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AESO/SE
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Memorandum

To: Regional Director, Lower Colorado Region, Bureau of Reclamation, Boulder City, Nevada (Attention: Area Manager, Boulder Canyon Operations Office)

From: Field Supervisor

Subject: 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

This document transmits the U.S. Fish and Wildlife Service's (Service's) biological opinion (BO) based on our review of effects of the proposed Interim Surplus Criteria (ISC), Secretarial Implementation Agreements (SIAs) for change in point of diversion for up to 400,000 acre-feet (af) of California apportionment waters within California, and implementation of certain conservation measures on the endangered razorback sucker (*Xyrauchen texanus*), bonytail chub (*Gila elegans*), desert pupfish (*Cyprinodon macularius*), Yuma clapper rail (*Rallus longirostris yumanensis*), brown pelican (*Pelecanus occidentalis*) and southwestern willow flycatcher (*Empidonax traillii extimus*); the threatened desert tortoise (*Gopherus agassizii*) and bald eagle (*Haliaeetus leucocephalus*); and designated critical habitat for the razorback sucker and bonytail chub in accordance with section 7 of the Endangered Species Act (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). There are five designated applicants for this consultation: Metropolitan Water District of Southern California (MWD), San Diego County Water Authority (SDCWA), Imperial Irrigation District (IID), Coachella Valley Water District (CVWD) and the San Luis Rey Tribe (SLR).

The Bureau of Reclamation (Reclamation) and the applicants have requested our concurrence that the action may affect, but is not likely to adversely affect the bald eagle. The Service concurs with this determination. Reclamation has also made findings of no effect for the desert pupfish, brown pelican, and desert tortoise and critical habitat for the bonytail chub.

This BO is based on information provided in the August 2000, biological assessment (BA) (USBR 2000a), the draft Environmental Impact Statement (DEIS) for the ISC (USBR 2000b), the final conservation measures provided in a memorandum from Reclamation on January 8, 2001 (USBR 2001), information from the 1996 Operations and Maintenance BA (USBR 1996) for the lower Colorado River (LCR), the 1997 BO on Operations and Maintenance (USFWS 1997); meetings with Reclamation with and without the applicants, technical information provided by Reclamation on computer simulation models and results of modeling, telephone and personal conversations, e-mails, and other sources of information. A complete administrative record of this consultation is on file at the Arizona Ecological Services Office in Phoenix. We have assigned log number 2-21-00-F-273 to this consultation. Please refer to that number in future correspondence on this consultation.

Consultation History

The Service met several times with Reclamation during 2000 and twice with the applicants regarding this consultation. Because of Reclamation's schedule to complete all environmental compliance on this project by December 31, 2000, the Service and Reclamation agreed to a time line that provided 60 days to prepare a biological opinion, provided that the BA was of sufficient detail that additional information would not be needed to prepare the BO. Informal consultation was initiated in March. A May 22, 2000 memorandum from Reclamation asked the Service for concurrence with a list of species. The Service replied on June 5, 2000 requesting the bald eagle and desert pupfish be added to the list of species. A draft BA was provided by Reclamation to the Service and applicants on August 15, 2000. The Service provided comments on the draft BA in a memorandum dated August 22, 2000. Formal consultation was requested by Reclamation on August 31, 2000. The Service requested additional information on the BA in a memorandum acknowledging that request on September 5, 2000. The Service stated the information contained in the BA was sufficient to initiate consultation as of August 31, 2000, but that the additional information was needed by September 12, 2000 in order to maintain the 60-day schedule. For unknown reasons, Reclamation did not get a copy of the memorandum until October 2, 2000 at a scheduled coordination meeting. Contents of the memorandum were discussed, and Reclamation was sent another official copy. Responses to the questions raised in the September 5, 2000 memorandum were received from Reclamation in a memorandum dated November 30, 2000. Extensive discussions on the final form of the conservation measures were held in December, 2000 and January, 2001. The final conservation measures were provided to the Service by Reclamation in a memorandum dated January 9, 2001.

In discussions with Reclamation, the Service will provide separate memoranda on findings for the effects of the proposed actions to listed species in the Grand Canyon and Mexico. This decision is necessary in light of changes to the findings for Grand Canyon species after the BA was provided, and the supplemental BA for species in Mexico used a different project and baseline than in the original BA. This biological opinion does not contain information on effects to listed species in those two areas.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

The proposed action would take place on the Colorado River in Arizona, California and Nevada. Figure 1 is a map of the area showing important features of the river. The proposed action is comprised of several connected yet independent actions that involve apportioned and designated surplus waters of the lower Colorado River (LCR). Although Reclamation has now selected a preferred alternative, this consultation is based on the California Plan alternative described in the DEIS (USBR 2000b) and in the BA (USBR 2000a). The preferred alternative Basin States Plan has less severe effects to Lake Mead than the California Plan considered in this consultation. The baseline "no-action" alternative is also slightly different for the preferred alternative, but not outside the bounds considered in this biological opinion. The changes in points of diversion for 400,000 af of California allocation water for which SIAs are needed are described in the draft California's Colorado River Water Use Plan (4.4 Plan) (Colorado River Board of California 2000), and in the BA. The information contained in the above documents is herein incorporated by reference.

<u>ISC</u>

The DEIS for the ISC contained four alternatives and a no-action alternative. The ISC eventually implemented will be in effect for the years 2001-2015 only. Beyond that time, the no-action alternative will be put into place. This alternative is essentially the same as the method used in the 1996-2000 water years to declare surplus conditions. The California Plan alternative was developed by California water users to meet the needs of implementation of the 4.4 Plan. In terms of the other ISC alternatives, its effects fall between the Flood Control Alternative and the Shortage Protection Alternative.

The California Plan is described in considerable detail in the DEIS and more generally in the BA. These descriptions are incorporated herein by reference. The critical points of the alternative are summarized in this document to provide for the focus of the BO analysis.

The California Plan has three Tiers or trigger elevation levels that provide for surplus declaration (Figure 2). These elevation levels would be determined using the August-24 month study projections for the January 1 system storage, which is not at the lowest point in Lake Mead's yearly elevation cycle. Lake Mead elevations vary 10-20 feet per year with maximum monthly increases or decreases of up to 3 feet (USBR 1996). Actual water surface elevations in Lake Mead are the result of water releases from Hoover Dam and inflows from Glen Canyon Dam and the Grand Canyon tributaries. An effort to reduce monthly reservoir level fluctuations by timing high Glen Canyon Dam releases with high Hoover Dam releases is made by Reclamation. All Tier elevations increase over the 15 year life of the ISC to provide the same degree of protection for Lake Mead water storage amounts as depletions in the Upper Colorado River

Basin States (Colorado, New Mexico, Utah and Wyoming) increase from approximately 3.96 maf in 2000 to 4.46 million af (maf) in 2015 (USBR 2000b). As the Upper Basin uses more of its water, there is less available to be stored in Lake Mead or Lake Powell. Most of the surplus water goes to California, with smaller amounts to Arizona and Nevada. Information in the DEIS Attachment G (USBR 2000b) contains the assumed depletion schedules for the three States used to run the models for Lake Mead elevations and contains surplus water amounts assumed for those years. Other information on depletion schedules is also in the DEIS.

Please refer to Figure 2 for this discussion. The Tier 1 elevation changes from 1160 to 1166 feet from 2001-2015. For surpluses declared at Tier 1, Arizona, California and Nevada divide up between 770,000 and 835,000 af for any beneficial purposes. For Tier 2 (1116 to 1125 feet), the States would still get surplus water, dividing up between 564,000 and 620,000 af. Agricultural uses for surplus and storage other than for future municipal uses would not be allowed. At Tier 3 (1098 to 1102 feet) the usage restrictions are much more severe and essentially restrict the use of surplus water to active municipal and industrial uses. The amount available is between 464,000 and 520,000 af. The amount of water designated for surplus in each year does not require that the Tier level be protected. No surplus water would be available at Lake Mead levels below 1098-1102 feet. These amounts result from a more liberal interpretation of what qualifies as a surplus year.

Use of more liberal surplus criteria would also result in changes to how space-building in Lake Mead is accomplished. The flood control plans require a certain amount of storage space be available at a specific time of the year to accommodate runoff. Reclamation has traditionally released water in excess of normal apportionment demands when necessary to provide for this space. With additional releases in the form of surplus water, the need for space-building releases will change.

Changes to the elevations of Tier lines would be made at 5-year intervals based on the review of the Long-Range Operating Criteria (LROC) for the LCR and actual operating experience. It is not clear if the changes to Tier water surface elevations could be made more liberal as well as more conservative during the review. In the case of more liberal criteria (lower water surface elevations would provide for surplus declarations), additional effects not covered by this BO or the EIS process may occur and additional consultation be required at that time. Decisions on when a surplus would be declared, and at what level, would be made for the Annual Operating Plan (AOP). Water deliveries for a surplus year would be made in such a way that the States could put to beneficial use all the water provided. The Law of the River prevents Reclamation from releasing any water that cannot be beneficially used by a water user with a valid water service or surplus contract except under flood conditions. Unlike normal water contracts for basic apportionments, surplus contracts are not permanent. This is an important distinction, as it provides for the continuing discretion of Reclamation in the matter of declaring surpluses.

4.4 Plan

The 4.4 Plan is a very complex, multi-component plan to maintain existing levels of water supplies to the Southern California urban areas while providing that the State will not use more than its apportionment of Colorado River flows. There are numerous features of the 4.4 Plan that are not the subject of this consultation. An EIS/EIR and ESA section 10 program are ongoing to address issues within California resulting from parts of the 4.4 Plan. There are also some possible connections to the Colorado River in the form of delivery overruns, water accounting, actual delivery of the transferred water, conjunctive use, storage projects and offstream interstate water banking that are not covered by this consultation. Some of these activities have a Federal nexus, but sufficient information was not provided for them to be included in this consultation.

California's apportionment is 4.4 maf of the total 7.5 maf for the Lower Colorado River Basin States (Arizona, California and Nevada). It has used up to 5.4 maf per year in the past, relying on unused apportionment from Arizona and Nevada to provide the excess water. Those States are now, or will be by 2004, using their entire apportionments, leaving none extra to provide to California. This shortfall will affect the Southern California urban areas, since the entities that supply water to those areas, like MWD, have been the ones using the unused apportionment of Arizona and Nevada. The MWD aqueduct from Lake Havasu can carry approximately 1.25 maf of water per year. The MWD has a water right for approximately 550,000 af, and has another 100,000 af that is part of an ongoing agreement between MWD and IID and will continue to be delivered to the MWD aqueduct. MWD thus needs to find 600,000 af of water to maintain existing supplies. The surplus water generated from the ISC will make up some of this water over the short-term. Approximately 400,000 af of California's Colorado River water proposed for changes in point of diversion from below Parker Dam to above Parker Dam will be part of long-term replacement water. This water has a variety of sources and eventual destinations, specifics of which are in the BA and DEIS. These transfers will take several years to accomplish, and will increase incrementally to the full amount. The completion of the transfers still leaves a 200,000 af deficit for MWD's aqueduct capacity that is not explained in the DEIS or BA. This water will have to be made up from in-state supplies, future surplus declarations (if any) or other sources. What is important for this analysis is that the total volume of water released from Hoover Dam will not change due to the SIAs. What will change is the timing of that release and where it will be taken from the river. Because diversions to IID and CVWD do not provide return flows to the river, the changing of flow patterns below Parker Dam will not be further complicated by elimination of those flows as the water now moves to the coastal plain instead of the Imperial Valley. The 4.4 Plan will be in effect for a maximum of 75 years. Once Reclamation, as Watermaster and representative of the Secretary of the Interior, signs the SIAs, there is no future or continuing discretion on delivery of the 400,000 af of water. It is also important to note that the diversion of the 400,000 af is not the subject of this consultation, only the delivery of the water by Reclamation to the point of diversion. Diversion is a State discretionary action and this BO has no section 10 component. Effects of the existing diversion are part of the baseline and cumulative effects.

As part of the 4.4 Plan, there are other actions that are not part of this consultation that may result in changes in points of diversion to Lake Havasu from other locations on the LCR below Parker Dam. For the purposes of this consultation, those changes in points of diversion may be included within the total 400,000 af of transfer water provided that they do not increase the total amount of water transferred beyond the 400,000 af. Any effects to listed species from these other types of transfers that are not covered in this analysis would require additional consultation.

Conservation Measures

Reclamation has provided conservation measures that would be part of the proposed action once one is selected. These measures are designed to reduce the significance of the effects of the action on the listed species and critical habitat. These measures were listed in the BA (Table 5) in very general form. Final conservation measures for this project were provide by Reclamation in a memorandum dated January 9, 2001 (USBR 2001).

The conservation measures for the ISC are:

1. Reclamation will continue to provide funding and support for the ongoing Lake Mead Razorback Sucker study. The focus will be on locating populations of razorbacks in Lake Mead from the lower Grand Canyon (Separation Canyon) area downstream to Hoover Dam, documenting use and availability of spawning areas at various water elevations, clarifying substrate requirements, monitoring potential nursery areas, continuing ageing studies and confirming recruitment events that may be tied to physical conditions in the lake. The expanded program will be developed within 9 months of signing the BO and implemented by January 2002. Initial studies will extend for 5 years, followed by a review and determination of the scope of studies for the remaining 10 years of the ISC. Reclamation will use the bathymetric surveys, to be conducted in fiscal year 2001, to gather data in the areas of the identified spawning habitat, if not already available.

2. Reclamation will to the maximum extent practicable provide rising spring (February through April) water surface elevations of 5-10 feet on Lake Mead, to the extent hydrologic conditions allow. Hydrologic studies indicate that such conditions could occur once in 6 years, although no guarantee of frequency can be made. This operation plan will be pursued through Beach/Habitat Building Flows (BHBF) and/or equalization and achieved through the Adaptive Management and Annual Operating Plan processes, as needed for spawning razorback suckers.

3. Reclamation will continue existing operations on Lake Mohave that benefit native fish during the 15-year ISC period and will explore additional ways to provide benefits to native fish.

4. Reclamation will monitor water levels of Lake Mead from February through April of each year during the 15 years ISC are in place. Should water levels reach 1160 feet because of the

implementation of ISC, Reclamation will implement a program to collect and rear larval razorbacks in Lake Mead the spawning season following this determination. If larvae cannot be captured from Lake Mead, wild larvae will be collected from Lake Mohave.

The implementation of ISC is not likely to produce a condition resulting in a minimum February through April Lake Mead elevation at or below 1130 feet for more than 2 consecutive years during which surplus is being declared. Therefore, this condition has not been evaluated as an effect of the proposed action.

The conservation measures for the 4.4 Plan are:

1. Reclamation will stock 20,000 razorback suckers, 25 centimeters (cm) or greater in length, into the Colorado River between Parker and Imperial dams. This effort would be a continuation of present effort and bring the total number of razorbacks of that size stocked below Parker Dam to 70,000. This will be completed by 2006.

2. Reclamation will restore or create 44 acres of backwaters along the LCR between Parker Dam and Imperial Dam. This effort could include restoring existing decadent backwaters for which no ongoing effort provides funding or responsibility for restoration, or the creation of new backwaters where water availability, access and other issues can be met. Maintenance of these backwaters for native fish and wildlife will be ensured for the life of the water transfers. This will be completed within 5 years of the first water transfers.

3. Reclamation will provide funding of $50,000 for the capture of wild-born or F1 generation bonytails from Lake Mohave to be incorporated into the broodstock for this species and/or to support rearing efforts at Achii Hanyo, a satellite rearing facility of Willow Beach National Fish Hatchery. These efforts will be funded for 5 years (2001-2006).

4. A two-tiered conservation plan has been developed to minimize potential effects to willow flycatcher habitat that could result because of reduced flows on the Colorado River between Parker and Imperial dams as water transfers and associated changes in point of delivery are implemented. The plan is also illustrated in a decision driven flow chart.

