level of take over the term of the LCR MSCP. Implementation of ongoing flow-related covered activities are not expected to result in indirect effects on the desert pocket mouse.

5.5.9.2 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 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.

Created habitats will be designed, to the extent consistent with achieving LCR MSCP conservation objectives for other species, to avoid affecting desert pocket mouse habitat. If habitat cannot be avoided, the LCR MSCP Conservation Plan provides for fully mitigating effects on the species.

5.5.10 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Colorado River cotton rat.

5.5.10.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of 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 5-5) 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 the potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3). Lowering groundwater elevations could cause direct loss of habitat by desiccating, fragmenting, or reducing the extent of habitat patches.

As described in Section 5.2.2.3, 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.

5.5.10.2 Effects of Federal Non-Flow-Related Covered Activities

Periodic maintenance of boat ramps, gaging stations, and water control structures will remove emergent vegetation and affect up to 3 acres of Colorado River cotton rat habitat (see Table 5-5). Operation of equipment and other activities associated with removing habitat could also result in harassment, injury, or mortality of individuals. As described in Section 5.2.2.3, indirect effects of ongoing non-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.

These activities are expected to result in some low level of take over the term of the LCR MSCP.

5.5.10.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining backwaters and marsh as habitat for covered species may result in take of 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 would avoid removing 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 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, injury, or mortality of individuals. The LCR MSCP would avoid removing 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.

Implementation of the LCR MSCP Conservation Plan will create at least 125 acres of Colorado River cotton rat habitat to replace habitat that could be lost as a result of covered activities.

5.5.11 Yuma Hispid Cotton Rat

Yuma hispid cotton rat is present in Reaches 6 and 7, which would not be affected by flow-related covered activities. Flow-related covered activities, therefore, would not result in take of 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. For the reasons described below, implementation of the non-flow-related covered activities and the LCR MSCP is likely to adversely affect the Yuma hispid cotton rat.

5.5.11.1 Effects of Federal Non-Flow-Related Covered Activities

Dredging desilting basins and converting lands to agriculture in Reaches 6 and 7 would remove up to 71 acres of Yuma hispid cotton rat habitat (see Table 5-5). Operation of equipment and other activities associated with removal of habitat could also result in harassment, injury, or mortality of individuals. As described in Section 5.2.2.3, indirect effects of ongoing non-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.

These activities are expected to result in some low level of take over the term of the LCR MSCP.

5.5.11.2 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining habitat for covered species may result in take of 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 would avoid removing primary habitat to establish habitat for other covered species. Some limited and low-value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be converted to habitat to benefit other covered species; with implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it is not expected to result in take of Yuma hispid cotton rat. 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.

Implementation of the LCR MSCP Conservation Plan will create at least 76 acres of Yuma hispid cotton rat habitat to replace habitat that could be lost as a result of covered activities.

5.5.12 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the western least bittern.

5.5.12.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of western least bittern. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 133 acres of habitat (see Table 5-5) 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 would avoid the potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3). Lowering groundwater elevations could cause direct loss of these habitats by desiccating, fragmenting, or reducing the extent of habitat patches.

As described in Section 5.2.3.3, 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 5.2.2.3, 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.

5.5.12.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) may result in take of western least bittern. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting western least bitterns. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 70 acres of western least bittern habitat could be removed to maintain channel functions (e.g., dredging desilting basins) (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. As described in Section 5.2.2.3, indirect effects of ongoing non-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.

The creation of western least bittern habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of western least bittern in the LCR MSCP planning area. Consequently, the number of western least bitterns exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.12.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining backwaters and marsh as habitat for covered species may result in take of 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 would avoid removing 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan, removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it is not expected to result in take of western least bittern.

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, 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create 512 acres of western least bittern habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 269 acres.

5.5.13 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the California black rail.

5.5.13.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of California black rail. Reservoir elevations in Reaches 3–6 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]). In Reaches 3 and 4, with the exception of Topock Marsh, California black rails are associated with marshes that would not be affected by flow-related covered activities. The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock

Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3). However, lowering groundwater elevations could result in the loss of 37 acres of California black rail habitat in Reach 5 by desiccating, fragmenting, or reducing the extent of habitat (see Table 5-5) provided by marshes associated with backwaters.

As described in Section 5.2.2.3, 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.

5.5.13.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) could result in take of California black rail. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting California black rails. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 31 acres of California black rail habitat could be removed to maintain channel functions (e.g., dredging desilting basins) (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or young. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. As described in Section 5.2.2.3, indirect effects of ongoing non-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.

The creation of California black rail habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of California black rail in the LCR MSCP planning area. Consequently, the number of California black rails exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.13.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining backwaters and marsh as habitat for covered species may result in take of 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 would avoid removing 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan, removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it is not expected to result in take of California black 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 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 130 acres of California black rail habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 27 acres. In addition, the LCR MSCP Conservation Plan will maintain existing important California black rail habitat areas in the LCR MSCP planning area.

5.5.14 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the yellow-billed cuckoo.

5.5.14.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of yellow-billed cuckoo. Changes in points of diversion in Reaches 3–5 would 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 (see Table 5-5). The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3).

As described in Section 5.2.3.3, 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 5.2.2.3, 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.

5.5.14.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) is expected to result in take of yellow-billed cuckoo. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting yellow-billed cuckoos. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 99 acres of yellow-billed cuckoo habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-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.

The creation of yellow-billed cuckoo habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of yellow-billed cuckoos in the LCR MSCP planning area. Consequently, the number of yellow-billed cuckoos exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.14.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 4,050 acres of yellow-billed cuckoo habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 2,516 acres. LCR MSCP–created southwestern willow flycatcher habitat patches that are larger than 25 acres (Halterman pers. comm.) and support cottonwood-willow types I-III would provide additional habitat for the yellow-billed cuckoo. In addition, the LCR MSCP Conservation Plan will maintain existing important yellow-billed cuckoo habitat areas in the LCR MSCP planning area.

5.5.15 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the elf owl.

5.5.15.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the owl. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 161 acres of elf owl habitat (see Table 5-5). As described in Section 5.2.2.3, 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.

5.5.15.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh restoration projects; conversion of lands to agriculture) could result in take of elf owl. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting elf owls. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 590 acres of elf owl habitat could be converted to agricultural fields (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-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.

The creation of elf owl habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of elf owl in the LCR MSCP planning area. Consequently, the number of elf owls exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.15.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 1,784 acres of elf owl habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 1,033 acres.

5.5.16 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the gilded flicker.

5.5.16.1 Effects of Flow-Related Covered Activities

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

As described in Section 5.2.2.3, 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.

5.5.16.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh restoration projects; conversion of lands to agriculture) could result in take of gilded flicker. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting gilded flickers. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 99 acres of gilded flicker habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-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.

The creation of gilded flicker habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of gilded flickers in the LCR MSCP planning area. Consequently, the number of gilded flickers exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.16.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 4,050 acres of gilded flicker habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 2,516 acres.

5.5.17 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 in the LCR MSCP planning area. In the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat would be gradual, commensurate with the creation of higher-value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize the direct effects of implementing covered activities and the LCR MSCP on Gila woodpecker. The potential effects of habitat loss are expected to be minimized through creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Gila woodpecker.

5.5.17.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of Gila woodpecker. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 819 acres of Gila woodpecker habitat (see Table 5-5). As described in Section 5.2.2.3, 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.

5.5.17.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) is expected to result in take of Gila woodpecker. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting Gila woodpeckers. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 26 acres of Gila woodpecker habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-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.

The creation of Gila woodpecker habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of Gila woodpecker in the LCR MSCP planning area. Consequently, the number of Gila woodpeckers exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.17.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 1,702 acres of Gila woodpecker habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 847 acres.

5.5.18 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the vermilion flycatcher.

5.5.18.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of 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 (see Table 5-5). The LCR MSCP will avoid the potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3).

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 5.2.2.3, 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.

5.5.18.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) could result in take of vermilion flycatcher. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting vermilion flycatchers. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 714 acres of vermilion flycatcher habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide over the term of the LCR MSCP.

The creation of vermilion flycatcher habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of vermilion flycatcher in the LCR MSCP planning area. Consequently, the number of vermilion flycatchers exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.18.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR

MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 5,208 acres of vermilion flycatcher habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 2,594 acres.

5.5.19 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Arizona Bell's vireo.

5.5.19.1 Effects of Flow-Related Covered Activities

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

As described in Section 5.2.3.3, 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 5.2.2.3, 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.

5.5.19.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gauge station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) could result in take of Arizona Bell's vireo. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting Arizona Bell's vireos. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 1,309 acres of Arizona Bell's vireo habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Up to an additional 3,832 acres of honey mesquite type 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. Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-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.