   Tier One

   The primary strategy of this tier is to use management actions to prevent changes in the existing micro-habitat and prey base of occupied willow flycatcher habitat. Reclamation will identify and monitor 372 acres of currently occupied habitat (monitored habitat) that may be affected by water transfers and changes in point of delivery of up to 400,000 af of Colorado River water between Parker and Imperial dams (water transfer actions). Soil moisture will be monitored and if levels decrease as a result of implementation of water transfer actions under consultation, management actions will be taken to maintain the monitored habitat. Initially, monitoring efforts will be at a level of effort similar to Reclamation's monitoring program under the existing interim biological opinion for river operations and maintenance. The monitoring program will be reviewed every five years to determine whether this level of effort is appropriate to monitor effects of water transfer actions or can be reduced for the remainder of the period that water transfer actions are occurring. Monitoring will continue for up to five years after implementation of all water transfer actions unless it becomes part of a broader effort associated with recovery actions.

In addition, Reclamation will restore and maintain 372 acres of new replacement willow flycatcher habitat along the lower Colorado River. All 372 acres of replacement habitat will be in place within five years of the effective date of the Implementation Agreement that provides Federal approval for water transfer actions.

Tier Two

A two step contingency strategy has been developed and will be initiated if Reclamation, in consultation with the Service, determines that management actions to prevent adverse changes to monitored habitat are no longer viable or will not be successful in maintaining "baseline" soil moisture conditions. (Note: baseline soil moisture conditions will be evaluated using criteria that will be developed within one year of the acceptance of the biological opinion).

The contingency strategy emphasizes replacement of the monitored habitat in Tier One that is impacted as a result of the water transfer actions under consultation. The status of willow flycatchers relative to success of recovery efforts along the Lower Colorado River between Parker and Imperial dams will form the primary basis for determining the level of habitat replacement implemented under this strategy using the following approach:

Flycatcher Status Improving:

If willow flycatchers along the lower Colorado River, when compared to data collected as of the year 2000 are exhibiting an appreciable upward trend, then one acre will be restored and maintained for every one acre of monitored habitat that is adversely impacted. In combination with the 372 acres of habitat established under Tier One, the maximum acreage conserved would be 744 acres and no further replacement of acreage is required.

Flycatcher Status is Stable or Decreasing:

Step 1 - If the willow flycatchers population along the Lower Colorado River is exhibiting an appreciable downward trend that is likely attributable to habitat factors along the lower Colorado River, then two acres will be restored and maintained for every one acre of monitored habitat that is adversely impacted for the first 186 acres (acres 1-186). Under this step, Reclamation will replace up to a maximum of 372 additional acres.

Step 2 - If after implementing step 1, additional acreage (acres 187-372) of the monitored habitat is affected, Reclamation will answer two questions:

a) Are flycatchers occupying the 372 acres of replacement habitat already being maintained under Tier One?

b) Are the flycatchers along the lower Colorado River exhibiting an appreciable upward trend?

If the answer to question a or b is yes, Reclamation will have no further requirement to restore acreage. However, if the answer to both questions are no, Reclamation will restore and maintain two acres for every one acre of monitored habitat that is adversely affected by the water transfer actions for the remaining 186 acres (acres 187-372) of monitored habitat. Under this step, Reclamation will replace and maintain up to a maximum of 372 additional acres.

Note: Should it be necessary to implement all of the Tier Two steps (744 acres) in addition to Tier One actions, Reclamation will have replaced the monitored habitat at an overall 3:1 ratio (a maximum of 1116 acres).

Reclamation will continue voluntary conservation efforts along the lower Colorado River and its tributaries to restore and maintain riparian habitat primarily for willow flycatchers. Reclamation may use this habitat as credit towards replacement of willow flycatcher habitat as long as they are not previously counted to support any other Reclamation Section 7(a)(2) obligation.

If the willow flycatcher is downlisted to threatened, then Reclamation can replace at an overall rate of 2:1 instead of 3:1 regardless of current trend in population numbers in the lower Colorado River recovery unit, and regardless of whether the first 372 restored acres is occupied by willow flycatchers.

Reclamation did not provide any conservation measures to offset the effects to 5404 acres of potential willow flycatcher habitat that is within the area of effect to groundwater levels from the water transfers. These effects will be addressed within the context of the MSCP or, if the MSCP is not developed, during reinitiation on operations and maintenance.

Description of the Action Area

The 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 CFR §402.02). In the BA, Reclamation has defined the geographic area as the Colorado River from Lake Powell to the Southern International Boundary (SIB). In accordance with the CFR requirements, the Service is defining the action area to be the Colorado River from the full pool elevation of Lake Mead beyond Pierce Ferry to the Gulf of California and the 100-year floodplain of the river, plus all land areas in the three states (Arizona, California and Nevada) in which waters from the Colorado River involved in this consultation are used now and in the future under the proposed action.

The initial area of potential effects of the ISC included Lake Powell and the Colorado River through Grand Canyon. These areas are discussed in the DEIS, and are included in the geographic area covered by the BA. The effects to listed species in the Grand Canyon are not included in this BO because the BA did not contain the necessary analysis.

Although Reclamation's BA does not conclude that the proposed actions may contribute to growth**,** the Service believes it is necessary to include the water use areas in the United States within the action area. These areas may have indirect effects attributable to the proposed actions. Indirect effects outside of the immediate project area are determined using the dual requirements of causation and reasonable certainty of occurring. Causation need not be exclusive, that is, the Federal action under consultation does not need to be the only means by which the indirect effect could occur. It only has to be one way the effects could be generated. Reasonable certainty can be difficult to document because of the nature of future growth and development projects. In this case, there are other factors to consider.

It is very important to understand that no new permanent water supplies based on the lower Colorado River will be developed under the proposed actions. Water provided under the ISC will only be available for a 15-year period. Under the SIA water transfers, water now used in one location would be redirected to another location within the same State. The need to implement the ISC and 4.4 Plan is based on having water to support existing uses and future needs within the MWD and SDCWA service areas. We do not need to know what or where those uses are for this consultation, only that there are present and future uses for this water within the service areas. The areas of present use for the 400,000 af are also included since they will have effects of reduced water availability as a result of the proposed actions. Effects in existing use areas are being covered under an on-going ESA section 10 process.

The Colorado River and 100-year floodplain in Mexico are part of the action area. Effects to species in Mexico have been detailed in a supplemental BA and are not included in this BO. Appropriate consultation with the National Marine Fisheries Service (NMFS) will be accomplished by Reclamation for the totoaba (*Totoaba macdonaldi*) and vaquita (*Phocoena sinus*) in the Gulf of California.

II. STATUS OF THE SPECIES/CRITICAL HABITAT

This section provides brief summaries of the status of the listed species and critical habitat that would be adversely affected by the proposed actions. Recovery plans, if one exists, are cited for each species in the appropriate section. Biological information on species for which a finding of "no effect" or "may affect, not likely to adversely affect" has been made by Reclamation and concurred with by the Service is not provided in this BO. Please refer to the BA for that information.

Species/Critical Habitat Description

Bonytail chub and razorback sucker

The bonytail chub was listed as an endangered species on April 24, 1980, with an effective date of May 23, 1980. Critical habitat for the bonytail was designated on March 21, 1994, with an effective date of April 20, 1994. Critical habitat in the action area is the mainstem Colorado River from Hoover Dam to Davis Dam including Lake Mohave to its full pool elevation and the river and 100-year floodplain between the northern boundary of the Havasu National Wildlife Refuge to Parker Dam, including Lake Havasu to its full pool elevation. The Bonytail Chub Recovery Plan was most recently updated in 1990 (USFWS 1990).

The razorback sucker was listed as an endangered species October 23, 1991, with an effective date of November 22, 1991. Critical habitat for the razorback was designated on March 21, 1994, with an effective date of April 20, 1994. Critical habitat in the action area is Lake Mead to its full pool elevation, the river between Hoover Dam to Davis Dam including Lake Mohave to its full pool elevation, and the river and 100-year floodplain between Parker Dam and Imperial Dam. The Razorback Sucker Recovery Plan was released in 1998 (USFWS 1998).

Yuma clapper rail

The Yuma clapper rail was listed on March 11, 1967, under endangered species legislation enacted in 1966 (Public Law 89-669). Only populations in the United States are protected under the ESA. Those in Mexico are not. Critical habitat has not been designated for this species. The Yuma Clapper Rail Recovery Plan was released in 1983 (USFWS 1983).

Southwestern willow flycatcher

The willow flycatcher was listed as endangered, without critical habitat on February 27, 1995. Critical habitat was later designated on July 22, 1997. A correction notice was published in the Federal Register on August 20, 1997, to clarify the lateral extent of the designation. Eighteen critical habitat units totaling 599 river miles in Arizona, California, and New Mexico were designated. Knowledge of important or "critical" habitat areas for willow flycatchers has improved since 1997, thus what was designated as critical habitat then, may not be the most accurate description of the most critical areas for willow flycatchers (i.e., Roosevelt Lake in Arizona, Colorado River main stem below Hoover Dam, etc.). No draft or final recovery plan has been released for this species.

Life History

Bonytail chub and razorback sucker

Life history information on the bonytail and razorback can be obtained in documents previously incorporated by reference into this BO (USBR 1996, USBR 2000a, USFWS 1997), the biological support document for the critical habitat designation (USFWS 1993a) and in the recovery plans (USFWS 1990, 1998). In the time period since 1997, new information on the number of founders for the bonytail broodstock (Hedrick *et al.* 2000) and on recruitment of razorbacks in Lake Mead (Holden *et al.* 1999) has been developed.

Yuma clapper rail

Life history information on the clapper rail can be obtained in documents previously incorporated by reference into this BO (USBR 1996, USBR 2000a, USFWS 1997), in the recovery plan (USFWS 1983) and other life history summaries (Eddleman 1989, Todd 1986). In the time period since 1997, no new significant biological information on life history for this species has been obtained, although information on the potential for selenium poisoning via food sources has been developed (Roberts 1996, King *et al.* 2000).

Southwestern willow flycatcher

Life history information on the willow flycatcher is also contained in documents previously incorporated by reference into this BO (USBR 1996, USBR 2000a, USFWS 1997). Since the 1997 critical habitat designation, significant new information on life history and habitat preferences have been obtained and are included in this document.

Declining willow flycatcher numbers have been attributed to loss, modification, and fragmentation of riparian breeding habitat, loss of wintering habitat, and brood parasitism by the brown-headed cowbird (Sogge *et al.* 1997, McCarthey *et al.* 1998). Habitat loss and degradation are caused by a variety of factors, including urban, recreational, and agricultural development, water diversion and groundwater pumping, channelization, dams, and livestock grazing. Fire is an increasing threat to willow flycatcher habitat (Paxton *et al.* 1996), especially in monotypic saltcedar vegetation (DeLoach 1991) and where water diversions and/or groundwater pumping desiccates riparian vegetation (Sogge *et al.* 1997). The presence of livestock and range improvements such as watering facilities and corrals, large scale agriculture, urban areas such as golf courses, bird feeders, and trash areas, may provide feeding sites for cowbirds. These feeding areas, coupled with habitat fragmentation, facilitate cowbird parasitism of willow flycatcher nests (Hanna 1928, Mayfield 1977, Tibbitts *et al.* 1994).

The willow flycatcher breeds in dense riparian habitats from sea level in California to just over 7000 feet in Arizona and southwestern Colorado. Historic egg/nest collections and species' descriptions throughout its range document the willow flycatcher's widespread use of willow (*Salix* spp.) for nesting (Phillips 1948, Phillips *et al.* 1964, Hubbard 1987, Unitt 1987, T. Huels *in litt.* 1993, San Diego Natural History Museum 1995). Currently, willow flycatchers primarily use Geyer willow, Gooddings willow, boxelder (*Acer negundo*), saltcedar (*Tamarix* sp.), Russian olive (*Elaeagnus angustifolio*) and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush (*Cephalanthus* sp.), black twinberry (*Lonicera involucrata*), cottonwood (*Populus* spp.), white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), and stinging nettle (*Urtica spp*.). Based on the diversity of plant species composition and complexity of habitat structure, four basic habitat types can be described for the willow flycatcher: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge *et al.*1997).

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of willow flycatcher territories and nests; willow flycatchers sometimes nest in areas where nesting substrates were in standing water (Maynard 1995, Sferra *et al.* 1995, 1997). However, hydrological conditions at a particular site can vary remarkably in the arid Southwest within seasons and between years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June). However, the total absence of water or visibly saturated soil has been documented at several sites where the river channel has been modified (e.g., creation of pilot channels), where modification of subsurface flows has occurred (e.g., agricultural runoff), or as a result of changes in river channel configuration after flood events (Spencer *et al.* 1996).

Throughout its range the willow flycatcher arrives on breeding grounds in late April and May (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Maynard 1995, Sferra *et al.* 1995, 1997). Nesting begins in late May and early June and young fledge from late June through mid-August (Willard 1912, Ligon 1961, Brown 1988a,b, Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995).

Willow flycatcher nests are fairly small (3.2 inches tall and 3.2 inches wide) and its placement in a shrub or tree varies throughout its range (2.0 to 59.1 feet off the ground). Nests are open cup structures, and are typically placed in the fork of a branch. Nests have been found against the trunk of a shrub or tree (in monotypic saltcedar and mixed native broadleaf/saltcedar habitats) and on limbs as far away from the trunk as 10.8 feet (Spencer *et al.* 1996). Willow flycatchers using predominantly native broadleaf riparian habitats nest low to the ground (5.9 to 6.9 feet on average), whereas birds using mixed native/exotic and monotypic exotic riparian habitats nest higher (14.1 to 24.3 feet on average).

The willow flycatcher is an insectivore, foraging in dense shrub and tree vegetation along rivers, streams, and other wetlands. The bird typically perches on a branch and makes short direct flights, or sallies to capture flying insects. Drost *et al.* (1998) found that the major prey items of the willow flycatcher (in Arizona and Colorado), consisted of true flies (Diptera); ants, bees, and wasps (Hymenoptera); and true bugs (Hemiptera). Other insect prey taxa included leafhoppers (Homoptera: Cicadellidae); dragonflies and damselflies (Odonata); and caterpillars (Lepidoptera larvae). Non-insect prey included spiders (Araneae), sowbugs (Isopoda), and fragments of plant material.

Brown-headed cowbird (*Molothrus ater*) parasitism of willow flycatcher broods has been documented throughout its range (Brown 1988a,b, Whitfield 1990, Muiznieks *et al.* 1994, Whitfield 1994, Hull and Parker 1995, Maynard 1995, Sferra *et al.* 1995, Sogge 1995b). Where studied, high rates of cowbird parasitism have coincided with willow flycatcher population declines (Whitfield 1994, Sogge 1995a,c, Whitfield and Strong 1995) or, at a minimum, resulted in reduced or complete nesting failure at a site for a particular year (Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995, Sferra *et al.* 1995, Sogge 1995a,c, Whitfield and Strong 1995). Cowbird eggs hatch earlier than those of many passerine hosts, thus giving cowbird nestlings a competitive advantage (Bent 1960, McGeen 1972, Mayfield 1977a,b, Brittingham and Temple 1983). Willow flycatchers can attempt to renest, but renesting often results in reduced clutch sizes, delayed fledging, and reduced nest success (Whitfield 1994). In one study, cowbird parasitism was often the cause of delayed fledging and nestlings that fledged later than July 20th had a significantly lower return rate than those fledging earlier (Whitfield and Strong 1995).

Willow flycatcher territory size likely fluctuates with population density, habitat quality, and nesting stage. Estimated territory sizes are 0.59 to 3.21 acres for monogamous males and 2.72 to 5.68 acres for polygynous males at the Kern River (Whitfield and Enos 1996), 0.15 to 0.49 acres for birds in a 1.48 to 2.22 acre patch on the Colorado River (Sogge 1995c), and 0.49 to 1.24 acres in a 3.71 acre patch on the Verde River (Sogge 1995a).

<u>Species Status and Distribution Range-Wide</u>

Bonytail chub and razorback sucker

Range-wide status and distribution information on the bonytail and razorback can be obtained in documents previously incorporated by reference into this BO (USBR 1996, USBR 2000a, USFWS 1997) and in the recovery plans (USFWS 1990, 1998). In the time period since 1997, species status has been affected by other Federal actions that have received informal and formal section 7 consultations, implementation of recovery and conservation actions, and implementation of reasonable and prudent alternatives (RPAs) from the 1997 BO.

The status of the bonytail in 2000 is also summarized in draft documents dealing with development of recovery goals (SWCA 2000a). No bonytails have been captured in the Upper

Colorado River Basin since 1988, although individuals are believed to persist in Desolation/Gray Canyons, Cataract Canyon, and Black Rocks areas.

In the Lower Colorado River Basin, bonytails persist in Lakes Havasu and Mohave. No natural recruitment has been documented. There is one broodstock being maintained at Dexter National Fish Hatchery and Technology Center (Dexter NFH&TC) in New Mexico. Recent information on the genetics of this broodstock state that as few as 3.5 of the 11 adults involved in the creation of the F1 generation actually contributed genetic material (Hedrick *et al.* 2000). Information on the genetics of the F2 indicate these fish were genetically acceptable to use in reintroductions (Minckley *et al.* 1989). However, for the long-term benefit of the species, additional fish must be incorporated into the broodstock.

Augmentation using hatchery born young bonytails is occurring in the Green and Colorado Rivers in the Upper Basin using 3 to 9 inch length fish. There have been 71,332 stocked between 1997 and September 2000 (Table 1) (Pat Nelson, FWS, pers. comm.). In the Lower Basin, bonytails are being stocked to augment the Havasu and Mohave populations. Fish 10 to 12 inches in length are stocked into the reservoirs as part of the implementation of previous BO actions (USFWS 1993b, 1994). Between 1997 and September 2000, 1,507 fish were put into Havasu (Al Doelker, BLM, pers. comm.) and 18,089 into Mohave (Chester Figiel, FWS, pers. comm). Another 8,379 will be stocked in October, 2000 and another 4,000 in November, 2000 (Manuel Ulibarri, FWS, pers. comm). Some of the 166,000 small bonytails stocked in the 1981-1991 period by the Service to Lake Mohave have recruited to the wild adult population and have been captured along with the wild adults.

The status of the razorback in 2000 is also summarized in draft documents dealing with development of recovery goals (SWCA 2000b). In the Upper Basin, razorbacks are found in the middle Green River (estimated at 524 adults in Modde *et al.* 1996) with very small (unquantified) numbers of wild fish in the upper Colorado, Gunnison, White, Duchesne and Yampa Rivers (SWCA 2000b). A small population of wild fish persists in the San Juan River (Jim Brooks, FWS, pers. comm.). The one significant population remaining in the Upper Basin, that in the Green River, has signs of limited recruitment (based on changes in length frequency data at 17.6-19.2 inch total length of captured fishes) with the population considered stable or slowly declining (Modde et al. 1996). Recruitment within the other Upper Basin populations has not been observed. Augmentation using hatchery born young fish is occurring in the Green, Gunnison and Colorado Rivers in the Upper Basin using 1-17 inch length fish. There have been 96,693 stocked between 1997 and September 2000 (Table 2) (Pat Nelson, FWS, pers. comm). Stocking also occurs in the San Juan River and Lake Powell.

In the Lower Basin, razorbacks persist on the Colorado River in Lakes Mead, Mohave and Havasu and in the mainstem between the reservoirs and downstream of Lake Havasu. In the Gila, Salt and Verde Rivers of interior Arizona, stocking activities have created small populations but no recruitment of wild-born young has been observed to these populations. One broodstock being maintained at Dexter NFH&TC in New Mexico, however, most fish for augmentation come from wild larvae caught in Lake Mohave or from paired matings with wild adults from Mohave. The wild adults in the Mohave population were estimated at 9,087 individuals in 1999 with and additional 3,104 repatriated sub-adults captured on the spawning grounds with the adults (Pacey and Marsh 1999). Population estimates of wild or stocked individuals for other Colorado River sites are not available, but populations are very small.

In the Lower Basin, populations in both Mohave and Havasu are being augmented with sub-adult fish raised in hatcheries or in semi-natural rearing ponds while the population below Parker Dam is being augmented through implementation of an RPA from the 1997 BO on BOR operations (USFWS 1997) and by adults being used in radio or sonic tracking studies. Fish 10-12 inches in length are stocked into the reservoirs as part of the implementation of previous BO actions (USFWS 1993b, 1994) and efforts of the Native Fish Work Group in Lake Mohave. Between 1997 and September 2000, 20,296 fish have been put into Havasu (Al Doelker, BLM, pers. comm.) and 33,708 into Mohave (Tom Burke, BOR, pers. comm; Chester Figiel, FWS, pers. comm). An additional 2300 razorbacks were stocked into Havasu in October, 2000 (Al Doelker, BLM, pers. comm.). Reclamation has stocked 4,596, razorbacks with an average length of 10 inches below Parker Dam under RPA 1 from the 1997 BO.

Spawning by razorback suckers has been documented in Lakes Mead and Mohave. Large recruitment events after Lakes Mead and Mohave filled (in the 1930's and 1950's respectively), created the adult populations found there (summarized in Minckley *et al.* 1991). Recruitment into the Lake Mohave population has not occurred since that time, resulting in the decline from an estimated 60,000 adults in the 1980's to the present 9,000 adults as fish age and die (Pacey and Marsh 1999). The normal pattern seen for razorback populations in reservoirs is to die out approximately 40-50 years after formation of the reservoir as fish reach the end of their life span. This decline in razorback populations was observed in Lake Mead. The Lake Mead population was rapidly disappearing from the lake in the late 1970's, as would be expected, since Lake Mead began to fill in the mid-1930's. Although there are many records in the literature on razorbacks in Lake Mead, none provide a population estimate beyond saying they were “common” or “abundant” (Minckley *et al.* 1991). No razorbacks were taken from Lake Mead in the 1980's (Sjoberg 1995).

In 1990, Nevada Division of Wildlife (NDOW) was advised by anglers that razorbacks were still present in Lake Mead and the Las Vegas Wash/Blackbird Point and Echo Canyon populations were confirmed. NDOW surveyed these areas in 1990, 1992-1994 capturing a total of 49 razorbacks (Sjoberg 1995). These razorbacks did not have the physical characteristics of old, senescent fish. They were, based on size and physical condition, estimated to be 20-30 years old, therefore born between the early 1960's-early 1970's. Arizona Game and Fish Department (AGFD) did capture six razorbacks averaging 231 mm in length in 1967 (cited in Sjoberg 1995), and using available growth curves, these may have been 3-5 years old at the time and may be part of the 20- 30 year old cohort now in the lake. Partial surveys of other likely spawning areas in the lake have not documented any other populations. Additional surveys are planned.

In addition to surveys, NDOW stocked a total of 97 razorbacks into Lake Mead since 1994. Of these, 57 were 1984 year class razorbacks from Dexter NFH&TC held at Floyd Lamb State Park and 40 were fish raised from captured wild larvae (Jon Sjoberg, NDOW, pers comm., Holden *et al.* 1997). Stocking information on these fish is given in Table 3. These stocked fish were all marked for later identification as stocked individuals to differentiate them from the wild-born and recruited individuals.

Since 1996, BioWest has been funded by Southern Nevada Water Authority (SNWA) and later with contributions from Reclamation, to examine the razorback population in Lake Mead. Their reports (Holden *et al.* 1997, 1999, 2000) were reviewed and used in this summary. The current population in Lake Mead is estimated at 400 in Las Vegas Wash and 50-60 in Echo Bay. Partial surveys in other parts of the lake have not located any additional populations, and more extensive surveys are planned for 2001. Based in sonic tracking data, the two populations do not seem to interact (Holden *et al.* 1999, 2000). Importantly, four subadults were captured in Echo Bay in the 1997-98 study year. One of these died and was aged at 4-5 years. An adult that also died that year was aged at 7-10 years. None of these were stocked fish (all stocked fish were tagged), indicating that recruitment events were still happening in the lake. Because of the limited data available, it is not clear if the present level of recruitment can sustain the population at its current level. The size of the current population is also too small to be genetically viable over the long term, however if additional recruitment opportunities are provided the population is likely to expand from its present size.

There is also a small spawning razorback population below Parker Dam that utilizes the Colorado River Indian Tribe (CRIT) canal system below Parker Dam. Capture records from 1980-1998 (Table 4) on approximately 80 individuals exist (Chuck Minckley and Mitch Thorson, FWS, pers. comm.). In addition, 5 adults were found and removed from the CRIT Main Canal in January, 1993 (Marsh 1993). Many of the captured fish were sub-adult sizes. There was a stocking of 60,000 average 2 inch razorbacks into the Parker Strip area on May 21, 1986 that may have produced some of these individuals. However, while razorbacks are known for growing quickly and at widely varying rates, and many of the sub-adults were found in January of 1987 (7-8 months after the known stocking), the lengths of these captured fish were up to 3 times the length of the stocked fish. This rate of growth would be extremely high even for razorbacks. Razorbacks of the same size range were found in 1986 in the canals before the stocking. It is therefore difficult to know how many of these fish were wild spawned and recruited and how many were from the stocking. It is important to note that success in stocking razorbacks below 10-12 inches in length has been extremely poor, and if some of the small stocked fish did live to grow to sub-adult size in the canals or somewhere else in the Parker Strip, this would be important to understanding how recruitment can be facilitated. Recruitment of young razorbacks in the canals may be related to cyclical maintenance and draining the canals that reduces the predator load. During the 1990's, several other razorbacks were found in the canals (Chuck Minckley, FWS, pers. comm) so there may be additional recruitment occurring. A spawning site has not been located in the Parker Strip reach of the LCR.

Ongoing research on the habitat preferences of the razorback sucker is being funded by Reclamation in the Imperial Division. Since 1995, Arizona Game and Fish Department has stocked 160 adult and sub-adult fish in the Division and followed them using sonic transmitters. Stocked razorbacks show a preference for backwaters over the main channel habitats (Gurtin and Bradford 2000).

Critical habitat for the razorback will be affected under the proposed action. Two of the areas, Lake Mead and the river reach below Parker Dam, have been the sites of the only known recruitment in the Lower Basin in the last 10 years or more and represent two thirds of the known recruitment areas range-wide. Information on exactly where, why and how this recruitment occurred is not available at the present time. Since lack of recruitment is the primary reason for the continued downward trend for the razorback, information on recruitment events is critical to future management. Changes to constituent elements that reduce or eliminate potential recruitment events are significant adverse effects to survival and recovery.

Yuma clapper rail

The status of the clapper rail in 2000 is provided by the results of annual surveys since 1997 (Table 5). These surveys do not provide estimates for the entire population, but provide information on the minimum number of birds present at survey sites. Survey data covers the LCR populations and also those found around the Salton Sea.

New information that may affect the life history of the clapper rail involves selenium levels in prey species (Roberts 1996, King *et al.* 2000). Levels in crayfish were high enough to cause concern for potential reproductive effects in clapper rails. No adverse effects have been noted, but because of the clapper rail's secretive nature, nests are difficult to find and a concentrated effort has not yet been made. Additional research and monitoring are under consideration at this time.

Southwestern willow flycatcher

Unitt (1987) documented the loss of more than 70 willow flycatcher breeding locations range-wide (peripheral and core drainages within its range) and estimated the range-wide population at 500 to 1000 pairs. There are currently 99 known willow flycatcher breeding sites (in CA, NV, AZ, UT, NM, and CO) holding approximately 712 territories (Table 6). Sampling errors may bias population estimates positively or negatively (e.g., incomplete survey effort, double-counting males/females, composite tabulation methodology) and random events, it is likely that the total breeding population of willow flycatchers fluctuates annually. Unpublished data from USGS (M. Sogge, USGS pers. com.) indicate that after the 1999 breeding season, just over 900 territories at 143 sites were known throughout the bird's range.

Seventy percent of the breeding sites where willow flycatchers have been found are comprised of five or fewer territorial birds. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances (e.g. in Arizona, approximately 55 miles straight-line distance between breeding willow flycatchers at Roosevelt Lake, Gila County, and the next closest breeding groups known on either the San Pedro River, Pinal County or Verde River, Yavapai County). To date, survey results reveal a consistent pattern range-wide; the willow flycatcher population is comprised of extremely small, widely-separated breeding groups including unmated individuals. Movement data indicates that willow flycatchers can disperse to areas as much as 200 kilometers away from past recorded locations.

Intensive nest monitoring efforts in California, Arizona, and New Mexico have shown that cowbird parasitism and/or predation can often result in failure of the nest; reduced fecundity in subsequent nesting attempts; delayed fledging; and reduced survivorship of late-fledged young. Cowbirds have been documented at more than 90 percent of sites surveyed (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Camp Pendleton 1994, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, T. Ireland 1994 *in litt.*, Whitfield 1994, C. Tomlinson 1995 *in litt.*, Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, Maynard 1995, McDonald *et al.* 1995, Sferra *et al.* 1995, Sogge 1995a,b, San Diego Natural History Museum 1995, Stransky 1995, Whitfield and Strong 1995, Griffith and Griffith 1996, Skaggs 1996, Spencer *et al.* 1996, Whitfield and Enos 1996, Sferra *et al.* 1997, McCarthey *et al.*1998). The probability of a willow flycatcher successfully fledging its own young from a cowbird parasitized nest is low (<5%). Also, nest loss due to predation appears consistent from year to year and across sites, generally in the range of 30 to 50 percent. Documented predators of willow flycatcher nests identified to date include common king snake (*Lampropeltis getulus*), gopher snake (*Pituophis melanoleucos affinis*), and Cooper′s hawk (*Accipiter cooperii*) (Paxton *et al.* 1997, McCarthey *et al.* 1998, Paradzick *et al.* 2000).

Cowbird trapping has been demonstrated to be an effective management strategy for increasing reproductive success for the willow flycatcher as well as for other endangered passerines (e.g., least Bell's vireo [*Vireo bellii pusillus*], black-capped vireo [*V. atricapillus*], golden-cheeked warbler [*Dendroica chrysoparia*]). It may also benefit juvenile survivorship by increasing the probability that parents fledge birds early in the season. Expansion of cowbird management programs has the potential to not only increase reproductive output and juvenile survivorship at source populations, but also to potentially convert small, sink populations into breeding groups that contribute to population growth and expansion.

Arizona Distribution and Abundance

As reported by Paradzick *et al.* (2000), the greatest concentrations of willow flycatchers in Arizona in 1999 were near the confluence of the Gila and San Pedro rivers (236 willow flycatchers, 134 territories); at the inflows of Roosevelt Lake (140 willow flycatchers, 76 territories); between Fort Thomas and Solomon on the middle Gila River (9 willow flycatchers, 6 territories); Topock Marsh on the Lower Colorado River (30 willow flycatchers, 16 territories); Verde River at Camp Verde (7 willow flycatchers, 5 territories); Alpine/Greer on the San

Francisco River/Little Colorado River (11 willow flycatchers, 8 territories); Alamo Lake on the Bill Williams River (includes Santa Maria and Big Sandy river sites) (43 willow flycatchers, 23 territories); and Lower Grand Canyon on the Colorado River (21 willow flycatchers, 11 territories).

Unitt (1987) concluded that "probably the steepest decline in the population level of *E.t. extimus* has occurred in Arizona...". Historic records for Arizona indicate the former range of the willow flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River. As of 1999, 289 territories were known from 47 sites along 12 drainages statewide (Table 6). The lowest elevation where territorial pairs were detected was 197 feet at Adobe Lake on the Lower Colorado River; the highest elevation was at the Greer town site (8300 feet). The majority of breeding groups in Arizona are extremely small. Of the 47 sites where willow flycatchers have been documented, 70 percent (n=33) contain 5 or fewer territorial willow flycatchers.

California Distribution and Abundance

The historic range of *E.t. extimus* in California apparently included all lowland riparian areas in the southern third of the State. It was considered a common breeder where suitable habitat existed (Wheelock 1912, Willett 1912, 1933, Grinnell and Miller 1944). Unitt (1984, 1987) concluded that it was once common in the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County. Specimen and egg/nest collections confirm its former distribution in all coastal counties from San Diego County north to San Luis Obispo County, as well as in the inland counties, i.e., Kern, Inyo, Mohave, San Bernardino, and Imperial. Unitt (1987) documented that the willow flycatcher had been extirpated, or virtually extirpated (i.e., few territories remaining) from the Santa Clara River (Ventura County), Los Angeles River (Los Angeles County), Santa Ana River (Orange and Riverside counties), San Diego River (San Diego County), lower Colorado River (Imperial and Riverside counties and adjacent counties in Arizona), Owen's River (Inyo County), and the Mohave River (San Bernardino County). Its former abundance in California is evident from the 72 egg and nest sets collected in Los Angeles County between 1890 and 1912, and from Herbert Brown's 34 nests and nine specimens taken in June of 1902 from the LCR near Yuma.