5.5.19.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 2,983 acres of Arizona Bell's vireo habitat to replace habitat that could be lost as a result of covered activities.

5.5.20 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. In the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat would be gradual, commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize the direct effects of implementing covered activities and the LCR MSCP on Sonoran yellow warbler, and the potential effects of habitat loss are expected to be minimized through creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Sonoran yellow warbler.

5.5.20.1 Effects of Flow-Related Covered Activities

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

As described in Section 5.2.3.3, 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 5.2.2.3, 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.

5.5.20.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gauge station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) could result in take of Sonoran yellow warbler. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting Sonoran yellow warbler. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 183 acres of Sonoran yellow warbler habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-

5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

5.5.20.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 4,050 acres of Sonoran yellow warbler habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 928 acres.

5.5.21 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the summer tanager.

5.5.21.1 Effects of Flow-Related Covered Activities

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

As described in Section 5.2.3.3, 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 roosting habitat, however, could result in a low level of take of summer tanager over the term of the LCR MSCP.

As described in Section 5.2.2.3, 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.

5.5.21.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) may result in take of summer tanager. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting summer tanagers. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 14 acres of summer tanager habitat could be removed to maintain channel functions (e.g., dredging desilting basins) (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. 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 agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-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.

The creation of summer tanager habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of summer tanagers in the LCR MSCP planning area. Consequently, the number of summer tanagers exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.21.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of 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 would avoid removing 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 be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR

MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take 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 of 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.

Implementation of the LCR MSCP Conservation Plan will create at least 602 acres of summer tanager habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of protected new habitat by 427 acres.

5.5.22 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. For the reasons described below, implementation of the non-flow-related covered activities and the LCR MSCP is likely to adversely affect the flat-tailed horned lizard.

5.5.22.1 Effects of Federal Non-Flow-Related Covered Activities

Conversion of lands to agriculture in Reaches 6 and 7 and activities associated with maintaining the 242 Well Field and Lateral near the SIB would result in take of flat-tailed horned lizard. Conversion of lands to agriculture would remove habitat, and operation of equipment necessary to convert lands and farm fields would result in harassment and mortality of individuals. This species inhabits sites that support sparsely vegetated fine sands. Species habitat cannot be directly correlated to mapped LCR MSCP land cover types, but could be present as inclusions within desert scrub and riparian land cover types in Reaches 6 and 7. The extent of habitat loss is estimated to be up to 10 percent of the total extent of desert scrub and riparian land cover types that would be converted to agricultural uses in Reaches 6 and 7. Up to 1,280 acres of desert scrub and riparian land cover could be converted to agricultural uses; therefore, based on this assumption, up to 128 acres of flat-tailed horned lizard habitat could be removed by these activities (see

Table 5-5). Channel maintenance–related activities would be implemented adjacent to the river channel, where this species and its habitat are not expected to be present.

Activities to maintain the 242 Well Field include controlling weeds, cleaning the lateral, grading and graveling access roads, and repairing or replacing infrastructure. Operation of vehicles and other equipment to implement these activities could result in direct mortality of individual lizards. Operation of equipment can crush lizards in underground burrows or on the surface in locations where maintenance activities are undertaken, or lizards present along roadways may be struck by vehicles (U.S. Fish and Wildlife Service 1997). These activities are expected to result in low level of take over the term of the LCR MSCP.

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

5.5.22.2 Effects of LCR MSCP Implementation

Activities associated with establishing and managing LCR MSCP–created covered species habitat may result in take of 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 likely would be unsuitable for creation of other habitat. To the extent practicable, construction of new infrastructure that may be required to establish and maintain conservation areas in Reaches 6 and 7 would be designed to avoid flat-tailed horned lizard habitat. However, 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.

Implementation of the LCR MSCP Conservation Plan will protect 230 acres of unprotected occupied flat-tailed horned lizard habitat to mitigate the loss of up to 128 acres of flat-tailed horned lizard habitat as a result of implementing covered activities. The acquired habitat will be transferred to an appropriate management agency for permanent protection of habitat for the species.

5.5.23 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. For the reasons described below, implementation of the flow-related covered activities and the LCR MSCP is likely to adversely affect relict leopard frog.

5.5.23.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of relict leopard frog. Relict leopard frog inhabits springs in Black Canyon in Reach 2. Although relict leopard frog breeds in springs, it has been observed in the mainstem of the LCR in Reach 2, which likely serves as a corridor for movement 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 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.

5.5.23.2 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 occupied by relict leopard frogs or that are located near occupied habitat, could result in some unquantified level of harassment and mortality of individuals.

Implementation of the LCR MSCP Conservation Plan will benefit the relict leopard frog by funding planned, but unfunded, research and conservation measures to be undertaken through existing programs, as appropriate. 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.

5.5.24 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the flannelmouth sucker.

5.5.24.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of flannelmouth sucker. Changes in flow in Reach 3 would result in the loss of 85 acres of flannelmouth sucker habitat (see Table 5-5). Spawning during 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 refuge from predators. Reduced flow and 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 desiccates occupied habitat. Effects of ongoing flow-related covered activities on the flannelmouth sucker would be the same as those described in Section 5.5.6 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 reservoir operations are expected to result in some low level of take.

5.5.24.2 Effects of Federal Non-Flow-Related Covered Activities

Implementation of non-flow-related covered activities to maintain the stable location and slope of the river channel, including dredging, bank maintenance, and maintenance of levees, jetties, and training structures, may result in take of flannelmouth sucker in Reach 3. Effects on flannelmouth sucker would be temporary, generally encompassing the period of construction. Dredging may remove potential spawning and rearing habitat associated with wash fans. Dredging and maintenance activities would temporarily remove food organisms and cover from the dredged areas of the river channel and backwaters. Placement of riprap and the removal of shoreline vegetation could reduce channel-edge complexity, subsequently reducing cover from predator species and production of invertebrates that are food for fish (Hicks et al. 1991). Increased turbidity caused by dredging and maintenance activities could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in some low level of take over the term of the LCR MSCP. As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of the river channel and backwaters that provide habitat over the term of the LCR MSCP.

In addition to causing effects on habitat, dredging and maintenance of banks, levees, jetties, and training structures could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from entrainment into the dredge intake or physical trauma to the organisms. Adult and juvenile fish may move away from affected habitat. These activities are expected to result an level of take over the term of the LCR MSCP.

Dredging backwaters and the areas surrounding jetties and training structures would maintain flow continuity between the backwaters and the river and would maintain the backwater area and depth. Flannelmouth sucker may benefit from maintenance of backwaters because backwaters along the LCR provide habitat (Bradford et al. 1998). Improved flow continuity in the backwaters will improve access and maintain water quality.

Construction and maintenance of fish grow-out coves, fishing docks, fish attraction structures, and boat ramps in Lake Mohave would disturb and cover up the reservoir bottom. Only a small area of potential spawning and rearing habitat would be removed as a result of construction; this removal would not be expected to adversely affect flannelmouth sucker. Temporary adverse effects could be associated with increased turbidity and contaminants contributed by construction and maintenance activities, which could affect spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in a low level of take over the term of the LCR MSCP.

In addition to effects on habitat, construction and resulting recreational activities associated with fishing docks, artificial fish habitats, and boat ramps at Lake Mohave could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from physical trauma to individual fish during construction or through capture by recreational anglers. Adult and juvenile fish may move away from affected habitat. In addition, these artificial habitats designed for nonnative fish species may adversely affect flannelmouth sucker by increasing local predator density. These activities are expected to result in a low level of take over the term of the LCR MSCP.

5.5.24.3 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. The adverse effects of habitat construction and maintenance activities on 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, which could adversely affect the survival, growth, and reproduction of flannelmouth sucker.

Although construction and maintenance activities could adversely affect 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 flannelmouth sucker may also inadvertently capture, injure, or result in mortality of individual flannelmouth sucker. Stocking razorback suckers in 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 in no net change for nonagricultural sites. Runoff/return flow from habitat creation sites would be minimized to the greatest extent possible. Therefore, contaminants associated with runoff from LCR MSCP habitats are unlikely to adversely affect flannelmouth sucker.

Implementation of the LCR MSCP Conservation Plan conservation measures, including creation of 85 acres of habitat and funding research to determine the management needs of the flannelmouth sucker in the LCR, will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained. Research undertaken by the LCR MSCP will provide the information necessary to identify future management actions that could be undertaken by the LCR MSCP or others that will benefit the species.

5.5.25 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. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the MacNeill's sootywing skipper.

5.5.25.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of MacNeill's sootywing skipper. Changes in flow in Reaches 3 and 4 would 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 (see Table 5-5). Reductions in groundwater elevations are not expected to affect quail bush or honey mesquite plants used by the species. However, reduction in groundwater elevations could be sufficient to degrade or eliminate the microhabitat conditions, maintained by high groundwater elevations, that are necessary to sustain MacNeill's sootywing skipper.

As described in Section 5.2.2.3, 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.

5.5.25.2 Effects of Federal Non-Flow-Related Covered Activities

Conversion of lands to agricultural uses could remove up to 50 acres of MacNeill's sootywing skipper habitat (Table 5-5). Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities) could result in take of MacNeill's sootywing skipper. These activities would, to the extent practicable, avoid removing MacNeill's sootywing skipper habitat. However, these activities may result in some low level of disturbance or loss of habitat over the term of the LCR MSCP. Non-flow-related activities associated with operation of equipment near existing populations may result in direct take of individuals.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

5.5.25.3 Effects of LCR MSCP Implementation

Habitat creation–related activities may result in take of MacNeill's sootywing skipper. LCR MSCP habitat creation–related activities would avoid removing MacNeill's sootywing skipper habitat. However, LCR MSCP activities related to establishing and managing created habitat, such as operation of vehicles and equipment, 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 the use of the new habitat by MacNeill's sootywing skippers.

Implementation of the LCR MSCP Conservation Plan will create at least 200 acres of MacNeill's sootywing skipper habitat to replace habitat removed as a result of implementing covered activities and will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained.

5.5.26 Sticky Buckwheat

Sticky buckwheat is a rare annual plant; its distribution is centered in the Muddy and Virgin River drainages. Regionally significant populations occur around the Overton Arm shoreline of Lake Mead, including some locations that are below the full-pool elevation (Niles et al. 1995, 1997; National Park Service 1999). Federal non-flow-related covered activities and implementation of the LCR MSCP are not expected to result in take of 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 would 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, affecting only 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. For the reasons described below, implementation of the flow-related covered activities, and the LCR MSCP is likely to adversely affect the sticky buckwheat.

5.5.26.1 Effects of Flow-Related Covered Activities

Implementation of ongoing and future flow-related covered activities may result in impacts on sticky buckwheat. 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 take of sticky buckwheat plants that have established below the full-pool elevation because reservoir elevations could rise and inundate these plants.

5.5.27 Threecorner Milkvetch

Threecorner milkvetch is an annual plant whose distribution is limited. In and adjacent to the LCR MSCP planning area, it is rare and occurs locally along the lower Muddy, Virgin, and Colorado Rivers. Federal non-flow-related covered activities and LCR MSCP implementation would not result in take of 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 would 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. For the reasons described below, implementation of the flow-related covered activities, and the LCR MSCP is likely to adversely affect the threecorner milkvetch.

5.5.27.1 Effects of Flow-Related Covered Activities

Implementation of ongoing and future flow-related covered activities may result in impacts on threecorner milkvetch. 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 take of threecorner milkvetch plants that have established below the full-pool elevation because reservoir elevations could rise and inundate plants.

5.5.28 Effects on Evaluation Species

5.5.28.1 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.

Implementation of the LCR MSCP conservation measures that will maintain or increase the production of insect food items will fully mitigate flow-related effects, 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.

5.5.28.2 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.

Implementation of the LCR MSCP conservation measures that will maintain or increase the production of insect food items will fully mitigate flow-related effects, 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.

5.5.28.3 Colorado River Toad

The Colorado River toad is a semiaquatic amphibian associated with Sonoran desert tortoise 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.

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.

5.5.28.4 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.

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.

5.6 Effects of Non-Federal Non-Flow-Related Covered Activities

5.6.1 Yuma Clapper Rail

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 Yuma clapper rail. The likelihood of take is expected to increase over the term of the LCR MSCP if Yuma clapper rail becomes more abundant 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. However, these activities 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 of permanent loss of habitat is considered minimal because restoration projects undertaken in existing Yuma clapper rail habitat would 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.

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 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 5.2.1.3, 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.

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

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Yuma clapper rail.

5.6.2 Southwestern Willow Flycatcher

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 southwestern willow flycatcher. The likelihood of take is expected to increase over the term of the LCR MSCP if southwestern willow flycatchers become more abundant 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 remove habitat to restore land cover types not used by southwestern willow flycatcher. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing southwestern willow flycatcher habitat would 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the southwestern willow flycatcher.

5.6.3 Desert Tortoise

Proposed activities related to habitat restoration and maintenance projects and facilities and infrastructure maintenance may result in take of desert tortoise. Restoration projects are not expected to be implemented in desert tortoise habitat or result in adverse modification of designated critical habitat because it is unlikely that the desert scrub communities the tortoise inhabits would be restored as aquatic, wetland, or riparian land cover. However, removal of relatively small amounts of habitat 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 is expected to be minimal and is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it is not expected to result in take. Injury or mortality of individual tortoises associated with implementing restoration projects, to the extent practicable, would be avoided. Over the term of the LCR MSCP, however, these activities (involving operation of vehicles and equipment in habitat) are expected to result in some low level of take.

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 (involving operation of vehicles and equipment in habitat) are expected to result in some low level of take of individuals. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the desert tortoise.

5.6.4 Bonytail

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 the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect the survival, growth, and reproduction of bonytail. Although construction and maintenance activities could adversely affect 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. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the bonytail.

In addition to causing 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 (assuming that bonytail larvae and juveniles are present). However, stocked rainbow trout are not expected to establish self-sustaining populations, and bonytail's temperature preference of near 75°F 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 would be a low level of take.

5.6.5 Humpback Chub

Implementation of state non-flow-related covered activities will not affect humpback chub.

5.6.6 Razorback Sucker

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 the local production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect the survival, growth, and reproduction of razorback sucker. Although construction and maintenance activities could adversely affect razorback sucker and its habitat, the effects would be minimal because of the small extent of disturbance by these activities. Implementation of these activities is expected to result in some low level of take over the term of the LCR MSCP. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the razorback sucker.

In addition to causing 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 their effects, compared to those of existing nonnative fish, are expected to be minimal. There would be a low level of take.

5.6.7 Western Red Bat

Proposed activities related to habitat restoration and maintenance projects along the LCR may result in take of 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. However, habitat restoration projects would avoid removing 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 non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the western red bat.

5.6.8 Western Yellow Bat

Proposed activities related to habitat restoration and maintenance projects along the LCR may result in take of 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. However, habitat restoration projects would avoid removing 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 non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the western yellow bat.

5.6.9 Desert Pocket Mouse

Proposed activities related to habitat restoration and maintenance projects in Reaches 1–3 may result in take of 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 or harassment, injury, or mortality of individuals. However, habitat restoration projects would avoid removing desert pocket mouse habitat to restore habitat for other species; therefore, effects on habitat associated with these projects would be temporary. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the desert pocket mouse.

5.6.10 Colorado River Cotton Rat

Proposed activities related to habitat restoration and maintenance projects along the LCR in Reaches 3 and 4 may result in take of Colorado River cotton rat. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat or 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 provides low-value habitat in Reaches 3 and 4 could be removed over the term of the LCR MSCP to restore habitat for other species. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Colorado River cotton rat.

5.6.11 Yuma Hispid Cotton Rat

Proposed activities related to habitat restoration and maintenance projects along the LCR in Reaches 6 and 7 may result in take of Yuma hispid cotton rat. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat or 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.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Yuma hispid cotton rat.

5.6.12 Western Least Bittern

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 western least bittern. The likelihood of take is expected to increase over the term of the LCR MSCP if western least bittern becomes more abundant 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 or harassment, injury, or mortality of individuals. However, these activities 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 provides low-quality habitat could be removed over the term of the LCR MSCP to restore habitat for other species.

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 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 5.2.1.3, 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.

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

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the western least bittern.

5.6.13 California Black Rail

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 California black rail. The likelihood of take is expected to increase over the term of the LCR MSCP if California black rail becomes more abundant 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 or harassment or mortality of individuals. However, these activities 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 of permanent loss of habitat is considered minimal because restoration projects undertaken in existing California black rail habitat would 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 provides low-quality habitat could be removed over the term of the LCR MSCP to restore habitat for other species.

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 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 5.2.1.3, 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.

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

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the California black rail.

5.6.14 Yellow-Billed Cuckoo

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. The likelihood of take is expected to increase over the term of the LCR MSCP if yellow-billed cuckoo becomes more abundant 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 or harassment of individuals if individuals are present and if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by yellow-billed cuckoo. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing yellow-billed cuckoo habitat would 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 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., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the yellow-billed cuckoo.

5.6.15 Elf Owl

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of elf owl. The likelihood of take is expected to increase over the term of the LCR MSCP if elf owl becomes more abundant 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 if activities are undertaken during the breeding season. Habitat restoration projects would avoid removing 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the elf owl.

5.6.16 Gilded Flicker

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of gilded flicker. The likelihood of take is expected to increase over the term of the LCR MSCP if gilded flicker becomes more abundant 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 if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by gilded flicker. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing gilded flicker habitat would 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 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., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the gilded flicker.