Survey and monitoring efforts since the late 1980s have confirmed the willow flycatcher's presence at a minimum of 11 sites on 8 drainages in southern California (including the Colorado River). Current known willow flycatcher breeding sites are restricted to coastal southern California from Santa Barbara to San Diego, and California's Great Basin near the towns of Kernville, Bishop, Victorville, the San Bernardino Mountains and along the lower Colorado River. The largest populations exist along the San Luis Rey, Santa Margarita, Santa Ynez, Kern and Owen's rivers. Combining survey data for all sites surveyed since the late 1980's for a composite population estimate, the total known willow flycatcher population in southern California is 95 territories, with possibly as many as 178 (M. Sogge, USGS, pers. com.).

Nevada Distribution and Abundance

Unitt (1987) documented three locations in Clark County from which *E.t. extimus* had been found prior to 1970. Current survey efforts have documented breeding birds along the Amargosa, Pahranagat, Muddy, and Virgin Rivers (McKernan and Braden 1997, 1998, 1999) in southern Nevada.

Federal Actions Throughout Subspecies Range

Since listing in 1995, at least 46 Federal agency actions have undergone (or are currently under) formal section 7 consultation throughout the bird's range (Table 7). Six actions have resulted in jeopardy determinations. Many activities continue to adversely affect the distribution and extent of occupied and potential breeding habitat throughout its range (development, grazing, recreation, dam operations, etc.). Stochastic events also continue to adversely affect the distribution and extent of occupied and potential breeding habitat. A catastrophic fire in June of 1996, destroyed approximately one half mile of occupied habitat on the San Pedro River in Pinal County. That fire resulted in the forced dispersal or loss of up to eight pairs of willow flycatchers (Paxton *et al.* 1996).

<u>Range-Wide Trend</u>

Bonytail chub and razorback sucker

Lack of recruitment to aging adult populations is resulting in increasingly smaller natural populations of bonytail and razorback as fish die and are not replaced by young fish. Extirpation and extinction from the wild for razorbacks and bonytails is being forestalled by the ongoing augmentation efforts, which have proved successful in re-establishing young adult populations into some areas of historic habitats. Use of wild larvae from razorbacks in Lake Mohave provides a vehicle to perpetuate this species' remarkable level of genetic variation to provide the most options for future reintroductions and augmentations. With the scarcity of wild bonytail adults left alive, adding diversity to this broodstock may be difficult, but every avenue must be exploited to provide the maximum retention of genetic variability. Efforts to capture additional wild bonytails from Lake Mohave are undertaken each year and increased efforts are needed.

Yuma clapper rail

Yuma clapper rail populations appear to be reasonably stable with no significant population declines or increases related to effects of activities within their habitats. Population changes on a local level have been noted, but these may be based on changes in habitat quality. Management actions such as burning old cattail stands and selected dredging to open up too-dense patches are under consideration in several areas to improve habitat conditions. The populations in Mexico, while not protected under the ESA, are critical to the ultimate survival of the species. These populations are mostly in the Cienega de Santa Clara, which is not directly connected to the

Colorado River but is supplied by water discharged from the US via the Main Outlet Drain from the Wellton-Mohawk Irrigation and Drainage District. Future operation of the Yuma Desalting Plant could have significant adverse effects on this water source. The Mexico rail populations were estimated at 6,400 individuals in 1999 (Hinojosa-Huerta *et al.* 2000).

Southwestern willow flycatcher

More intensive and widespread surveys and monitoring efforts have documented the presence of a greater number of willow flycatchers than known at the time of listing. However, this does not imply an increase in the actual population, or that the status of the species has remarkably improved. Continuing losses of occupied habitats and degradation of other areas precludes the possibility of population increases. Recovery actions may take many years to implement and decades for habitat to be restored. Protection of occupied habitats as a consequence of section 7 consultation does provide some stability for those populations, but the net result is still a declining population.

Analysis of the Species/Critical Habitat Likely to be Affected

The proposed action would take place in occupied habitats for the bonytail, razorback, clapper rail and willow flycatcher, and within designated critical habitat for the bonytail and razorback. The Colorado River within the vicinity of the proposed action has the largest populations of bonytails and razorbacks remaining in the wild, supports half of the clapper rail population in the United States, and is an important breeding and recovery habitat area for the willow flycatcher. The Salton Sea supports the other half of the clapper rail population in the US, and effects to this area are being covered by 4.4 Plan internal California compliance actions. Recovery of all these species will require these habitats to be able to support these species at current or higher levels.

III. ENVIRONMENTAL BASELINE

The environmental baseline is the analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area. For the lower Colorado River, the 1997 BO (USFWS 1997) provided an extensive environmental baseline. This has since been augmented by a discussion of the losses of riparian habitat (USBR 1999) prepared as part of RPA 11 for the 1997 BO. The information in these documents is herein incorporated by reference. The environmental baseline for areas outside of the river and 100-year floodplain has not been previously described. Because little has physically changed on the LCR for the bonytail, razorback and clapper rail since 1997, the description of the baseline is provided in very broad terms. Additional information is provided for the willow flycatcher because of the magnitude of new information developed.

The Colorado River and 100-Year Floodplain

Reclamation has been working to accomplish the short-term RPAs contained in the 1997 BO. For razorback and bonytail, the review of fish and wildlife programs (RPA 2), and research into conflicts between native and non-native fish (RPA 4) have been accomplished. Augmentation of razorback populations (RPA 1) is underway with 4,596 fish stocked to date, and development of the isolated impoundments (RPA 3) is underway. For willow flycatchers, approximately half of the 1400 acres of habitat protection/restoration (RPA 5) has been completed, and reviews of ongoing programs (RPA 6), protective management (RPA 7) and study funding (RPA 8) have been accomplished.

Under the long-term RPAs, Reclamation has stated it will support the reintroduction of bonytail to the lower river below Parker Dam (RPA 9) and has contributed to the study of razorbacks in Lake Mead (RPA 10). The alternative compensation habitat (RPA 11) implementation has generated an estimate of how much habitat for willow flycatchers was present along the river (USBR 1999), and some sites have been identified for inclusion in the compensation program. No lands have been protected to date, but most of this compensation was focused on implementation through the Lower Colorado River Multi-Species Habitat Conservation Program (MSCP). Potential areas for restoration on the river have been identified along with constraints (RPA 14). Reclamation has been an active participant in the MSCP (RPA 12), has provided the Service with a detailed description of their discretion in river operations (RPA 13), and has met with the Service in 1998-2000 to discuss progress (RPA 16). Implementation of RPA 15 involves Reclamation's use of its discretion to enable implementation and this is occurring. The last RPA, RPA 17, only comes into play if the MSCP efforts do not result in a section 10 permit by May 2002. At which time Reclamation must reinitiate on all of its operations. The Service believes that reinitiation should also include the ISC, because it will play a major role in how the river is operated and to not include it would make analysis of the system incomplete.

Since 1997, the lower Colorado River has also been the site of conservation and recovery actions, research and monitoring, population augmentations and additional development actions requiring consultation. Most of the development actions have been small and localized in extent of effects.

Table 7 provides information on willow flycatcher consultations within the action area. Despite the numerous Federal agencies and actions involved, only the1997 BO with Reclamation, and this current opinion has been initiated to look at the overall management of the LCR and its effects to willow flycatchers. The broad scope of interrelated and interdependent actions, or those that would not be possible but for the management of water on the LCR, has also had a significant and widespread impact on the willow flycatcher. For example, the availability of irrigation water spawned wide-scale agricultural development on private lands in the Colorado River valley. More than 75 percent of Mohave, Parker, Palo Verde, and Yuma valleys has been converted to agriculture (USFWS 1986). These areas formerly contained vast riparian forests and were captured in early photographs of the area. This riparian habitat probably comprised the most important riparian corridor in the Southwest and provided significant stands of habitat suitable for the willow flycatcher. The effect of these losses on the willow flycatcher has also been great; today, nowhere on the Colorado River could an individual look within a two-mile stretch and find 34 willow flycatcher nests as was done by Herbert Brown in June of 1902.

Only 3 BOs have been written since May 1997 on projects along the river (Table 8). Also included is a BO written just before the 1997 Reclamation BO was issued. In addition, the Service agreed that a dredging project in the Imperial Division was included under the 1997 BO. In addition to formal consultations, important informals where findings of "may affect, not likely to adversely affect" (NLAA) were made are listed in Table 9. There were many other small projects with the same findings. These types of projects were for recreational events such as boat races and waterski events, small 404 permits for docks and minor dredging at marinas, minor changes to recreational sites, and similar types of activities. Physical effects due to these projects were not significant and no take was foreseen for the bonytail, razorback and clapper rail.

Two findings of NLAA were for control activities for giant salvinia (*Salvinia molesta*), an invasive non-native, aquatic fern discovered entering the LCR from the West Side/Outfall Drain of the Palo Verde Irrigation District near Blythe, California, in 1999 (Science Advisory Panel 1999). At least 70 miles of the LCR have been infested with propagules (small survival stage clumps or individual plants) from the Drain. Requests for consultation from the Bureau of Land Management (BLM) and the Service addressed use of herbicides (Reward, a commercial formulation of diquat), barriers and physical removal of plants on Service and BLM lands along the LCR (USFWS 1999, BLM 2000). This infestation of giant salvinia threatens aquatic and marshland habitats along the river. In quiet waters, giant salvinia can form mats over 2 feet thick, blocking sunlight and oxygen circulation as well as replacing native aquatic plant species and decreasing macroinvertebrate biomass (Salvinia Task Force Action Plan Sub-Committee 1999). Giant salvinia prefers warm, still or very slow moving waters with high nitrogen concentrations. The LCR backwaters and impounded areas behind low dams would be the likeliest places for heavy infestation. The LCR is not heavily eutrophic, but sufficient nitrogen is present in the system to allow for at least localized problems. The presence of this plant in the LCR backwaters will restrict availability and quality of these desired razorback sucker habitats and may also affect clapper rail foraging areas or the ability of birds to use them. Efforts to control this plant in other parts of the US and in foreign countries have not been completely successful (Salvinia Task Force Action Plan Sub-Committee 1999). Some of the herbicides used are toxic to aquatic organisms, although diquat has very low toxicity when used properly (USFWS 1999). Biological controls are under evaluation but the effects and effectiveness are not fully understood.

Also during the 1997-2000 period, river management activities covered under the 1997 BO for Reclamation have continued to occur. These include maintenance of Front Work and Levee System improvements, generation of power, determinations of surplus water availability, flood control releases, and water delivery to Mexico. All Federal discretionary activities are covered by the 1997 BO until May 2002. After that time, the MSCP will be in place to address Federal and non-Federal activities along the river. If the MSCP is not completed by that time, additional consultation on Reclamation activities, including ISC, will be required.

There is currently no consultation or section 10 permit in place to cover the non-Federal actions along the river. Although Reclamation is the Watermaster for the LCR, there is limited Federal discretion in the release of the 7.5 maf of Lower Basin apportioned water. Reclamation can only not release water to a qualified contract holder if it is determined that the amount of water requested is in excess of that needed for beneficial uses. There is also some discretion in offering unused apportionment water to other States for use. Otherwise, the release of water from Hoover Dam and subsequent diversion for offstream use is entirely a discretionary action by the water rights holders. Over the 1997-2000 period, the water rights holders have requested and received their water and additional waters provided by unused apportionment and surplus declarations. Other non-Federal actions along the river and floodplain since 1997 include urban development, continuation of farming activities, and recreational use of the river and associated facilities.

The end result of the past, ongoing and present actions of water and land management along the LCR has been a maintenance of currently degraded habitat conditions for listed species. Because of the wide range of activities, jurisdictions and amount of discretion held by the various entities, it is very difficult to make any significant changes to the management of the system.

<u>Action Areas Within the Three States</u>

Lands where Colorado River waters are currently used have been developed for agriculture and also contain extensive areas urban/suburban development. The metropolitan areas of southern California (including Los Angeles and San Diego), Las Vegas, Phoenix and Tucson all rely to some extent on Colorado River waters included in the proposed action. The farmlands of the Imperial and Coachella valleys in California depend on Colorado River water. These areas have already been developed.

<u>Status of Species in Action Area</u>

Razorback sucker

The status of this species within the action area has been described as part of the range-wide status discussion earlier in this BO. However, additional information on known spawning areas and the operations of Lake Mead from 1935 to 2000 is needed for evaluations of effects of the action.

The Las Vegas Bay spawning site is on Blackbird Point facing the channel between the point and the marina (Figure 3). Elevations from topographic maps of this area show that the deepest area between the two sites is contained in the 1120 foot contour. Based on data from Holden *et al.* (1997, 1999, 2000), the spawning area is at approximately 1120-1150 feet elevation for an average of 1135 feet. The Bay is less than a mile wide and slowly deepens to 1080 feet within a mile to the east, continuing a shallow drop beyond that point but widening out.

The Echo Bay spawning area is at the western end of the bay in shallow water (Figure 4). Videotape data of spawning razorbacks was taken in 1999 with the area being used at elevation 1192. Holden *et al.* (1997) show a use area between 2013 and 1181 feet on the south shore of the bay. This use area is considerably smaller than the Las Vegas Bay site, and is in much shallower water. It may have been dry during the 1995 spawning season. There is a site with similar characteristics around the next bend of the bay also on the south side that may provide spawning habitats at slightly lower elevations, since the slope falls off to an elevation of 1148. Further east, the bay becomes deeper and wider and joins into the Overton Arm of the lake. Below elevation 1148, the Bay is essentially dry above the launch ramp at the campground, which includes most of the area used by the razorbacks during the spawning season (Holden *et al*. 1999, 2000). Given that there does not appear to be much interchange between the two populations in Lake Mead, the four sub-adults captured in Echo Bay in 1997-1998 were likely all spawned and recruited in this area.

Lake Mead was constructed in the early 1930's and began to fill in 1935. Over the 66-year period of record, water levels have fluctuated in response to inflows, outflows and operation of new dams on the Colorado River (Figure 5). Reclamation maintains exacting records of Lake Mead elevations on a monthly basis from February 1935 to the present. That information is available from Reclamation on its website and was used to develop the analysis presented here.

Including the 1935-1939 filling period, Lake Mead water levels during the spring spawning period (February-April) of the razorback have been over 1150 feet elevation in 44 of 66 years. This increases to 50 of 66 years if we include years where more than one but less than 3 months met this condition. Lake levels did not first reach 1150 until 1939, so the first 4 years of record do not provide anything to the analysis. Years when lake levels did not reach 1150 are concentrated in the 1952-1957 and 1964-1969 periods. The filling of Lake Powell in the 1960's had an effect on Lake Mead water levels. Water surface elevations dropped significantly as less water was reached Lake Mead. Figure 5 shows this pattern very clearly.

The second parameter of interest is whether water levels are increasing or decreasing during the spawning period. Using the Reclamation data, including the 1935-1939 period, there are 20 of 66 years where water levels were rising over the 3 month period (Table 10). Fifteen of those years are post 1939 and are important to the discussion. Of those 15 years, the average rise in water levels was 4.28 feet with a median of 3.50 feet (range 0.12-11.41 feet) during this period. As shown in Table 10, rising water levels have occurred in the 1940's, 1960's, 1980's and 1990's. Although the evidence is unclear, rising water levels may have played a role in post-1930's razorback recruitment in Lake Mead.

Razorback sucker populations in Lake Mead were first formed by the capture of fish living in the river reach that became the lake. As has been discussed earlier, those fish reproduced during the first years of lake formation to provide the population observed through the 1970's. The present adult population is hypothesized to be 20-30 years old (as of the early 1990's) and represent at least one year of recruitment. Based on the 1967 capture of sub-adult razorbacks, estimated at 3-5 years old using growth curves, this event may have occurred in the 1962-1964 window. Table 10 shows that 1960, 1962 and 1965 were all years of rising water levels, and two were over 1,150 elevation. The 7-10 year old captured in 1998 does not correlate to a rising water level year, but water levels were very high during this period. The 4-5 year old also captured in 1998 does correlate to the 1993 rising water year. Additional research and monitoring are needed to evaluate this population and its recruitment events.

Yuma clapper rail

The clapper rail appears to be expanding its range up into southern Nevada, including Lake Mead. Rails have been found in the lake and in wetlands habitats only recently and are still in small numbers. Since these habitats have existed for many years, it is unclear as to why they are just now being occupied. In some cases, surveys have not been done for clapper rails in those areas until very recently, or they were found during other bird surveys. Populations on the LCR and in the Salton Sea have not shown any large increases that would encourage dispersal into new habitats, but some areas of historic use have shown a decrease in habitat quality that may affect dispersal of rails from these areas.

Southwestern willow flycatcher

Unitt (1987) believed that the willow flycatcher had been extirpated, or virtually extirpated (i.e. few territories remaining) along the lower Colorado River. Its former abundance along the Colorado River was evident by Herbert Brown's 34 nests (93 eggs) and 9 specimens taken in June of 1902 near Yuma (Unitt 1987). Local collections of this magnitude suggest both a keen understanding of willow flycatcher habitat and use on the part of the collector, and that this subspecies was locally very abundant. However, subsequent to this collection, the distribution and abundance was not tracked well in the literature until declines were reported from the 1960's to present day (Phillips *et al.* 1964, Unitt 1987, Rosenberg *et al.* 1991).

Growing concern for the status of the willow flycatcher and its new status as a federally endangered species, prompted more survey effort along the lower Colorado River throughout the 1990's. Concurrently, more survey methodology was developed with species specific criteria for determining resident status (Sogge *et al.* 1997, USFWS 2000).

The Colorado River from Lake Mead down to the Southerly International Border separates Nevada and California from Arizona. Therefore, it is difficult, without extreme clarification, to describe populations along the Colorado River by state. As a result, populations will be described by reaches, near cities, or below dams, etc.

1993-1996

From 1993-1996 (Muizneiks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996, McKernan and Braden 1997), approximately 60 locations were surveyed on the lower Colorado River for willow flycatchers. McKernan and Braden (1997, 1998, 1999) continued to refine their search effort along the lower Colorado River in the late 1990's. Results from those surveys reveal a pattern of widely-separated and small breeding groups, similar to what is found throughout the subspecies' range (Table 6). Only two territories were discovered (Ehrenberg) between Parker and Imperial dams from 1993 to 1995 (Muizneiks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996).

Migrant willow flycatchers, probably including *E.t. extimus*, were documented along the length of the lower Colorado River (Muizneiks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996, McKernan and Braden 1997, 1998, 1999, Paradzick *et al.* 1999, Paradzick *et al.* 2000). Many sites had small, but relatively constant, numbers of willow flycatchers remaining on site early in the season for up to several weeks, but then disappear around mid-June. Sogge and Tibbitts (1992), Sogge *et al.* (1993), Sogge and Tibbitts (1994), and Sogge *et al.* (1995), also documented widespread use of the Colorado River through Grand Canyon National Park by migrant willow flycatchers. Records from Grand Canyon and the LCR downstream from the Grand Canyon combined with historical records demonstrate that this system is an important migratory corridor for this species.

1996-2000

Beginning in 1996, more extensive surveys began along the lower Colorado River and its tributaries from Lake Mead down to Yuma, Arizona (McKernan and Braden 1997, 1998, 1999). Tributaries examined were the lower Virgin, Bill Williams, and Gila rivers. Through this effort, more territories were located than previously known and, as a result, more was learned about the distribution of willow flycatchers along the length of lower Colorado River (Table 11). Most birds were found above Hoover Dam at the Colorado River Delta of Lake Mead (whose nesting habitat was subsequently inundated), the lower Virgin River, and Topock Marsh. McKernan and Braden (1999) attempted to survey all locations that they assessed as being suitable for nesting willow flycatchers. Reports for McKernan and Braden’s work exist for 1996 through 1998, and the data from 2000 used in this opinion were received by personal communication and are currently being compiled into a report.

In 1996, a concentration of nesting willow flycatchers were found at the inflow of the Colorado River to Lake Mead where 10 territories (8 confirmed pairs) were documented (McKernan and Braden 1997) in a random sample of plots within a 1219 acre area dominated by Goodding willow. An additional 15 to 20 territories were suspected in unsurveyed portions of the Lake Mead inflow and another eight to twelve territories were suspected in adjacent habitat in Grand Canyon National Park.

Seven nests were found at the Lake Mead inflow (McKernan and Braden 1997). None of the willow flycatcher nests at Lake Mead inflow were parasitized by cowbirds or depredated. However, three willow flycatcher nests at the inflow were lost due to treefall resulting from willows that were saturated from prolonged inundation of root crowns. All nests at Lake Mead inflow were located in Goodding willow. These Colorado River Delta nest areas and approximately 20 acres of occupied habitat at the Virgin River delta were subsequently lost due to inundation from Lake Mead by 1999 (McKernan and Braden 1999, USBR 2000) and consulted upon by Reclamation (USFWS 1997).

In 2000, McKernan (San Bernardino County Museum (SBCM), pers. comm.) examined 8 study areas from Lake Mead to Parker Dam, each consisting of numerous survey sites along the lower Virgin River (n=18), Colorado River in lower Grand Canyon (n=18), below Hoover Dam along the Colorado River (n=48), and on the lower Bill Williams River (n=12). Along the Virgin River from Littlefield, Arizona down to Lake Mead, 21 to 25 pairs were discovered. Also, 14 resident pairs of willow flycatchers were discovered on the Colorado River in the Grand Canyon. Below Hoover Dam 30 resident pairs were present this past season at Topock Marsh (n=44). Study sites (with no resident birds detected) were also surveyed at Topock Gorge (n=3) and Lake Havasu (n=1). Along the Bill Williams River on the Bill Williams National Wildlife Refuge, 4 resident pairs were discovered.

Between Parker and Imperial Dam, 16 study areas exist that contain 20 study sites (B. McKernan, SBCM, pers. comm.). Suitable habitat is not as abundant as sites above Parker Dam, thus the few number of sites within each area. All but three study areas have had a resident pair of willow flycatchers present during a season at least once since 1996 (B. McKernan, SBCM, pers. com.). In 2000, resident pairs were found at Big Hole (n=2), Ehrenberg (n=2), Walker Lake (n=2), Adobe Lake (n=2), Picacho West (n=2), Picacho/Camp Store (n=2), and Ferguson Lake (n=1). No nesting attempts were discovered at any of these sites.

Below Imperial Dam, McKernan (pers. com.) looked at 9 study areas which contained 21 survey sites. Again, while resident willow flycatchers have been detected at nearly all study areas at some time in the recent past, only two areas had resident birds in 2000. Resident willow flycatcher pairs were detected at the Gila River/Colorado River confluence (n=2), and along the lower Gila River (n=2).

Along the LCR, nest searches were conducted in most areas where resident birds were found, but in many areas nests were not found (B. McKernan, SBCM, pers. com.). That does not necessarily indicate that birds did not reproduce; but simply that no nests were found. Intensive searches were done in most areas, but some areas were not thoroughly searched (B. McKernan, SBCM, pers. com.). In 2000, nesting was documented along the lower Virgin River where approximately 38 attempts were recorded and in the Grand Canyon where 1 attempt was observed. Nesting attempts were also recorded at Topock Marsh ($n \cong 19$) and at the Bill Williams River (n=1). Downstream of Parker Dam, no nesting attempts were discovered.

The review of historic and current data on the distribution and abundance of the willow flycatcher, as well as data on productivity throughout this subspecies' range, presented under Status of the Species provides part of the baseline necessary to evaluate the effects of the proposed action. Other components of the baseline include the anthropogenic activities affecting the species and its habitat, the overall pattern and trend of habitat gains and losses, and the effects of Federal actions that have undergone formal section 7 consultation to individual birds from management and research activities, specific training in standardized survey and monitoring procedures (Sogge *et al.* 1997) are required throughout its range.

Change in aquatic and riparian systems

The development of limited and sparsely-distributed water resources in the Southwest has resulted in large-scale changes to aquatic and riparian systems. Those changes include losses of perennial aquatic ecosystems due to dams, diversions, and groundwater pumping; conversion of alluvial-influenced riparian areas to lacustrine-influenced reservoirs; loss and fragmentation of riparian and aquatic habitats due to residential, commercial, and agricultural development, overgrazing in riparian areas and in watersheds; modifications to stream systems from bank stabilization efforts and channelization; and invasion of remaining riparian areas by exotic species such as saltcedar. These activities and impacts are common among major stream systems in the Southwest.

The LCR has been transformed from a dynamic system prone to scouring, deposition, and meandering channels that leave floodplain forests in their wake, to one where human modifications have greatly reduced or eliminated these factors. This is described in the 1997 BO on Reclamation operations on the LCR (USFWS 1997). Historically, where the water table was relatively close to the surface, cottonwood-willow forests formerly extended away from the river for up to several miles (USBR 1996). Most of this habitat no longer exists (Ohmart 1979, USBR 1996). Ohmart *et al.* (1988) documented an 80 percent decrease between 1938 and 1960 in the areal extent of cottonwood-willow habitat in the Parker II Division. In that case, the loss amounted to more than 4,000 ha (9,880 ac) of cottonwood-willow. Historic photos compiled by Ohmart (1979) demonstrate the magnitude of loss of not only cottonwood-willow, but also of mesquite habitat. In addition to invasion by saltcedar, much of the native habitat loss resulted from agricultural expansion in floodplain terraces (Ohmart *et al.* 1988).

Riparian Restoration Along Lower Colorado River

Reclamation continues to sponsor a riparian restoration program along the river, including native plant nurseries and demonstration projects. Reclamation's BA for their operations on the lower Colorado River (USBR 1996) described that several areas were under restoration and will contribute approximately 220 acres of new or restored riparian habitats. Several other projects were in the planning stage, including a 22 acre wetland restoration project at the lower end of Las Vegas Wash and a 30-year cost-share project to restore 2,964 acres of native riparian habitat along a 9.3 mile stretch through the Imperial Division. As a result of the 1997 BO with

Reclamation on their operations along the LCR, Reclamation will establish no more than 1400 acres of riparian habitat for the willow flycatcher in order to replace habitat lost around Lake Mead. Some, but not all of these 1400 acres will be established on the lower Colorado River. The potential for these projects to successfully establish habitat suitable for the willow flycatcher is not known. However, because plantings are comprised mostly of cottonwood, and are typically spaced in an open plantation style, in small areas (i.e., 24.7 acre or less), the probability that these areas will develop into suitable willow flycatcher habitat in the near future is low.

To date, willow flycatchers have not been documented at locations where previous or on-going planting efforts have occurred. Other factors such as habitat extent and the presence of water must be considered when evaluating the probability that a planting effort will be successful for the willow flycatcher. Areas well away from river channels that have no standing or flowing water during the willow flycatcher's breeding season have a low probability of attracting nesting willow flycatchers. Similarly, plantings done in narrow strips only a few trees wide also have a low probability of attracting willow flycatchers.

Contaminants

Water management operations on the lower Colorado River exacerbate potential effects to willow flycatcher reproduction by concentrating naturally occurring selenium. During 1996, monitoring efforts in southwestern Colorado, a willow flycatcher fledgling was found with a crossed bill, a symptom of selenium poisoning in birds (Beyer *et al.* 1996, Heinz *et al.* 1987, Heinz *et al.* 1989, Ohlendorf *et al.* 1986a). The deformity prevented this bird from normal foraging. This willow flycatcher was reared in the Escalante State Wildlife Area, which drains agricultural lands where high levels of selenium have been detected in past monitoring (M. Sogge, USGS, pers. comm.). Portions of the lower Colorado River are also known to have high levels of selenium.

Recovery

Recovery of the willow flycatcher depends upon reversing the current population status of the bird. Therefore, throughout the subspecies range, it is important to increase the abundance of, and decrease the distance between sub-populations. To accomplish this task, watersheds must be improved, suitable riparian habitat developed, and in many cases, natural hydrologic processes restored (especially where dams and/or diversions occur along streams).

As described in the Environmental Baseline of the 1997 BO, the flow of water has dramatically changed due to damming, diversion, channelization, dredging, levee construction, and development (i.e. agriculture) within the floodplain. As a result, lakes replaced former river channels, recycling floods are largely prevented, sediment flow is limited, the groundwater table has significantly dropped, and river beds are incised.

Through these changes to the LCR, riparian habitat has changed in quantity, quality, and plant species composition. Disturbances to the flow regime and prevention of river flooding, combined with the introduction of non-native salt cedar, caused this exotic species to become the dominant plant along the river. Salt cedar has not entirely, but has largely replaced native cottonwood and willow trees (historic native plant species used/needed for nesting willow flycatchers). In most instances, native species, even if planted, could not grow naturally because of the lowered groundwater table, and increased soil salinity and compaction. The large fuel load that salt cedar creates, the oils from its leaves, and dry river channel has greatly elevated the occurrence and risk of fire along the LCR. The increased risk of fire not only threatens willow flycatcher salt cedar habitat, but also remnant stands of native trees.

The most notable change in plant communities along the lower Colorado River is the conversion of native cottonwood/willow forests to salt cedar and loss of mesquite. This change is characteristic of the dramatic interruption of the natural hydrologic regime. Reclamation (2000a) described the continuing changes over the last 20 years (1976 to 1997) where monotypic salt cedar has increased from 35,461 to 55,437 acres, and cottonwood/willow trees have decreased from 8,288 to 5,044 acres. An additional 27,000 acres were classified as mixed-salt cedar/mesquite types in 1997. Monotypic honey mesquite (16,207 to 3,258 acres) and screwbean mesquite (20,783 to 8,966 acres) have also declined.

The willow flycatcher has found salt cedar useful for nesting (Paradzick *et al.* 2000), but a variety of specific vegetation structure and micro-climate features still need to be met before it (or native species) will be used (Sogge *et al.*1997). The specific habitat conditions are not completely understood. Possibly more so than in other less harsh environments, moist soils and/or standing water are needed at nesting sites along the lower Colorado River. Therefore it is not surprising that moist soils are a common component in occupied willow flycatcher habitat along the LCR (Table 12). Additionally, the salt cedar (or native plants) are typically expansive in size, with a dense interior, and largely vegetated from the ground to the canopy (Sogge *et al.*. 1997, McKernan and Braden 1997, 1998, 1999). It is believed that these larger tracts of habitat with moist soils and closed canopies contribute to the desired vegetation structure, solar protection, humidity, and possibly the insect populations for successful nesting. Thus, due to the changes to the river and riparian habitat, only a fraction of all salt cedar (and/or native trees) is appropriate habitat for nesting willow flycatchers. And while the prevention of flood flows and lowered groundwater table certainly prevent native plants from being established, the same conditions are also prevent salt cedar from growing into suitable willow flycatcher nesting habitat.

While known willow flycatcher populations have increased throughout the bird's range since the bird was listed (primarily as a result of increased survey effort), most populations on the LCR remain very small with great distances between them. For example, below Hoover Dam, 66 percent of all willow flycatcher pairs (n=30) exist at Topock Marsh. This is a key issue, because recovery is dependent upon maintaining a well balanced distribution of birds and bringing breeding populations closer together. Increasing the stability of breeding populations allows birds to withstand stochastic events (flooding, fires), prevents isolation and associated threats (cowbird parasitism/predation), and allows exchange of material to promote genetic heterozygosity. The LCR is an important location to maintain distribution and abundance of breeding birds, because it is the common thread between five states (Arizona, California, Nevada, Utah, and Colorado) and other rivers/populations (Pahranagat, Muddy, Virgin, Gila, Bill Williams, Big Sandy, and Santa Maria rivers). Its central geographic location in the birds range likely increases its importance as breeding habitat and a migratory corridor.

The willow flycatcher's current status along the LCR, was considered by Lamberson *et al.* (2000) to be one of the least stable populations in the subspecies' range. Lamberson *et al.* (2000) used existing survey data to provide information on spatial patterns and colonization and extinction rates for individual sites, which in turn were used to simulate the dynamics of the population. In general, the model found that the species may be in jeopardy in areas where the occupied sites are small and widely distributed. This was the conclusion for the willow flycatcher on the LCR and to prevent local extirpation, territories must increase in number and proximity.

IV. EFFECTS OF THE ACTION

In 50 CFR § 402.02, effects of the action are defined as "...the direct and indirect effects of the action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action...." Further, indirect effects are defined as "...those that are caused by the proposed action and are later in time, but are still reasonably certain to occur."