5.6.17 Gila Woodpecker

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of Gila woodpecker. The likelihood of take is expected to increase over the term of the LCR MSCP if Gila woodpecker becomes more abundant 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 if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by Gila woodpecker. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Gila woodpecker habitat would 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 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., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Gila woodpecker.

5.6.18 Vermilion Flycatcher

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of vermilion flycatcher. The likelihood of take is expected to increase over the term of the LCR MSCP if vermilion flycatcher becomes more abundant 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 remove habitat to restore land cover types not used by vermilion flycatcher. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing vermilion flycatcher habitat would 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 provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Habitat restoration projects would avoid removing 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the vermilion flycatcher.

5.6.19 Arizona Bell's Vireo

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of Arizona Bell's vireo. The likelihood of take is expected to increase over the term of the LCR MSCP if Arizona Bell's vireo becomes more abundant 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 if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by Arizona Bell's vireo. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Arizona Bell's vireo habitat would 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 honey mesquite type 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Arizona Bell's vireo.

5.6.20 Sonoran Yellow Warbler

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the Sonoran yellow warbler. The likelihood of take is expected to increase over the term of the LCR MSCP if Sonoran yellow warbler becomes more abundant 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 if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by Sonoran yellow warbler. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Sonoran yellow warbler habitat would 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 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP

HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Sonoran yellow warbler.

5.6.21 Summer Tanager

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of summer tanager. The likelihood of take is expected to increase over the term of the LCR MSCP if summer tanager becomes more abundant 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 if activities are undertaken during the breeding season. Habitat restoration projects would avoid removing 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 avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the summer tanager.

5.6.22 Flat-Tailed Horned Lizard

Maintaining and replacing facilities and infrastructure could result in take of 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.

Habitat restoration and maintenance projects are not expected to affect the desert scrub communities inhabited by flat-tailed horned lizard because it is unlikely that the desert scrub communities it inhabits will be restored as aquatic, wetland, or riparian land cover. However, removal of relatively small amounts of habitat could be required if access roads and other infrastructure required to install and maintain restored habitats are constructed in flat-tailed horned lizard habitat. Nevertheless, the level of habitat removal is expected to be minimal and is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it not expected to result in take. However, over the term of the LCR MSCP, operation of vehicles and equipment in habitat is expected to result in some low level of take. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the flat-tailed horned lizard.

5.6.23 Relict Leopard Frog

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. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the relict leopard frog.

5.6.24 Flannelmouth Sucker

Covered activities related to construction and maintenance of fish attraction structures and navigation structures, as well as 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 the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect the survival, growth, and reproduction of flannelmouth sucker. Although construction and maintenance activities could adversely affect 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. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the flannelmouth sucker.

In addition to causing 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 their effects, compared to current nonnative fish interactions, are expected to be minimal. There would be a low level of take.

5.6.25 MacNeill's Sootywing Skipper

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 non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the MacNeill's sootywing skipper.

5.6.26 Sticky Buckwheat

Implementation of state non-flow-related covered activities will not affect sticky buckwheat.

5.6.27 Threecorner Milkvetch

Implementation of state non-flow-related covered activities will not affect threecorner milkvetch.

5.6.28 Impacts on Evaluation Species

5.6.28.1 California Leaf-Nosed Bat

Implementation of state non-flow-related covered activities are not expected to affect California leaf-nosed bat.

5.6.28.2 Pale Townsend's Big-Eared Bat

Implementation of state non-flow-related covered activities are not expected to affect pale Townsend's big-eared bat.

5.6.28.3 Colorado River Toad

Because the Colorado River toad is not present in the LCR MSCP planning area, implementation of state non-flow-related covered activities will not affect Colorado River toad.

5.6.28.4 Lowland Leopard Frog

Because the lowland leopard frog is not present in the LCR MSCP planning area, implementation of state non-flow-related covered activities will not affect lowland leopard frog.

5.7 Effects of Federal Actions on the Bald Eagle

Flow-related and non-flow-related covered activities are not expected to affect the food resources, foraging opportunities, or nesting habitat of the bald eagle within the LCR MSCP planning area. Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration projects; conversion of lands to agriculture) could result in temporary harassment of foraging or roosting individuals if individuals are present when such activities are implemented. Wintering birds, however, are expected to continue using the river and most likely will congregate where food resources are plentiful and excessive disturbance from recreation can be avoided. Implementation of the covered activities and the LCR MSCP may affect, but unlikely to adversely affect the bald eagle.

5.8 Interrelated and Interdependent Actions

Interrelated actions are those actions that are part of the larger proposed action and that depend on the proposed action for their justification (50 C.F.R. §402.02). Interdependent actions are actions that have no independent utility apart from the proposed action (50 C.F.R. §402.02). The Federal action agencies have not found any actions that qualify as interrelated or interdependent to the Federal proposed actions covered in the LCR MSCP BA.

5.9 Net Effect of Actions under Consultation

Table 5-7 summarizes the effects on covered and evaluation species habitat of implementing the flow-related and non-flow-related covered activities and the LCR MSCP Conservation Plan covered activities described in Chapter 2, “Description of Federal Actions (Covered Actions),” and non-federal non-flow-related covered activities described in Chapter 3, “Non-Federal Discretionary Covered Activities: Ongoing and Future.”

5.10 Indirect Effects outside the Planning Area

The prior sections in Chapter 5 address the effects, both direct and indirect, of the covered activities within the LCR MSCP planning area. A separate issue that has been raised is whether the covered activities that involve the delivery of water from the Colorado River affect listed species within service areas outside the LCR MSCP planning area by causing growth and development. This section addresses the potential for those indirect effects. The ESA regulations define indirect effects as effects that are caused by a proposed action and are later in time, but still are reasonably certain to occur (50 C.F.R. §402.02). The first issue to be examined under this definition is that of causation. The second issue to examine is whether any causal effects are reasonably certain to occur. Indirect effects exist only if both causation and reasonable certainty of occurrence are found.

5.10.1 Causation

The ESA regulations provide that a Federal proposed action must assess effects that are caused by the proposed action. The issue of causation is a fact-intensive inquiry that addresses close issues of proximity and degree. The ESA regulations do not provide guidance on the nature of the causal inquiry to be conducted. Similarly, ESA case law concerning indirect effects and the issue of causation is rare, with no real guidance issuing from the courts in the past 15 years. The older ESA cases that addressed the issue of causation did not directly address what the test for causation should be or how it should be applied to complex factual situations of the type presented by the LCR MSCP (See e.g., *National Wildlife Federation v. Coleman*, 529 F.2d 359 [5th Circuit], cert. denied, 429 U.S. 979 (1976), *Riverside Irrigation District v. Andrews*, 758 F.2d 508 [10th Circuit 1985]).

The regulatory language that defines indirect effects and incorporates the concept of causation under the ESA is the same framework used under NEPA. In both cases, the causal test is established by the simple phrase “indirect effects are caused by the action” (40 C.F.R. §1508.8(b) and 50 C.F.R. §402.02). NEPA and the ESA thus appear to have the same test for causation. Under NEPA, recently issued judicial opinions have provided significant guidance on how to conduct the causal analysis. These decisions address complex fact patterns that are comparable to the issue addressed in this section. The LCR MSCP participants have reviewed the analysis provided in these cases for use in developing the indirect effects analysis set forth below. The following guidance provided by the courts in the context of NEPA has been considered in performing the indirect effects analysis conducted for the LCR MSCP.

The Ninth Circuit has held that an effect is caused by an action if the action is an “indispensable prerequisite” or an “essential catalyst” to the effects. *City of Davis v. Coleman*, 521 F.2d 661, 674 (9th Circuit 1975). In contrast, it is not enough that the actions might be related or that each “might benefit from the other’s presence.” *Sylvester v. U.S. Army Corps of Engineers*, 884 F.2d 394 (9th Circuit 1989). Similarly, it is not enough if a proposed action “may induce limited additional development” when “the existing development necessitated the [action].” (*City of Carmel by-the-Sea v. DOT*, 123 F.3d 1142 [9th Circuit 1997]) In *City of Carmel by-the-Sea*, the Ninth Circuit upheld an analysis that stated that the proposed project “had the potential to facilitate growth” but would not ultimately do so because of the development constraints imposed by local authorities. Similarly, in a case involving an airport expansion project designed to address existing levels of air traffic, the Ninth Circuit rejected the argument that airport expansion removed a constraint to growth because without the project, growth could not occur safely. The Ninth Circuit stated, “the fact that it might also facilitate further growth is insufficient to constitute a growth-inducing impact ….” *Morongo Band of Mission Indians v. Federal Aviation Administration*, 161 F.3d 569 (9th Circuit 1998).