Because the models used by Reclamation are not predictive but are based on past inflow events, it must be cautioned that any of the details on flows and changes in lake elevation are not actual events that will occur at certain years. If runoff patterns are significantly different from those in the past, either because of drought or high precipitation years, the actual outcome in terms of lake elevations and flows will be quite different. It may be possible to have fewer or more surplus declarations, at different Tier levels, than the BA presumed based on the model results. The "certainty" shown in the following discussions should be understood to be based on the model results showing differences between the no-action and California Plan alternatives given the same inflow data and not on any actual future levels. Implementation of the Basin States alternative in place of the California Plan will also affect actual future reservoir levels since the tiers and amounts available as surplus are not the same between the two plans. Please note that all Reclamation model runs are in feet, not metric measure, and have been kept as described in the DEIS and BA.

Changes to Upper Basin development of their water resources will also have an effect on the actual Lake Mead elevations seen over the life of the project and beyond. Reclamation has included all those increases as baseline, however, some portion of those increases may be more correctly interpreted as cumulative or future Federal actions. Because these increases cannot be separated out of the model runs, this discussion includes the Upper Basin depletions under direct and indirect effects. This should not be interpreted as acceptance by the Service of these depletions as part of the baseline, but as a consequence of the type of model data provided in the BA by Reclamation.

Direct and Indirect Effects: River and 100-Year Floodplain

ISC

Implementation of the California Plan will have effects to water levels in Lake Mead, normal contracted releases from Hoover and Davis Dams, flows below Davis Dam to Lake Havasu, and the frequency and volume of flood control releases and space-building releases from Hoover Dam. The latter will affect flows downstream of Davis and Parker dams to the Colorado River Delta in Mexico. Normal contracted releases will not change below Parker Dam because the surplus water provided to the States will be taken from Lake Mead directly (Nevada's share), or out of Lake Havasu (Arizona's and California's share).

Lake Mead

Lake Mead's elevations result from the pattern of yearly inflows (from Lake Powell and the Grand Canyon tributaries) and outflows (releases from Hoover Dam and the Southern Nevada Water Authority diversion). Over the course of a year, elevations will vary by 10-20 feet on average (USBR 1996) as water enters and leaves the reservoir. The median levels generated by the models for the 2000 to 2050 period are for January 1 water elevations. In most recent years, lake elevations are falling from January through May which includes the spawning period of the razorback sucker (February-April). Water levels may fall as much as 3 feet in a month during this period (USBR 1996). Because of past management direction and a series of wet years, Lake Mead's water levels were near capacity at the start of the planning process for this project. Figure 5 demonstrates that water levels over the last 20 years have been lower and higher than present levels.

Please refer to Figure 6 for this discussion. Under the no-action alternative, the median lake level of Lake Mead will fall from 1205 in 2000 to 1171 in 2015, a drop of 34 feet. This drop is a result of the increases in Upper Basin diversions of Colorado River water that reduces the inflows to Lake Powell and subsequently to Lake Mead. This drop in median water levels is gradual at an average of about 2 feet per year. The median water levels for the California Plan alternative fall from 1205 to 1147 feet in 2015, 24 feet more than under the no-action alternative, at an average of about 4 feet per year. The median water levels of the no-action alternative do not reach the 2015 California Plan levels until about the year 2032 and the medians are generally the same thereafter. Looking at the 10th percentile water levels, we see a decline from 1194 to 1130 feet in the no-action alternative, a change of 64 feet with an average drop of 4 feet per year. The California Plan goes from 1194 to 1098 feet in the same 2000-2015 period for a change of 96 feet with an average drop of 6 feet per year. Post-project, it is not until about 2027 that the no-action alternative reaches the 2015 level for the California Plan. Further, for the 10th

percentile line, the California Plan has consistently lower elevations than the no-action plan until 2049. What we see in the effects of the action for the median is a doubling of the rate of decline of water levels during the 15 year project duration, a 17 year loss of those higher median water levels being available after the project ends, and an increase in the number of years at lower water levels over the no-action alternative. For the 10th percentile, the rate of decline increases 50% and the two lines retain a 15 to 25 foot difference in elevation until 2045 not coming together until 2049, indicating a longer period of lower elevations under the California Plan.

Another form of the data is in Table 13. This table was generated from the 85 model runs per year (traces) for various Lake Mead elevations. These elevations were chosen for analysis based on known spawning habitat for the razorback. These are the same data used to develop the medians shown in Figure 6. The baseline/no-action alternative (75R) is compared to the California Plan alternative (CP). The data show that the number of traces above the target elevations declines much more rapidly under the CP than the 75R, with the CP figures up to 34% lower than the corresponding 75R figures. While the CP does not show lower overall figures than the 75 R, in part because the lowest target elevation 1,120 is considerably above the 10th percentile range, it reaches these lower levels more quickly and more often in a comparison between years.

These changes translate into different probabilities of a particular water level or set of levels in Lake Mead being met or exceeded. For example, under the no-action alternative, a water level of 1171 in 2015 would be met or exceeded 50% of the time. The same 1171 foot elevation under the California Plan would be met less than 50% of the time in 2015 because there would be elevations above the 1147 median level that are below the 1171 level. An elevation of 1150 would be met more than 50% of the time under the no-action alternative, because it would always be met by the 50% of the points above the median and by that percentage of the below median points that were still greater than 1150. The 1147 median would not be able to meet the 1150 elevation 50% of the time because some of the points in that 50% would be between the 1150 and 1147 levels. Plus, the 50% of the points below 1147 would not be able to provide additional chances to meet the 1150 level because they are lower in elevation. The 10th percentile probability does not change for the 1150 level for either the no-action or California Plan, however, as this level drops, there is an decrease in the water level at which this 10% occurs. This translates to an increase in the range of the lowest 50% of possible levels, thus to more and lower levels being seen below the median level. There is also an increase in the lowest levels of the bottom 10th percentile, as is shown by that level dropping on Figure 6.

Reclamation predictions based on modeling and likely surplus releases over the life of the project do not foresee extended periods of low water levels in Lake Mead as a likely result of the action. The circumstance in question is water levels at or below 1130 feet for more than 2 consecutive years when a surplus is being declared. Thus, such a condition would not be covered under this biological opinion, and if it occurred, would constitute an effect of the action not previously considered.

Razorback sucker

For razorbacks in Lake Mead, these changes in the median and 10th percentile figures will have significant adverse effects to the two known spawning locations in Lake Mead, resulting in lower water levels at these sites and an increased potential for them to be completely dry in some years. If the known habitats are not available, spawning would likely still occur, but the quality of the replacement habitats is not certain.

Based on the 1171 median for the no-action alternative in 2015, the average important spawning elevations (1120-1150 feet) would be protected significantly over 50% of the time until 2025 and still at over 50% until 2040. Spawning habitat would not be entirely subject to the lowest 10th percentile levels until about 2016. Under the California Plan's median of 1147 feet, much less of the known spawning area remains above the median level each year from 2001-2040 and the median hovers at around 1150 for most of the 2015 to 2040 period, and the entire known location is below the 10th percentile by 2011. This would reduce the number of years that known spawning habitats would be available to the fish, which may adversely affect the combination of conditions needed to provide for recruitment. These habitats would not be lost permanently, but would be unavailable more often under the California Plan.

Of additional concern in the Las Vegas Bay area is access to Las Vegas Wash, upstream of the known spawning site. This area is between 1120 and 1200 feet elevation with a considerable portion at the 1160 contour. Spawning has not been documented in this habitat, but sonic-tagged razorbacks do use the area and larvae were found there (Holden *et al.* 1999), and it may be important habitat when it is available. Under the no-action alternative, much of this habitat would be available at above the median 1171 level. Under the California Plan, much of it would not be available at the 1147 median. This would reduce the number of years that known spawning habitats would be available to the fish, which may adversely affect the combination of conditions needed to provide for recruitment. Critical habitat constituent elements for spawning habitats would be compromised more often under the California Plan. These habitats would not be lost permanently, but would be unavailable more often.

Defining the Echo Bay spawning area as between 2013 and 1181, both the no-action and California Plan alternatives have significant adverse effects to water levels at the known spawning area. Under the no action alternative, the 1171 median is 9 feet below the bottom of the area, and there will be less than 50% of the time that the area would be usable. However, the area around the point to the east would remain partially available since the elevation goes to 1148. The situation for the 1147 median of the California Plan is that the known spawning sites would be available far less than 50% of the time with the eastern end availability perhaps at 50%. For the 10th percentile under the no-action alternative, the level is reached in about 2010 and for the California Plan in about 2007. This means that water levels will be lower sooner and this reduces the availability of known spawning habitats more often.

Declining lake elevations due to ISC may also affect potential nursery habitats. Razorback sucker larvae and juveniles use shallow waters in coves and other protected habitats for nursery areas. The waters here are warmer, and food resources more abundant than in deeper areas. These shallows also have an advantage during rising water levels, in that if there has been terrestrial vegetation growing, inundation of the vegetation provides cover for small fish and nutrient loading that benefits phyto- and zooplankton and benthic invertebrates. The amount and quality of nursery habitat is not known at most lake elevations. With reduced inflows to Lake Powell as Upper Basin depletions increase, there may not be the same level of equalization opportunities to offset the greater drain on Lake Mead. That could result in a decrease in the probability of rising spring water levels due to lower Lake Powell water levels, resulting in less opportunity to flood terrestrial vegetation.

A complicating factor at yearly elevations near the bottom of the spawning habitats is the usual pattern of falling lake elevations during the spring months. The median and 10th percentile figures are based on end-of-year figures, and data from Reclamation show declines of as much as 3 feet in March with lesser decreases in February and April (USBR 1996). This trend of declining levels was discussed in the baseline. Therefore, even at acceptable end-of-year elevations, spawning habitats may not be as available during the spawning season. Because additional water will be released from Lake Mead year round, during a surplus year the amount of monthly drawdown may increase.

Razorbacks in Lake Mead, as well as in Lake Mohave and in the Upper Basin, show a high degree of fidelity to spawning sites. The same sites are used year after year by the population. This trait has been used in Lake Mohave to assist in the monitoring of that population over the last 30 years and to direct efforts to locate larvae. Spawning bars in the Green River are similarly targeted by Upper Basin researchers. Known spawning areas in Lake Mohave are generally not subject to the degree of water level fluctuations seen in Lake Mead, and in the Green River, cobble and gravel spawning bars do shift somewhat in response to changes in flows, so it is difficult to assess how far razorbacks will relocate to suitable spawning areas near known sites that are not available in a particular year. A reasonable expectation would be that if suitable habitat was available, it would be used. What is unclear is if suitable habitats are available adjacent to existing sites at the lower water elevations that will be seen in Lake Mead. Razorbacks prefer gravel and cobble substrates, not ones with large amounts of fine sediments that may be present at deeper lake elevations. Further, razorback adults spend the immediate pre-reproductive season in shallow waters that are warmer and may provide benefits for sexual maturation, feeding and other behaviors (SWCA 2000b). Lower water elevations may reduce or eliminate those habitats in the vicinity of the spawning areas. There may be suitable spawning areas along the southern shore of Echo Bay where it reaches the main part of the Overton Arm, but fish have not been recorded using those areas (based on sonic tagging) for spawning at this time. Under different conditions, there may be use, but data are not available. In Las Vegas Bay, suitable spawning habitat in the vicinity of the existing area may not be as readily available due to the topography of the site.

Razorback sucker are long-lived fish, reaching 50 years of age. In the pre-development Colorado River Basin, with its large yearly water level fluctuations, successful spawning and recruitment likely did not occur every year. Water levels might be too high or too low at the proper time to provide suitable spawning and nursery habitats. With long-lived adults, yearly success was not as critical to the survival of the species. In the Upper Basin Rivers, razorbacks spawn on the rising arm of the spring hydrograph (SWCA 2000b). Spawning times in the Lower Basin are earlier in the year, perhaps reflecting a difference in when suitable temperature and rising water conditions were available. Recruitment of razorbacks to the initial Lake Mead and Lake Mohave populations took place at a time when reservoir levels were rising and non-native predator populations were low. Rising water levels inundate vegetated shorelines that may be important for providing food and cover for larval and juvenile fish. Rising water levels have occurred over the 61 years of record (excluding 1935-1939) 15 times, for an average occurrence of once every 4.4 years. Over the last 19 years, a rise in the spring water levels in Lake Mead can be seen in Table 10 for the years 1983, 1986, 1993 and 1997. The 1993 rise may correspond to the recruitment of the four sub-adults captured in 1998. The Echo Bay spawning area was flooded during the spawning season after having been dry the previous 2 years. We do not know if this rise in water elevation was a critical factor to that recruitment event, but it is an anomaly that should be considered. A smaller rise in water elevations is noted in 1986, which is before the other young fish (the 7-10 year old) was perhaps spawned. The existing adult population was thought to have been spawned between the early 1960's to 1970's (Sjoberg 1995), and there are two large water level increases in that period. Aging of razorback suckers becomes more difficult at older ages due to the numbers of false and incomplete annuli. Techniques to refine aging estimates, especially those that do not require killing the specimen, are under review (Holden *et al.* 2000) and may shed light on recruitment years.

This discussion has two relevant points. One, that perhaps ascending water levels during the spawning period is important for recruitment (perhaps through providing nursery habitat), and two, that the opportunity for such increases is limited by normal reservoir operations. Even historically, razorbacks likely did not have significant recruitment every year so conditions need not be perfect every year. The number of years that lake levels start at acceptable levels and can increase is reduced if the median water surface elevation for the lake is lower over time and there are fewer years where water levels start out at an adequate level. With less water reaching Lake Powell due to Upper Basin increased depletions, there is a reduced opportunity for equalization between the two lakes that reduces the opportunity for rising water levels in Mead. The result is that with the California Plan, there is a greater risk of not meeting the conditions for successful recruitment than there is under the no-action alternative. Further, because the California Plan drops the water levels sooner than under the no-action, researchers have less time to determine what the important parameters are before the changes to water elevations become critical.

Overall, fish habitat within Lake Mead will be adversely affected by the lower lake elevations. Depending upon topography of preferred habitat areas, there may be less or more habitats of particular types available. Reduced habitats may result in crowding of razorbacks and non-native competitors or predators into the same spaces. We know from literature reviews that there is a considerable overlap in habitat use and preferences between razorbacks and non-native fish species (Pacey and Marsh 1998). Competition for food and space may result in reduced growth and health of individual razorback suckers. Telemetry data indicate that razorbacks can be very sedentary (Holden *et al.* 1999, 2000; SWCA 2000b) and may rest on the bottom for extended periods. The presence of other fish species, or crayfish, may cause them to move more often if they are disturbed. This can affect feeding and resting behaviors. Parasites such as *Lernea* may be more prevalent in areas with denser populations of fish to act as hosts. Declining water levels will also affect production of benthic organisms, aquatic plants and other important components of the habitat (Ploskey 1983) to the detriment of the fish population as a whole. Given that both important areas for razorbacks in Lake Mead are near existing recreational sites, shallower waters in the area also concentrate the effects of boats and personal watercraft (which include noise disturbances, and wake damage to shallow spawning or nursery habitats), risks to the area from spills or releases of toxic materials and take by fishermen.

Lake Mead has been designated as critical habitat for the razorback sucker. Constituent elements of water, physical habitat, and biological environment are all adversely affected over the next 50 years by both the no-action and California Plan alternative. The additional effects that result from the California Plan alternative cause greater effects over the short- and long-term and increase the level of damage to the constituent elements, especially those associated with spawning and nursery habitat availability and quality.

The 1997 BO addressed the potential for razorback suckers to be transported from the river into canals and other diversion facilities and to pass through dam turbines. Increased diversions by Southern Nevada Water Authority at their Lake Mead pumping plant would occur during surplus years. Sonic telemetry has not shown any use of the pumping plant area by the razorbacks in the Las Vegas Bay area, so this risk may not be increased. If populations in Lake Mead expanded, there may be cause to review this issue. Similarly, increases in water going through the turbines at Hoover Dam would not be expected to result in higher razorback mortality under present conditions since individuals are not known to use the area. Additional information on distribution within the lake may change this; however, to date no concentrations of fish have been found in the vicinity of the dam.