In a recent example of the application of the causal analysis to a complex fact pattern, the court in *Border Power Plant Working Group v. Dept. of Energy*, (2003 WL 21037927 [S.D. Cal.]), followed the analysis established by *Sylvester*, *City of Carmel by-the-Sea*, and *Morongo*. The court found that authorization of a power transmission line on the U.S./Mexico border did not require analysis of emissions from a Mexican power plant that could use the new line to transmit power to the United States. The court held that the

Table 5-7. 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]	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[b]
Bonytail	399	0	399	360[c]
Humpback chub	ND[d]	0	ND[d]	ND[d]
Razorback sucker	399	0	399	360[c]
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	71	71	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[e]	2,983[e]	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[f]
Relict leopard frog	0[g]	0[g]	0[g]	0[g]
Flannelmouth sucker	85	0	85	85
MacNeill's sootywing skipper	172	50	222	222
Sticky buckwheat	ND[h]	0	ND[h]	ND[h]
Threecorner milkvetch	ND[h]	0	ND[h]	ND[h]
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 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 to be habitat . These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. With implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), removal of these low-quality habitats, however, is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of covered or evaluation species.

[a] From Table 5-5.

[b] Net loss in habitat is fully mitigated by protecting 230 acres of desert tortoise habitat in accordance with mitigation requirements in the document entitle “Compensation for Desert Tortoise” (Desert Tortoise Compensation Team 1991).

[c] 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.

[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] 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.

[f] 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 (Foreman 1997).

[g] 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.

[h] 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.

turbines in the plant dedicated to production of power for Mexico were not causally linked to the new transmission line "in a way that makes the Baja California Power line a necessary prerequisite or essential catalyst to their operation." The court further noted that "because the line of causation is too attenuated between these turbines and the Federal action permitting the Baja California Power line, Ninth Circuit authority makes clear that the emissions of the non-export turbines were not effects of the Baja California Power line and that the Federal defendants were therefore under no NEPA obligation to analyze their emissions as effects of the action." The court also found that because the turbine in the plant that was dedicated to the export of power had an alternate route, the Baja California Power line could not be considered the but-for cause of the export turbine's operation and effects from the operation of the turbine were therefore not indirect effects of the Baja California Power line.

Based on existing judicial guidance, relevant factors in the causal analysis concerning growth-inducement include whether the action is the sole cause, whether the action has a useful purpose other than serving new growth, whether the action is intended to induce growth or to address existing levels of demand, and whether growth is being regulated at the local level. The test embraced by the courts demonstrates a pragmatic approach that recognizes there must be a stopping point in any causal analysis.

5.10.2 Reasonably Certain to Occur

If it is determined that a proposed action has the potential to cause indirect effects, then an analysis must be conducted to determine whether any of the potential indirect effects are reasonably certain to occur. The term "reasonably certain to occur" is narrower than the "reasonably foreseeable" standard used under NEPA. The term "reasonably certain to occur" was selected by the USFWS to eliminate speculation concerning future actions (51 FR 19926, 19933 [June 3, 1986]). In order for an action to be reasonably certain to occur, "there must exist more than a mere possibility that the action may proceed." (*Id*.) Factors to be considered to determine whether a proposed action is reasonably certain to occur include the economic, administrative, and legal hurdles remaining, as evidenced by work plans, appropriations, and pending or issued permits. (*Endangered Species Consultation Handbook*, p. 4-28, U.S. Fish and Wildlife Service 1998.) According to the Service, "the more State, tribal or local administrative discretion remaining to be exercised before a proposed … action can proceed, the less there is reasonable certainty the project will be authorized." (*Id*. at p. 4-30.)

5.10.3 Current and Continuing Operations

The covered activities include the continuation of water diversions from the LCR at existing levels and through existing diversion facilities as described in Chapters 2 and 3. Ongoing diversions of LCR water are delivered for a variety of uses, including agriculture, housing, commercial and industrial facilities. The geographic areas outside the LCR MSCP planning area that are serviced by LCR water include the Imperial and Coachella Valleys and the coastal plain of southern California, Clark County in southern Nevada, and parts of Arizona served by the CAP.

5.10.3.1 Causation

In the case of the LCR MSCP, the issue of causation is two-tiered. First, whether the continued operation of existing facilities for delivery of LCR water to service areas outside the LCR MSCP planning area causes growth and development in the service areas, and second, whether that growth and development will cause the incidental take of listed species. This subsection examines the factual circumstances of the LCR MSCP that are relevant to causation.

The factors that cause growth are mainly economic, especially job availability, but also include the availability and quality of housing, levels of foreign immigration, and even the weather (see *City Growth and the 2000 Census: Which Places Grew, and Why,* Glaeser and Shapiro 2001). Throughout the United States, growth has occurred even as overall water use has leveled off and even declined (Gleick 2003).

Water supply has not been a cause of growth in areas served with LCR water. For example, data for the San Diego region of southern California, which receives LCR water, suggests that the water supply has had little to no influence on growth. The population of the San Diego region has fluctuated extensively over the past two decades in response to economic factors such as employment availability. In 1993, the population in the San Diego region declined dramatically, reaching 1972 levels; the region is only now beginning to return to 1989 population levels. (San Diego Association of Governments 1999). These fluctuations occurred despite the existence of the same water availability for the past two decades. (see *Regional Urban Water Management Plan*, pp. I-4 to I-11, Metropolitan Water District of Southern California 2000).

An additional factor to consider in the analysis of the effect of the delivery of LCR water on growth and development is the availability of other sources of water supply. The availability of multiple sources of water supply means that no individual source is "indispensable" or "essential" to the area served. There are, within the areas served by LCR water, other existing and potential sources of water. For example, the Metropolitan Water District of Southern California has identified a portfolio of diversified supplies for its service area in addition to LCR water, including the California State Water Project, groundwater and surface storage, recycling and conservation, and desalination. (*Regional Urban Water Management Plan* [Metropolitan Water District of Southern California 2000] and *Report on Metropolitan's Water Supplies* [Metropolitan Water District of Southern California 2003]).

The second issue related to causation is whether the growth within areas served by LCR water will cause the take of protected species. As with the first issue, there is no basis for a causal connection between the delivery of water and incidental take by new development. Growth does not result in the take of species if the new development occurs in areas that do not contain listed species or their habitats. For that reason, urban infill and increased housing density does not cause take of protected species. Infill development, sometimes referred to as "smart growth," is currently occurring in the areas served by LCR water. In San Diego, for example, thousands of residential units are being added to the downtown area. The city is also creating a "City of Villages" concept that emphasizes urban infill and increased density and is designed to meet the demand for 89,000 new housing units through 2020 (Jackson 2002), providing an example that substantial new growth can occur in service areas without adversely affecting existing habitat areas. The causal factor for any incidental take that results from new development is the decision regarding where the development will occur. Those decisions reside in the jurisdiction of government agencies with land use authority, not with water agencies.

The ESA prohibits unauthorized impacts on listed species through habitat destruction. The USFWS, through the HCP permitting process under the ESA, is playing a central role in determining where and to what extent development can affect listed species in areas served by LCR water. If an area already has incidental take authorizations, then delivery of LCR water into that area cannot cause impacts on species in violation of the ESA. State and local government agencies are also responsible for regulating and approving new development in these areas. The level of separate regulatory approvals required for any new development within the service areas is substantial. Federal, state, and local government agencies other than water agencies control the extent and location of growth and development. Endangered and threatened species habitat, in particular, is being closely protected by regulatory agencies with the authority to enforce compliance with state and Federal endangered species laws and to permit the incidental take of listed species within the service areas. As described in Section 5.10.3.2, below, significant portions of the service areas have engaged in regional permitting under the ESA, and any impacts on listed species from new development within those areas are authorized by, and subject to the restrictions and mitigation obligations contained in, those permits.

The delivery of LCR water is an activity of a type that the courts have indicated do not cause indirect effects. The continued delivery of water through existing facilities will not cause unauthorized impacts on listed species in the areas served. The absence of any causal link is shown both by the reality that existing water supply is not the driving force behind growth in general, and growth in habitat areas in particular. Furthermore, there is no causation in cases such as this where the action involves the ongoing delivery of water through existing infrastructure into service areas that use multiple sources of water and where growth that does occur is regulated by land use and regulatory agencies to ensure compliance with ESA.

5.10.3.2 Reasonably Certain to Occur

This subsection describes the factors that are relevant in determining whether effects on listed species are reasonably certain to occur as a result of delivery of LCR water in the service areas. Relevant factors include the long-term nature of the LCR MSCP, the trends toward urban infill, increased density, urban renewal, and the advent of regional habitat conservation planning under the ESA.