Yuma clapper rail

Lake Mead has only recently been found to support clapper rails. Rails have been found in the Virgin River delta area (McKernan and Braden 1999) and in Las Vegas Wash (NDOW unpublished data). Increased fluctuations of water levels over time may dry up existing or create new marsh habitats, especially in the Virgin River delta. Parts of the Las Vegas Wash marsh habitats supported by high water levels in Lake Mead may also be adversely affected. Depending upon local conditions and the rate of change of water levels from year to year, there may be more or less habitat available in any particular year. Cattail and bulrush habitats can develop relatively quickly if they are near to existing marshes and both areas may continue to support habitat at lower lake elevations if there are sufficient mud flats for cattails to colonize. If there are significant yearly fluctuations that inundate newly formed marshes at the low water elevations, replacement of affected habitats could be questionable in some years. As water levels decline, cattail areas may be left on dry land and degrade. Depending on how fast the water levels decline, new habitats may not be formed at the edges of old areas to preserve habitat availability. This would result in a lack if breeding, feeding and sheltering habitat for the rails.

Southwestern willow flycatcher

Surplus criteria will lower the level of Lake Mead which may allow willow flycatcher habitat to develop in the Virgin, Muddy, and Colorado river inflows. However, the amount, type, quality, and longevity of this habitat will be in question depending 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 conducted by Reclamation (USBR 2000b) predicts that Lake Mead elevations will fluctuate between full level and progressively lower levels during their 50-year period of analysis. Therefore, there may be a possible benefit from the proposed action, that by lowering 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 loss of willow flycatcher habitat within the influence of Lake Mead and those birds via the 1997 BO and provided replacement habitat to offset the periodic loss of this area. Thus, the willow flycatcher may obtain a temporary benefit from having this habitat occasionally available and at worst would not be worse off than at present if it is eliminated.

Hoover Dam to Parker Dam

Releases of water from Hoover Dam during a surplus year will be higher than in a non-surplus year. This would affect all species present in this reach. The amount of the increase would depend on the amount of surplus, estimated to be around 800,000 af during a Tier 1 year. This would add at most approximately 9% to the flows between Hoover and Parker Dams. Since these releases would be for municipal and industrial uses, it can be assumed that equal amounts would be released over the year to keep the MWD aqueduct full. This would mean an increase in releases of up to 1105 cubic feet per second (cfs) into Lake Mohave. Water levels in Lake Mohave may increase slightly, but there would not be meaningful changes since water would be released immediately to provide for this flow downstream. Water releases from Davis Dam are made to provide downstream demand and generate power. Thus, flows vary significantly over a 24-hour period. Water levels in the reach from Davis Dam to Lake Havasu may increase slightly or be at higher levels for longer periods. The specific release patterns are not detailed in the DEIS or BA. This change may be more noticeable in the winter low flow period when releases vary between 4,000 and 14,000 cfs over a day than the high flow periods when releases vary between 10,000 and 27,000 cfs (USBR 1996). Higher or more sustained high flows in the Davis Dam to Lake Havasu reach will result in higher water velocity in the main channel, and perhaps more movement of sediments within the unarmored sections of the river bed that may result in more scouring and channel deepening. Much of the upper end of this reach is armored and the channel is at equilibrium. Further downstream there is still considerable bedload and equilibrium has not been established. Anything that deepens the river channel will also affect the water level in marshes and backwaters as well as groundwater in the floodplain. Higher flows may also provide better circulation of water within the backwaters and marshes found along this river reach. Benefits due to refreshing flows may be negated if the river channel deepens, dropping the water level for these habitats and causing degradation. If new flow release patterns have greater fluctuations, greater oscillation of water elevations in the channel and backwaters will result. This effect would be attenuated as the water moves downstream toward the head of Lake Havasu but the attenuation may not occur as quickly. Maintaining oscillations causes shallow habitats to dry out and be temporarily lost.

Bonytail chub and Razorback sucker

Razorback sucker populations in this reach of the river are increasing, probably because of fish moving up from Lake Havasu. Mueller (2000a) has reported young adult razorbacks schooling with the adult flannelmouth suckers in this reach. Spawning has not yet been documented, but is likely as the young stocked fish mature. The flannelmouth population here has recruitment, and it is not known if the factors enabling that recruitment will also provide for razorback recruitment; however, there is a difference in spawning times that may be significant since razorbacks spawning earlier than flannelmouth suckers (Mueller 2000b). Razorback spawning and nursery habitats may be disrupted due to changes in flows and fluctuations, with losses to eggs and young fish. Drying of backwaters also interferes with adult cover and feeding since benthic areas are dried and inundated repeatedly which may reduce benthos and amount of time to utilize these resources.

Over time, as the Lake Havasu bonytail population increases, these fish may move into the reach between the reservoir and Davis Dam and be subject to the same effects as razorbacks. Wild bonytail chub were captured in this reach (USFWS 1990) until the 1970's and may be expected there in the future. There is no information on spawning habitats for the bonytail in the LCR outside of the reservoirs, so it is not clear if there could be effects to spawning in this reach during the 15-year project period.

Surplus water would be removed from the system at Lake Havasu, and effects to the reservoir elevations are not expected. Because the MWD aqueduct currently runs full with unused apportionment and other waters, the removal of surplus water via the aqueduct is not expected to increase the risk to fish of being transported out of the river to California because there is no increase in diversion. If the aqueduct is not filled by MDW apportionment and surplus, then there may even be a decreased risk to fish entrainment; however the project description has the aqueduct full. Increased diversions to Arizona of surplus water do increase the risk of fish being transported into the CAP canal. This may not be significant for razorback and bonytail until populations in the lake increase.

Yuma clapper rail

Marshes are equally susceptible to water oscillations and nesting clapper rails can only tolerate fluctuations that do not drown out nests. The primary clapper rail populations in this reach of the river are at the bottom end at Topock Marsh and Topock Gorge. Water level oscillations are generally flattened out by the time waters reach these areas, and the Marsh is protected from river effects by inlet and outlet structures. Effects to rail habitat in those areas are not expected to occur. Rails in the Laughlin Bay area, nearer to Davis Dam, may be subject to greater fluctuations and effects from daily oscillations and habitats may become less usable due to the fluctuations. Increased oscillations affect the availability of food and cover for the rails.

Southwestern willow flycatcher

Effects to the willow flycatcher habitat in this reach are not expected to be significant since groundwater levels are not expected to change unless there is additional channel incisement. If that does occur, there could be changes to groundwater levels that would affect riparian habitats and thus degrade willow flycatcher habitat.

Parker Dam to Imperial Dam

Normal water releases below Parker Dam would not be directly affected by surplus water releases unless some of the designated surplus is being used by a diverter in this reach. Under Tier 1 and Tier 2 releases, there is some availability of water for agricultural purposes and most of the major agricultural diversions are below Parker Dam. Since the ISC is primarily a tool for providing water to MWD, it is not likely that large amounts of water for agricultural uses will be available to cause an increase in river flows.

What will be affected by the ISC will be the probability of flood control and space building releases from Hoover Dam. Space building releases are those which provide the necessary amount of storage space that needs to be available in Lake Mead at certain times of the year. Currently, Reclamation attempts to match up contracted water releases with the need to maintain storage space, but higher than requested flows are sometimes needed to provide for required space. Since Reclamation cannot release water without a beneficial use, these excess releases are destined for some use within the system. The volume of Lake Mead needed for flood control will be within the area defined as containing the surplus under the California Plan, so what would have been space building releases will become surplus releases. Releases in excess of 19,500 cfs below Parker will be reduced 0.9% (13.9 to 13.0%), which is actually a 6% reduction from the no action under the California Plan over the 2000-2015 period and 1.8% (19.7 to 17.9%), which is actually a 9% reduction from the no action under the 2016-2050 period. The probabilities of such flows is not high even without the ISC so the reductions are more significant to the river environment than may first appear. Flood release criteria start at 19,500 cfs and go up to 73,000 cfs. Reclamation attempts to release these higher flows in concert with downstream water needs so no “excess” water is put into the system. Flood control releases also provide for diversion of water by water contract holders along the system. Thus, even at higher flood control releases, the river does not see uniformly high flows and determining the effects to the system of a reduction in the probability of those flows becomes very difficult. There are some general observations of the effects of higher flows that can provide insights for the analysis.

At relatively lower high-flow levels, there is a change in velocity and pattern of releases. There may be fewer hourly or daily oscillations due to the need to not back up water in the system. This causes changes to bedload transport and channel armoring/equilibrium. Erosion and deposition patterns experience local changes. Higher water levels provide additional water exchange to backwaters and marshes and sustained high flows increase groundwater levels near the river channel. If these flows occur at the proper time of the year for cottonwood or willow seeds to be present, then regeneration of native riparian plants may occur in saturated soils.

At very high flow levels, because of the effects of past channelization, the effects to the river ecosystem are generally adverse. Very high flows cause significant channel degradation and aggradation that may reach several feet. In lowered channel areas, backwaters and marshes are dried out and degraded. Groundwater levels in these areas decline as a result. In aggrading areas, marshes and backwaters may be filled and lost but groundwater may rise under the floodplain. This phenomenon was noted in the 1980's and early 1990's high water events. Although high flows were characteristic of the pre-development Colorado River, the maintenance of the managed river prevents the beneficial effects to habitat replacement and recreation from high flows from operating.

Bonytail chub, Razorback sucker, Yuma clapper rail

Under the ISC, there will be fewer high level flood releases, but the range of water levels that would occur will not change (as shown by the unchanging 90th percentile line). Within the US reaches of the river, there will be fewer opportunities for both lower high flows and higher high flows, thus there will be benefits (in terms of fewer destructive flows) and adverse effects (in terms of lower beneficial flows) as a result. For razorbacks, bonytails (once the population is established here), and clapper rails in this reach, there will be effects to habitat quality and quantity. Lower frequency of beneficial flood flows may result in reductions of water quality in backwaters as there is less opportunity for movement of water through them. This affects the quality of fish habitat, and the habitat for prey items of the clapper rail. The number of damaging floods may decrease, thus reducing the deposition of large amounts of sediments in backwaters that cause them to dry up. Less channel degradation from the high flows may also protect existing backwaters by protecting water levels that support them. Because of the magnitude of these changes, the effects to these species are not significant, however, this is predicated on the fact that the normal flood cycles have already been severely impacted by past actions.

Southwestern willow flycatcher

For willow flycatchers, the effects of ISC in this reach involve groundwater levels. Higher river flows during space-building or flood control releases translate into higher groundwater levels under the floodplain during those time periods. This provides more water and moist soils for riparian habitats and when they occur there are benefits to the trees and shrubs that may influence the suitability of these habitats for willow flycatcher breeding in those years. Lingering benefits to riparian vegetation may last past the decline in water levels if trees became better established and able to cope with drier conditions as a result. Because these higher than normal flows will be more curtailed under the ISC than at present, any beneficial effects would be reduced in scope until Lake Mead elevations recover from the additional releases.

Imperial Dam to Southerly International Border

Normal water deliveries past Imperial and Morelos Dam will occur as a result of this project. Reduction of flood flows from the Colorado River, which are currently reduced as a result of damming, are expected to be reduced even further, but at an insignificant amount (about 5%). This reduced percentage is not expected to have any noticeable change to habitat for the clapper rail or the willow flycatcher. Flood flows entering the Colorado River from the Gila River will not be affected from the proposed action and these exercise greater effects on this reach of the river.

Applicable Conservation Measures for ISC

As part of the proposed action, there are several conservation measures designed to reduce the adverse effects of the proposed action on listed species. For the ISC, the species of special concern is the razorback sucker. The conservation measures have been listed previously in this biological opinion. The effects are discussed in this section.

Continuing and expanding the ongoing research on the Lake Mead razorback population will assist in the survival and recovery of the species by answering questions about the recruitment and the events that may be controlling it. Providing for recruitment is the primary focus of razorback sucker recovery efforts. While in some portions of the historic range of the species flowing rivers remain, much of the habitat in other portions of the basin have been modified by dams. Adult razorback sucker populations do well in reservoir situations and, if factors that provide for recruitment to those populations can be identified, these reservoirs could make significant contributions to recovery.

Reclamation would use its discretion under existing programs to provide rising water levels during the spring in Lake Mead. Research into razorback recruitment needs to have years of rising water levels during the spawning period to assist in defining physical conditions during recruitment events. This effort to provide rising water levels may also offset to some extent the foreseen decrease in lake levels and number of rising water level years attributed to reduced inflows to Lake Powell from the increased uses in the Upper Basin.

Although Lake Mohave is not expected to be affected by the proposed ISC or 4.4 Plan, Reclamation will continue to operate Lake Mohave water levels for native fish conservation.

This will provide long term protection for the native fish propagation programs ongoing in Lake Mohave. These programs provide for the maintenance of genetic variability in the species that is needed for reintroduction and augmentation programs throughout the range of the species.

Loss of spawning and nursery habitat due to lowered lake elevation reduces the potential for recruitment by reducing the available physical habitat. Therefore, Reclamation will minimize the effects of that loss after years when the ISC would cause the lake elevation to be below 1160 feet by collecting wild born larvae the next spawning season after the event, rearing them to stocking size (25 cm), and returning them to the lake as sub-adults. These individuals would be tagged to distinguish them from the wild-born and recruited members of the population. Because of the uncertainty about numbers of recruitment events and the number of fish that result from such, the number of fish that might be lost cannot be quantified. Further, these losses of habitat make it more difficult for the research effort to study recruitment events because some critical feature may be lacking or reduced below viable levels. However, the population augmentation proposed by Reclamation would increase the number of potential spawners in the future, which would benefit the population and assist in monitoring. These additional sub-adults may actually augment the population in Lake Mead, provided that more fish are stocked than what would have recruited naturally. The Lake Mead and Lake Mohave razorback populations have been separated for 65 years and using Lake Mohave stock for these repatriations is not likely to have any adverse effects to the genetic variability or special adaptations in the Lake Mead fish.

Complete loss of spawning habitat in more than 2 consecutive years is not anticipated for the proposed action. Based on existing data, below the 1130 level most of the known spawning habitat is out of the water, resulting in displacement of spawning adults from the known spawning area. With the ISC, although reduced lake levels are anticipated, Reclamation does not believe that the effects of ISC would be severe enough to cause lake levels of or below 1130 to occur greater than 2 consecutive years, and therefore we did not include this case in this analysis. If this situation were to occur, it would be considered an effect of the action not considered in this biological opinion.

4.4 Plan

The implementation of the change in point of diversion for the 400,000 af of water under the 4.4 Plan will not affect overall releases from Hoover Dam, however, the timing of the releases will be different. Agricultural releases vary seasonally more than M&I uses therefore, as with ISC releases, it can be assumed the changed releases will be equalized over the year. This will result in a change of up to 552 cfs in Hoover Dam daily release levels. Summer releases may be less than under current conditions (because normal summer releases are high) and may be higher under the winter conditions (when releases are generally lower). Effects to the reservoir and river levels above Parker Dam are therefore going to be seasonally different and, due to the actual size of the change, difficult to detect in this reach. Below Parker Dam is where the effects of this change will be most apparent. These effects will occur over time, as the amount of water diverted at Lake Havasu is increased. This increase is seen in 20,000 af yearly increments.

The DEIS and BA contain tables showing the decrease in water levels for groundwater and river elevations based on the change in point of diversion below Parker Dam. The model results are based on 100,000 af increments of the total 1.574 maf that could have a change in point of diversion as part of the MSCP. The 400,000 af is a portion of this total and is the only part analyzed here.

Parker Dam-Imperial Dam

Bonytail chub, razorback sucker and Yuma clapper rail

Because of the seasonality of normal release levels, Reclamation has evaluated three release patterns (April, August and December). The greatest effect, as well as the greatest potential time for adverse effects to occur to razorbacks and clapper rails, was in the April time period. The change in point of diversion for 400,000 af of water will result in the loss of 35 surface acres of open water in the main channel, 17 surface acres of open water in backwaters and 28 acres of emergent vegetation in backwaters. These losses would occur incrementally over the implementation of the transfers. These losses would eliminate that amount of habitat from the system.