The term of the LCR MSCP authorization is expected to be from 2004 to 2054. As noted in Section 5.10.2, to meet the requirement for reasonable certainty, there should be evidence of work plans, appropriations, or approvals for those actions. The more administrative and legal hurdles that remain for approval of an action, the less certain it is that the action will occur. It would be mere speculation to identify where specific development will occur within areas served by LCR water. Even assuming for purposes of this analysis that a causal relationship between water delivery and actions that modify habitat in service areas could be established, the requirement for reasonable certainty cannot be met in this instance. Conversely, even if it is found that the take of listed species is reasonably certain to occur as a result of identifiable future development, there is no causal linkage between the development and the supply of LCR water.

Population trend data forecasts growth during the 50-year term of the LCR MSCP, but trend data is only a generalized forecast directed at rates of growth. Trend data is particularly unhelpful with regard to the central inquiry involved here, which is whether future growth will cause the incidental take of protected species or habitat. As discussed in Section 5.10.3.1, the water service areas at issue are able to accommodate extensive growth in non-habitat areas without infringing on protected species. In addition, some existing outdated development will be removed to make way for new growth as part of the urban renewal trend.

More importantly, any new development that may cause the take of a listed species is subject to the regulatory controls of land use and resource agencies. Any conclusion that new development is reasonably certain to cause the take of species must be based on the assumption that these agencies will fail to comply with the requirements of the ESA. On the contrary, the record reflects general compliance with the ESA. The existence of regional HCPs in areas served by LCR water indicate that it is reasonably certain future projects will avoid and mitigate for impacts on protected species and critical habitat in a manner that is reviewed and approved by the USFWS. The development of conservation plans for geographic regions ensures compliance with the ESA for any growth that may occur within that region. As a result, the effects of such projects are not reasonably certain to adversely affect protected species and critical habitat in a manner that is not already authorized.

In California, regional habitat conservation plans have been developed or are planned for most of the water service areas that include protected species and their habitat. Existing HCPs cover regions within Orange, Riverside, and San Diego Counties (Western Riverside County MSHCP, Orange County Central-Coastal MSCP, San Diego MSCP). Additional MSHCPs are pending approval for other parts of Orange, San Diego, and Imperial Counties (San Diego MSHCP, Orange County Southern MSHCP, Coachella Valley MSHCP). These HCPs provide authorization for specific levels of incidental take that may occur through new development within those regions. The USFWS has the authority to enforce the measures contained in the permits issued in relation to these regional plans and the plans themselves require annual compliance monitoring. Therefore, unauthorized impacts on protected species are not reasonably certain to occur as a result of LCR water deliveries within these service areas. The following excerpt from an annual report for the San Diego MSCP is an example of full compliance and strict control over actions within the area covered by the HCP:

> In 2001, 111 new development projects were reviewed by the MSCP staff for consistency with the adopted MSCP Subarea Plan and implementing regulations. Since January 2002, an additional 109 new development projects have been reviewed. City staff continues to ensure that the MHPA [Multi-Habitat Planning Area] preserve design, land use adjacency guidelines, mitigation requirements and specific area management directives have been evaluated and, as appropriate, incorporated into project designs.(Page 4, 2002 MSCP Annual Public Workshop- Summary Report [City of San Diego 2002]).

In Nevada, LCR water is delivered within Clark County. The county has completed a long-term MSHCP and received a section 10 permit authorizing impacts on threatened and endangered species on a countywide basis (Clark County MSHCP). Impacts on listed species that are not already authorized by the section 10 permit are not expected. The Clark County MSHCP closely tracks all land disturbance authorized and the conservation revenue that is generated from it. (Clark County MSHCP Biennium Progress Report for 1999–2001, page 108 [Clark County 2002]).

In Arizona, water deliveries outside the LCR MSCP planning area occur through the CAP. There have been more than 40 section 7 consultations involving the CAP. The effects of water deliveries via CAP have been analyzed and authorized in these section 7 consultations. The indirect effects associated with water deliveries via CAP have thus already been addressed.

In light of the evidence of the widespread use of regional HCPs in areas served by LCR water, it is reasonably certain that any new development in these areas will not result in the unauthorized take of listed species. Similarly, growth that occurs in areas without listed species or their habitat will not cause effects to those species. As a result, unauthorized impacts on protected species and habitat outside the LCR planning area are not reasonably certain to occur.

5.10.4 Future Covered Activities

The covered activities include possible future changes in points of delivery and diversion in an amount that could total up to 1.574 mafy of LCR water. These changes in points of delivery and diversion would result from water transfers, other similar actions, and administrative actions implemented by Reclamation as described in Chapters 2 and 3. For the reasons stated in Section 5.10.3, above, the diversion and delivery of water to service areas outside the LCR MSCP planning area will not cause any identifiable indirect effects to listed species. When the projects or agreements are proposed in the future, the Secretary of the Interior, acting as watermaster, may consult with the USFWS to determine whether there are any other indirect effects.

5.10.5 Conservation Actions

Implementation of the LCR MSCP Conservation Plan is not expected to cause any indirect effects outside of the LCR MSCP planning area.

Chapter 6
Cumulative Effects

6.1 Introduction

This chapter addresses the cumulative effects of covered activities and the LCR MSCP Conservation Plan on covered and evaluation species. Cumulative effects are defined under ESA regulations as those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 C.F.R. §402.02). This definition applies only to section 7 analyses and differs from the broader definition used under NEPA and other environmental laws. In this chapter, foreseeable non-Federal projects expected to occur in the LCR MSCP planning area are identified, and their probable effects on covered species evaluated.

6.2 Foreseeable Non-Federal Projects in the LCR MSCP Planning Area

Various non-Federal activities occur in the LCR MSCP planning area. Non-Federal activities affecting the LCR mainstem river and reservoirs include:

- diversion of state entitlement waters;
- potential decrease in water quality by municipal effluent discharge, storm runoff, agricultural drainage, recreational waste, and other nonpoint sources; and
- increased recreational use including fishing, hunting, boating, and swimming.

Non-Federal activities affecting the LCR floodplain include:

- agricultural development, including land conversion, pesticide application, soil erosion/minimum tillage, cropping patterns that benefit certain covered species, and land fallowing;
- municipal and industrial development, including land conversion, air pollution (dust, automotive, and industrial emissions), and natural area management;
- trash accumulation, including solid waste disposal (landfills);

- increased wildfire frequency resulting in reduced native riparian habitat and expansion of saltcedar; and
- increased recreational uses, such as hunting, camping, hiking, and off-road vehicle use.

It is anticipated that these contemporaneous non-Federal actions will continue in the future. Table 6-1 lists potential non-Federal projects in the LCR MSCP planning area that have been identified by contacts with local and state agencies.

The potential effects of non-Federal flow-related activities are assessed in the impact analysis in this BA in combination with Federal flow-related activities. Flow-related effects on each covered species are provided in Section 5.5, "Effects on Covered Species." A detailed accounting of LCR water diversions, returns, and consumptive use is provided in the Appendix 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." The same non-Federal and Federal flow-related impacts are addressed in the LCR MSCP HCP.

6.3 Cumulative Impacts on Covered Species

Non-Federal activities in the LCR MSCP planning area that may result in cumulative impacts on covered and evaluation species are divided into five categories:

- human population growth and economic development,
- visitation and recreation,
- environmental contaminants, and
- wildfires.

Human population growth and economic development can lead to the loss of covered species' habitat, disturbance of covered species, and increased predation and parasitism on covered species. Visitation and recreation can lead to disturbance of covered species, and increased contamination of the river from motorized recreation. Environmental contaminants may adversely affect reproduction in covered fish species and cause birth defects in some covered bird species. Wildfires can disturb covered species and remove habitat on which they depend. Each of these five categories of activities is discussed in more detail in the following sections.

6.3.1 Effects of Human Population Growth and Economic Development

Growth is projected in urban areas along the LCR, which will increase all cumulative impacts. Growth will lead to increased development, visitation, recreation, and contamination and could lead to increased fire frequency.

Table 6-1. List of Known Non-Federal Projects in the LCR MSCP Planning Area with Potential to Affect Covered Species

Reporting Agency	Project	Location
La Paz County	*Emerald River and Associated Townhome Development*—A 275-acre development project, including 600 residential units, a small hotel, and a marina, and a 7-acre 43-unit townhome development project.	Ehrinburg, Arizona
Imperial County	*Riverfront Specific Plan #01-0001 and Tract Maps #946 and #947*—34 residential lots and 9 open space lots on an 80-acre parcel developed through a specific plan, general plan amendment and zone changes, and two tract maps.	Imperial County, California
City of Blythe	*Blythe Mobile Home Park Solar Power Conversion*—Conversion of buildings within the park to solar power.	Blythe, California
Riverside County	*Mayflower Park Improvements and Expansion*—12 individual projects, including planning and development of the park expansion site, infrastructure improvements, lagoon improvements, and construction of new recreational buildings and restrooms on an approximately 85-acre site.	Unincorporated area approximately 4 miles north of Blythe, California
City of Blythe	*Queshan Park Improvements*—Planning, design, and construction of improvements, including boat launch, recreational vehicle parking, new campsites, limited boat slips, restaurant, and lagoon improvements.	Blythe, California
Caltrans (District 8 – San Bernardino County)	*Needles Highway Improvements Project*—Improve the highway pavement and add passing lanes. The project would include environmental clearance, surveying, horizontal and vertical alignment changes, pavement widening, passing lanes, left turn pockets, shoulder widening, and pavement rehabilitation. Total study area is approximately 730 acres.	Needles Highway from Needles, California to Laughlin, Nevada.
City of San Luis	*City of San Luis Wastewater Treatment Plant Facility*—Expanding the sequential batch reactor system of the plant by adding two new parallel reactors, two aerobic sludge digesters, and all the associated piping and equipment.	San Luis, Arizona
City of Yuma	*Gateway Park*—A planned 20-acre park that includes recreational and historical interpretive park improvements using native vegetation. The park will use only native vegetation and should provide ancillary habitat for species either listed or nonlisted.	Yuma, Arizona
City of Somerton	*Somerton, Arizona Replacement of Wastewater System Project*—Reconstruct the Somerton Wastewater Treatment Plant. The project site is approximately 15 acres.	Somerton, Arizona
Bullhead City	*Bullhead City*—There are approximately 90–100 planned and proposed residential, commercial, and other development projects in this area pending environmental documentation.	Bullhead City, Arizona
Quechan Indian Nation, City of Yuma, and Yuma Crossing National Heritage Area	*Yuma East Wetlands Restoration Project*—A 1,400-acre native riparian and river restoration project centered on the restoration of habitat through the reopening of historical channels and slough, clearing of nonnative species, and revegetation of the area with native plants and trees.	Yuma, Arizona

Reporting Agency	Project	Location
Quechan Indian Nation, City of Yuma, and Yuma Crossing National Heritage Area	*Yuma West Wetlands*—A 110-acre former landfill to be revegetated and converted to a recreational park, and an additional 35 acres of habitat restoration through the removal of exotic plant species and revegetation with native plants and trees.	Yuma, Arizona
Clark County	*Clark County Multiple Species Habitat Conservation Plan*—An approved multiple species habitat conservation plan being implemented to address the conservation needs of the entire range of biological resources in Clark County.	Clark County, Nevada
The Metropolitan Water District of Southern California, Palo Verde Irrigation District	*Land Management, Crop Rotation, and Water Supply Program in the Palo Verde Irrigation District*—A land management, crop rotation, and water supply program to develop a flexible and reliable water supply for The Metropolitan Water District of Southern California and to assist in stabilizing the farm economy in the Palo Verde Valley.	Palo Verde Valley, California
Nevada Division of State Lands	*Floating Dock*—proposed.	Regency Casino, Laughlin, NV
City of Blythe	*Riverview Estates subdivision*—79 single-family residential lots.	City of Blythe, California
City of Blythe	*Palo Verde Oasis*—Phase III: approximately 29 single family residential lots.	City of Blythe, California
Cocopah Tribe	*River Restoration Project*—12-mile stretch of the river.	Northern Cocopah Reservation
Fort Mojave Indian Reservation	*South Point/Calpine Cogeneration Plant*	Fort Mojave Indian Reservation
Imperial County	*Palo Verde River Properties*—18-parcel subdivision, 12 parcels abut the lower Colorado River.	Imperial County, California

Note: Some of these apparently non-Federal projects may require Federal funding or authorization (e.g., a Clean Water Act section 404 Permit may be required) and hence be Federal actions. In such cases, the project would not be considered to result in cumulative effects.

Economic development in the LCR MSCP planning area could include the construction of residential areas and supporting infrastructure; commercial developments; recreational developments, such as marinas, docks, and boat ramps; and casinos and associated infrastructure. In addition, economic development could include an increase in agricultural land use and production; however, development will likely result in the conversion of agricultural land to urban uses. Economic development effects on covered species may include increased public use of the species' habitat, removal of the species' habitat, disturbance or mortality of individuals (e.g., incidental harvest of covered fish species by anglers), reduction in the area available to potentially create habitat because of development, increased predation/competition by domestic animals and introduced nonnative fish, and increased parasitism by the brown-headed cow bird as a result of habitat fragmentation. Effects with the potential to affect all covered species are increased public use of the species' habitat, removal of the species' habitat, disturbance or mortality of individuals, and reduction in the area available to potentially create habitat. Increased predation by domestic animals (e.g., cats) and increased parasitism by the brown-headed cowbird have the potential to affect covered bird species. Increased predation by introduced nonnative fish has the potential to affect all covered fish species.

6.3.1.1 Contribution of Covered Activities and LCR MSCP to Cumulative Effects

Covered activities and LCR MSCP Conservation Plan impacts related to population growth and economic development include maintenance of roads, canals, and drains; other miscellaneous maintenance; and construction of boat ramps, sport-fishing docks, and roads. The relative contributions of the covered activities and LCR MSCP conservation measures to impacts having to do with population growth and economic development are not expected to contribute to cumulative impacts in the LCR MSCP planning area.

6.3.2 Effects of Future Visitation and Recreation

Visitation and recreation along the LCR have steadily increased in the past; this trend likely will continue. Future increases in use of motorized vehicles on the river may result in increased spills of petroleum products and other contaminants, as well as in discharge of both treated and untreated sewage effluent (U.S. Fish and Wildlife Service 1993), adversely affecting water quality. Decreases in water quality could affect covered fish species and covered bird and mammal species that use marsh and backwater land cover types (i.e., California leaf-nosed bat, pale Townsend's big-eared bat, western red bat, western yellow bat, Colorado River cotton rat, western least bittern, California black rail, and Yuma clapper rail).

As visitation and recreational use increase, more disturbances of covered species will result. A number of tribes and private groups are proposing to build large casinos and recreation facilities on the river. These projects could increase the number of people fishing, swimming, skiing, hunting, and boating on the river, as well as using off-road vehicles near the river. Such activities would result in impacts on many of the habitat areas used by covered species, including riparian, marsh, and desert scrub land cover types. Increased visitation and recreation also could cause increased disturbance of covered fish and their spawning areas, and unintentional harvest of covered fish species by anglers.

6.3.2.1 Contribution of Covered Activities and LCR MSCP to Cumulative Effects

Covered activities and LCR MSCP Conservation Plan impacts related to visitation and recreation include construction and maintenance of boat ramps, fishing docks, and roads, which could contribute to the increase in human use and disturbance of covered species' habitats. However, the relative contributions of the covered activities and LCR MSCP Conservation Plan to impacts on covered species having to do with visitation and recreation are not expected to contribute to cumulative impacts within the LCR MSCP planning area.

6.3.3 Effects of Environmental Contaminants

Elevated levels of organochlorides, selenium, arsenic, cadmium, copper, lead, and zinc in covered species' habitats can have effects on covered species. Sources of contaminants include municipal effluent discharge, stormwater runoff, agricultural drainage, recreational waste, and other nonpoint discharges. Irrigation water returns to the LCR contain higher levels of organics from fertilizers and pesticide and herbicide residuals than the water contains when it is diverted. Air pollution may also affect covered species. Pesticides can drift from croplands, potentially affecting both terrestrial and aquatic covered species.

High levels of contaminants may have an effect on razorback sucker and other covered fish species. Organochlorines and industrial contaminants are known to have adversely affected the reproductive organs of male carp in razorback sucker spawning areas in parts of Lake Mead (Bevans et al. 1996). Reproduction, and thereby long-term viability, of the razorback sucker may be adversely affected in these areas, but further research is needed to assess actual effects, if any. High selenium concentrations in fish located in backwater lakes on Cibola, Havasu, and Imperial NWRs may continue to pose a risk to razorback suckers; elevated levels of arsenic, cadmium, copper, lead, and zinc were also found in some fish (King et al. 1993).

Elevated levels of selenium may also have an effect on covered bird species. A southwestern willow flycatcher fledgling in southwestern Colorado was found with a crossed bill, a classic symptom of selenium poisoning in birds. The flycatcher was reared in the Escalante State Wildlife Area, which drains agricultural lands and for which high levels of selenium have been detected in past monitoring (Sogge pers. comm. in U.S. Fish and Wildlife Service 1997). Selenium and other contaminants have been found in elevated levels in Yuma clapper rails and other birds within the LCR (Estrada and Maughan 1999; King and Andrews 1996). Continuing exposure to selenium and other contaminants may threaten covered bird species.

6.3.3.1 Contribution of Covered Activities and LCR MSCP to Cumulative Effects

Drainage of irrigation water associated with creation of LCR MSCP habitats on natural lands could increase the contribution of contaminants into the LCR. The LCR MSCP, however, will reduce contaminants entering the LCR in drainage from agricultural lands that will be converted to covered species habitat. It is anticipated that LCR MSCP–created habitats will require minimal application of pesticides and will not require application of fertilizers. Consequently, the load of agricultural contaminants discharged to the LCR would be reduced with implementation of the LCR MSCP Conservation Plan. Operation of equipment to implement covered activities and LCR MSCP conservation measures (e.g., for establishing and maintaining created habitat, constructing and maintaining access roads and other facilities) could result in accidental and localized spills of petroleum products. The relative contributions of the covered activities and LCR MSCP conservation measures to impacts having to do with environmental contaminants are not expected to contribute to cumulative impacts within the LCR MSCP planning area.

6.3.4 Effects of Wildfires

As human activity in riparian zones along the LCR increases, fire frequency is also likely to increase (Busch 1995). As fire frequency increases, and as saltcedar and arrowweed continue to dominate postfire recovery, more disturbances of covered species that use riparian land cover types (i.e., California leaf-nosed bat, pale Townsend's big-eared bat, western red bat, western yellow bat, desert pocket mouse, Yuma hispid cotton rat, yellow-billed cuckoo, elf owl, gilded flicker, Gila woodpecker, southwestern willow flycatcher, vermilion flycatcher, Arizona Bell's vireo, Sonoran yellow warbler, and summer tanager) likely will occur.

6.3.4.1 Contribution of Covered Activities and LCR MSCP to Cumulative Effects

The covered activities and LCR MSCP Conservation Plan impacts related to increased wildfire frequency may include construction of boat ramps, fishing docks, and roads, possibly increasing access and visitation to riparian areas. The relative contributions of the covered activities and LCR MSCP conservation measures to impacts having to do with wildfires are not expected to contribute to cumulative impacts within the LCR MSCP planning area. The LCR MSCP Conservation Plan includes provisions to provide funding in support of fire suppression programs undertaken by local, state, and Federal agencies and will contribute toward reducing the current level of risk for wildfires along the LCR.

6.4 Summary of the Effects of Covered Activities and the LCR MSCP in Addition to Cumulative Effects

Effects of implementing the covered activities and LCR MSCP Conservation Plan include reduction in flow; construction of boat ramps, sport-fishing docks, and roads; maintenance of roads, canals and drains; other miscellaneous maintenance; fish stocking; and habitat creation. Construction of boat ramps, sport-fishing docks, and roads can cause the loss of small amounts of riparian, marsh, and desert scrub land cover types and increased harassment of covered species because of increased human access and recreation. Maintenance of washes, levees, banklines, desilting basins, and roads, as well as other miscellaneous maintenance, can cause the loss of small amounts of riparian, marsh, and desert scrub land cover types and disturbance of covered species that use those land cover types. In addition, environmental contaminants can be introduced during construction and maintenance activities. Though covered species habitat may be removed as a result of covered activities, there is a net gain in natural habitat for covered species as a result of implementing the LCR MSCP Conservation Plan. The net effects of all covered activities and LCR MSCP conservation measures on covered species are either beneficial or none (no effects) and, therefore, implementation of the covered activities and the LCR MSCP Conservation Plan will not contribute to cumulative impacts.

Chapter 7

Summary of Effects Analysis

Table 7-1 summarizes the potential effects of implementing the Federal and non-Federal covered activities and LCR MSCP Conservation Plan addressed in the LCR MSCP BA on covered and evaluation species. Reclamation's determinations in this LCR MSCP BA are based on applicable ESA regulations and USFWS Guidance. With respect to the "effects analysis" summarized in Table 7-1, Reclamation's analysis concludes that any effects resulting from proposed discretionary actions described in the LCR MSCP BA are not significant. However, Reclamation cannot conclude that isolated take of a single individual of a species will not occur, and the effects determinations have been made pursuant to this analysis (see discussion of potential take in the Endangered Species Consultation Handbook [U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998, pg. 3–12]). Although, as described in Chapter 5, "Effects of the Covered Actions," implementing the LCR MSCP Conservation Plan (see Chapter 5, "Conservation Plan" of the LCR MSCP HCP) may result in take of covered species, the net effects of implementing the LCR MSCP Conservation Plan will be to avoid, minimize, and fully mitigate effects on all the covered species and contribute to the recovery or reduce the likelihood for future listing of 18 of the 27 covered species.

Common and Scientific Name	Federal Status[a]	No Effect	May Affect: Not Likely to Adversely Affect	May Affect: Likely to Adversely Affect	Will Not Modify Critical Habitat	May Modify Designated Critical Habitat[b]
Federal Threatened and Endangered Species						
Yuma clapper rail *Rallus longirostris yumanensis*	FE			X		
Bald eagle *Haliaeetus leucocephalus*	FT		X			
Southwestern willow flycatcher *Empidonax traillii extimus*	FE			X		X[c]
Desert tortoise (Mojave population) *Gopherus agassizii*	FT			X	X	
Bonytail *Gila elegans*	FE			X		X
Humpback chub *Gila cypha*	FE			X		
Razorback sucker *Xyrauchen texanus*	FE			X		X
Other Covered Species						
Western (desert) red bat *Lasiurus blossevillii*	–			X		
Western yellow bat *Lasiurus xanthinus*	–			X		
Desert pocket mouse *Chaetodipus penicillatus sobrinus*	–			X		
Colorado River cotton rat *Sigmodon arizonae plenus*	–			X		
Yuma hispid cotton rat *Sigmodon hispidus eremicus*	–			X		
Western least bittern *Ixobrychus exilis hesperis*	–			X		
California black rail *Laterallus jamaicensis coturniculus*	–			X		
Yellow-billed cuckoo *Coccyzus americanus occidentalis*	FC			X		
Elf owl *Micrathene whitneyi*	–			X		
Gilded flicker *Colaptes chrysoides*	–			X		
Gila woodpecker *Melanerpes uropygialis*	–			X		

Common and Scientific Name	Federal Status[a]	No Effect	May Affect: Not Likely to Adversely Affect	May Affect: Likely to Adversely Affect	Will Not Modify Critical Habitat	May Modify Designated Critical Habitat[b]
Vermilion flycatcher *Pyrocephalus rubinus*	–			X		
Arizona Bell's vireo *Vireo bellii arizonae*	–			X		
Sonoran yellow warbler *Dendroica petechia sonorana*	–			X		
Summer tanager *Piranga rubra*	–			X		
Flat-tailed horned lizard *Phrynosoma mcalli*	–			X		
Relict leopard frog *Rana onca*	FC			X		
Flannelmouth sucker *Catostomus latipinnis*	–			X		
MacNeil's sooty winged skipper *Pholisora gracielae*	–			X		
Sticky buckwheat *Eriogonum viscidulum*	–			X		
Threecorner milkvetch *Astragalus geyeri* var. *triquetrus*	–			X		
Evaluation Species						
California leaf-nosed bat *Macrotus californicus*	–		X			
Pale Townsend's big-eared bat *Corynorhinus townsendii pallescens*	–		X			
Colorado River toad *Bufo alvarius*	–		X			
Lowland leopard frog *Rana yavapaiensis*	–		X			

Notes:

For non-Federal status, refer to the species status reports in Appendix I.

[a] Federal Status:

FE = Listed as endangered under the Federal Endangered Species Act (ESA).

FT = Listed as threatened under the ESA.

FC = Candidate for listing under ESA.

[b] The effects are not expected to appreciably diminish the value of the critical habitat for species conservation.

[c] 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.

Chapter 8

Experts Contacted and Peer Review Process

8.1 Experts Contacted

The individuals listed below are experts in the ecology and management of species addressed in the 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
Terry Fulp	Boulder Canyon Area Office Manager	Bureau of Reclamation

Name	Title	Organization
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
Thomas Shrader	Ecologist	Bureau of Reclamation
Roger Sorenson	Hatchery Supervisor	Arizona Game and Fish Department
John Swett	Wildlife Biologist	Bureau of Reclamation
Joe Szewczak	Comparative Physiologist	University of California White Mountain Research Station, Bishop, California
Richard Tracey	Wildlife Biologist	University of Nevada, Reno

Name	Title	Organization
Gene Trapp	Professor Emeritus	California State University Sacramento
Kent Turner	Chief of Natural Resources	Lake Mead National Recreation Area
Jim Warneke	Fishery Program Manager	Arizona Game and Fish Department
Dennis Watt	Hydrologist	Bureau of Reclamation
William Werner	Aquatic Habitat Coordinator	Arizona Game and Fish Department
Don Young	Assistant Area Manager	Bureau of Reclamation, Yuma Area Office
Ruben Zubia	Managing Engineer	Brown and Caldwell

8.2 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.

8.2.1 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 approach 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.

8.2.2 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 9
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9.2 Personal Communications

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