Changes in flows and water surface elevations resulting from those flows can affect habitat values for razorbacks and any future bonytail population. Increased fluctuations can strand fish or expose spawning areas causing death of eggs and just hatched young fish. This area is critical habitat for the razorback sucker, and changes to constituent elements of water and physical habitat are expected to occur due to declining water levels. Declining water levels force fish into deeper water where there may be less cover and protection from predators. Exposure of shallow areas also reduces the benthos and may affect the ability of fish to feed and remain healthy. Shallow waters also become very hot in the Colorado River, and reduced water quality may make preferred backwaters less able to support fish over the entire day or even the season.

Clapper rails nest and feed in shallow waters. They do not prefer areas with wide fluctuations, which damage nests and potentially injure eggs and young birds before they leave the nest within 48 hours of hatching (Rosenberg *et al.* 1991). Fluctuations may also make some habitats more susceptible to terrestrial predators. Shallow water is crucial for feeding, and clapper rails do not dive for prey. Depending upon the slope of the backwater or shoreline area, wide fluctuations may significantly reduce potential feeding habitats or make prey more difficult to catch.

Effects to razorbacks and clapper rails from the 4.4 Plan water transfers below Parker Dam are more significant than the changes in the same reach caused by ISC. The future reintroduction of bonytail chub to this portion of the LCR would also be affected if habitats were reduced or compromised. Additionally, one of the most successful rearing areas for bonytail is the High Levee Pond on the Cibola National Wildlife Refuge. The pond is kept filled by the adjacent river, and reductions in river elevation have an effect on this pond's water level. Reductions may have adverse effects to production of food resources and changes in water quality that affect health and growth of the fish present. Considering the difficulties that have been plaguing the bonytail reintroduction program, compromising the ability of High Levee Pond to contribute to the survival and recovery of the bonytail may reduce the ability of ongoing programs to meet their goals.

Southwestern willow flycatcher

Between Parker and Imperial dams, approximately 21,218 acres of riparian habitat (cottonwood/willow types I, II, III, IV, and saltcedar types III and IV) exist which have the structure to be, or develop into willow flycatcher habitat (USBR 2000a). Reclamation (B. Raulston, USBR, pers. comm.) indicates that all currently suitable habitat (1570 acres in 15 study areas) has been identified and surveyed for willow flycatchers.

The change in points of diversion (less water traveling between Parker and Imperial dams) will cause a drop in groundwater levels of 1.55 feet or less. It is uncertain how this drop in groundwater will affect existing occupied and potential willow flycatcher habitat. Experts agree (McKernan and Braden 1998, Sogge *et al.* 1997) that moist soils and standing water are important micro-habitat components of willow flycatcher nesting habitat, and are present at all occupied habitat between Parker and Imperial dams (Table 12). Moisture in the soils likely benefits the distribution, abundance, and success of willow flycatchers at a site by providing the proper humidity, ground cover, solar protection, and/or insect populations for food. In addition to soil moisture problems, newly established cottonwood and willow stands (classified as types V and VI) would also be adversely affected due to their recent establishment and shallow roots. There are 46 known acres of this type V and VI habitat which are expected to be influenced by the proposed action.

As a result of the proposed project, Reclamation (2000a) estimates that 372 acres of occupied willow flycatcher habitat could lose its moist soils. This could occur at 11 of the 15 study areas (Table 12). The BA assumed that the gross plant composition (cottonwood and willow trees) in occupied habitat will be affected by any change in groundwater level due to the groundwater table being relatively high in these areas (which is why moist soils are present). The changes in soil moisture will not occur immediately. Rather, it would likely occur at some point throughout the life of the project. Therefore, it is uncertain when a change may occur. But if moist soils are removed from the site, we expect this change will affect the distribution, abundance, occupancy, prey base, and breeding success of nesting willow flycatchers.

The potential impacts of the project and risk to the willow flycatcher are significant because a large proportion of the current willow flycatcher population along the LCR and nearly all the sites and birds between Parker and Imperial dams will be affected. In 2000, there were a total of 45 pairs along the LCR below Hoover Dam. Thirteen of these 45 pairs exist between Parker and Imperial dams, and 9 of these 13 resident willow flycatcher pairs could lose moist soils in their nest areas. Therefore, 20 percent (n=9) of all the pairs (n=45) below Hoover Dam and 70 percent (9/13) of all pairs between Parker and Imperial dams could be negatively affected by the project.

Additionally, 11 of the existing 15 areas where suitable habitat exists could be rendered partially or completely unsuitable.

Dropping the groundwater level is also expected to delay willow flycatcher recovery and cause recovery to be more difficult by further degrading potential riparian nesting habitat in the Colorado River floodplain. Groundwater levels have already been dramatically lowered along the floodplain, thus some mature existing plants (salt cedar, mesquite) are not expected to show any detrimental effects from the project due to their deep roots being established. However, cottonwoods and willows are most susceptible to changes in groundwater elevation.

Reclamation estimated that there are 5,404 acres of potential willow flycatcher habitat between Parker and Imperial dams that could be influenced by the drop in groundwater level. The nature, extent and timing of effects is difficult to determine. For some areas with established vegetation, the effect may be on the ability to sustain or develop moist soil conditions**.** Depending on how long the drop in groundwater takes, plants whose roots are barely established in groundwater may also be affected if the water escapes their reach.

It is clear than continuing to drop groundwater levels in the floodplain further reduces the ability to restore these 5,404 acres to suitability for nesting willow flycatchers. As described above, nesting habitat is dependent upon the density, vigor, structure of plant species and microclimate of sites. High groundwater levels are a key component of healthy and expansive riparian habitat for willow flycatchers. Continuing to drop groundwater levels reduces the restoration potential of this acreage and moves a large amount of habitat further away from suitability and eventual recovery. As stated in Reclamation's analysis in their BA (2000a); "although this habitat is unsuitable at this time, it could be improved with appropriate management in the future." Therefore, the proposed project will continue to degrade what is already a poorly functioning ecosystem along the LCR below Hoover Dam.

The Colorado River is an important location to maintain the distribution and abundance of breeding willow flycatchers, because it is the common thread between five states (Arizona, California, Nevada, Utah, and Colorado), other rivers/populations (Pahranagat, Muddy, Virgin, Gila, Bill Williams, Big Sandy, and Santa Maria rivers). It is a central geographic location for a breeding habitat and as a migratory corridor allowing birds to reach other portions of the range.

The primary effects to the willow flycatcher from Reclamation's ISC and 4.4 plan are from lowering groundwater levels between Parker and Imperial Dams. Lowering of groundwater levels may remove the moist soils underneath occupied willow flycatcher habitat (372 acres), thus changing micro-habitat qualities at 70 percent of all the occupied sites between Parker and Imperial dams. This loss of moist soils could lead to a decrease in the occupancy, distribution, success and/or abundance of nesting willow flycatchers. Lowering the groundwater between Parker and Imperial dams may also reduce the quality of thousands (5,404) of acres of "potential" willow flycatcher habitat in the Colorado River floodplain by degrading, modifying, and fragmenting this habitat even further from its already poor condition.

The effects from the change in point of diversion on occupied and potential willow flycatcher habitat, for all practical purposes, will be permanent. As a result of the proposed project, recovery of these habitats to willow flycatcher suitability will be delayed even longer, cause recovery to be more difficult, and further degrade the lower Colorado River ecosystem.

Applicable Conservation Measures for 4.4 Plan

The loss of potential spawning habitat in the mainstem from the reduction in river flows is difficult to measure. Considerable areas of gravel bars exist and, with changing flows, erosion and deposition events will be affected as well. The existing razorback population in the affected reaches is very low, and spawning and nursery areas are not used to capacity by the existing population. Assuming the survival figures for razorbacks stocked into Lake Mohave are similar to those for the river, the 50,000 fish stocking commitment under the 1997 BO would result in a population of 17,000 adult fish. The stocking of 20,000 sub-adult razorbacks below Parker Dam would provide for a larger and more robust population in this reach. The additional 20,000 would bring that to approximately 24,000 adult fish. This larger population may be more efficient in fully utilizing available habitats and provide for more effective monitoring and management actions in the future.

Replacement of 44 acres of backwater and marsh habitats will offset the physical losses expected to those types of habitats from the change in point of diversion of 400,000 af of water and flood flow changes from ISC. These new habitats would be in place within 5 years, before adverse effects of the water transfers would be anticipated. Specific locations for the new habitats is not known at this time, but will be located in the LCR. There would be no net loss of habitat, however, existing habitats would be smaller and perhaps less suitable as a result of the lower flows and those effects are not offset by the new or restored habitats. These new areas would have to be designed so as not to be adversely affected by the future flow reductions that could render them unsuitable. These habitats will be used by razorback, bonytail and clapper rails.

The bonytail initiative is directed to capture more wild bonytail for inclusion in the broodstock and it's importance cannot be understated. Our ability to capture such fish would be enhanced by understanding their behavior in the wild. We know that some stocked fish have survived to adulthood and been captured with wild born fish. Increasing our opportunities to locate and capture fish to maintain the genetic integrity of the species benefits both survival and recovery. This measure offsets effects to future potential bonytail spawning in the Davis Dam to Parker Dam reach and the Parker Dam to Imperial Dam reach of the LCR. The option to fund operations at Achii Hanyo Fish Hatchery instead of capture wild fish is equally valid for bonytail conservation. There is a bottleneck in rearing bonytails to stocking sizes that must be addressed for ongoing and future augmentation and reintroduction efforts to be successful.

For the willow flycatcher, the extent to which the proposed action will result in the loss of nesting habitat components between Parker and Imperial dams has been estimated using models and assumptions about effects to moist soils from declining water levels. This is further confounded by the long term implementation of the project (20-25 years) and the possibility that adverse effects may be seen only decades from now or possibly not appear at all. Should adverse effects never occur from the water transfers, the conservation measures proposed are expected to provide benefits to the willow flycatcher in the form of 372 acres of new habitat. If effects begin to appear, the monitoring and management strategy is expected to identify and reverse the problems associated with the loss of soil moisture in occupied willow flycatcher habitat. Should even these management efforts fail, additional habitat development will occur, with a maximum of 1116 acres of new habitat provided, to reduce and minimize the effects of habitat loss from the proposed action.

Because of the uncertainty in our knowledge of how to create habitat that will be occupied by willow flycatchers, and the uncertainty inherent in modeling of effects to soil moisture, the Service believes it is appropriate to also include a “worst-case” scenario as part of the incidental take statement. In the “worst-case” scenario, all 372 acres of occupied habitat are lost. We do not expect that, if the conservation measures are implemented, this would happen, but in making the assumption, are providing an option to cover any take that might occur.

The Service supports using the status of the LCR population below Lake Mead to determine which Tier Two conservation measures to implement. As indicated earlier in this opinion, this population is considered the least stable of all southwestern willow flycatcher populations (Lamberson *et al.* 2000) and must be improved. Additionally, recovery of the flycatcher is likely dependent upon increases in the number of flycatcher pairs, and proper distribution of breeding flycatchers. Thus, the LCR is important for the overall stability of flycatcher populations throughout its range.

The proposed conservation measures provide the road map, but not the details to implement an appropriate decision-driven monitoring and management strategy. For Reclamation and the Service to assure a mutual understanding of how the monitoring and management strategy will occur and when certain benchmarks are reached, our agencies need to agree to established standards and terms.

Direct and Indirect Effects: Delivery Areas

Defining the magnitude of indirect effects in the delivery areas does not require that the proposed action be the only causative factor in those effects, only that it be a factor. We understand that Reclamation and the applicants do not concur with our determination that the proposed actions may contribute to growth. However, we believe that these effects need to be mentioned in this BO. Given the level of existing growth that depends upon the presence of Colorado River water, and the documented future growth, there is a likelihood that these effects will exist.

ISC

There should be no direct effects of the ISC to areas outside of the river channel and 100-year floodplain of the Colorado River and its reservoirs. There will be indirect effects of providing this surplus water to the water delivery areas in the three states.

The area of Colorado River water use in Nevada is contained within Clark County. There is an ongoing Habitat Conservation Plan (HCP) (Regional Environmental Consultants 1995) that covers urban and suburban growth in the county that would address any developmental indirect effects of the additional surplus water provided for Nevada.

The Central Arizona Project (CAP) is the likely sole beneficiary of surplus water in Arizona. The majority of the CAP construction and operation has completed consultation under the ESA and the remaining portions are under consultation at this time. Providing surplus water over the 15 year period will increase the certainty of supply, as it is likely that Arizona will store much of the water it obtains to make up for post-2015 shortage year deliveries. Having this water in storage will provide respite for native groundwater supplies at those times since pumping needs would be reduced during shortage periods.

California is the primary beneficiary of the ISC. As noted in the BA, the surplus water is not additive over the amount of water currently available for municipal and industrial use, but it will ensure that current amounts do not decrease markedly in the future as they otherwise may have without the ISC. As such, surplus water may be viewed as serving the future growth that depends on maintenance of the current levels of water supply. Significant portions of the southern California delivery areas are already covered by existing HCP permits, and any growth in those areas will be authorized through those HCP permits. In other portions of the water delivery service area, HCPs (Riverside, Coachella Valley, the San Diego Multiple Habitat Conservation Program and Multiple Species Conservation Program North) are in preparation and are anticipated to be permitted within the next 3 years (in approximately 2004). Effects to listed species in the agencies' service areas would be covered by existing and developing HCPs and by other plans and consultations for projects in those service areas.

4.4 Plan

Only California is affected by the 4.4 Plan water transfers. Effects to MWD and SDCWA service areas would be covered by existing and developing HCPs and other plans and consultations for projects occurring in those service areas. Effects to the IID service area are being addressed in a HCP and EIS/EIR currently under development. The CVWD has begun discussions with the Service on effects in their delivery area which will be addressed by a separate HCP or by participation in the Coachella Valley Multiple Species Habitat Conservation Plan. The IID's and CVWD's efforts will cover effects to the clapper rails and desert pupfish at the Salton Sea that result from the proposed action. If the IID and Coachella Valley HCPs are completed as anticipated, we do not expect that this action will lead to effects on species that have not already been authorized at a regional level.

Interrelated and Interdependent Actions

Interrelated actions are part of the proposed action that depend on the action for their justification, and interdependent actions have no independent utility apart from the proposed action. The Service has not found any actions that qualify as interrelated and interdependent to the ISC and water transfers. The remainder of the 4.4 Plan not included in this consultation is more properly considered under cumulative effects and future Federal actions to be subject to future consultation.

Critical Habitat

Effects to constituent elements of designated critical habitat for the razorback sucker include changes to water quality and quantity and loss of physical habitat used for spawning, nursery areas, feeding and sheltering areas. The ISC will adversely affect the availability of known spawning habitats in Lake Mead through lowering the water levels that may leave these locations less available in significantly more years than under the no-action alternative. Shallow waters near the known spawning habitats that provide nursery areas would also be unavailable at these lower water elevations. The conservation measure for rising water levels would offset some of these effects. Unless the water levels go to below 1130, it is not expected that spawning and nursery habitats would completely be lost in any year or subsequent year. Water levels caused by ISC below those levels for over 2 consecutive years are not considered part of the proposed action under consultation.

Changes to flood flows downstream of Parker Dam due to the ISC would reduce water quality in backwaters, which affects the usability of these areas for feeding and sheltering as well as for nursery areas. Losses to backwaters from the 4.4 Plan would be offset by the creation of new areas under the conservation measures, thus there would not be a loss to constituent elements of physical habitat and water quality. However, the effects to spawning habitats in the main channel from the reduction in flows is not covered by the replacement habitat. Additional augmentation of the below Parker Dam population will offset some of the effects to spawning habitats.

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The size of the action area for this consultation precludes having detailed discussions of the actions likely to occur in the foreseeable future. We can, however, discuss in general terms the types of activities that are likely to occur, based on continuation of existing actions and likely future development.

The primary cumulative effect to the LCR and its floodplain is the continuing diversion of 7.5 maf each year by the three Lower Basin States. Data provided by the States for the DEIS show the intent is to continue taking their full apportionments each year for the foreseeable future. The proposed depletion schedules and immediate need for this water to support existing development make these diversions a reasonable certainty. Uses for water along the river for M&I and agriculture, with their respective return flows, will continue to affect water quality in terms of salinity, selenium levels, nutrient loading and changing flow levels. Larger changes in river flows result from the major diversions to the use areas away from the river where no flows return at all. Because this 7.5 maf of water is removed from the system, it does not back up behind the dams requiring more frequent flood releases and precludes the natural hydrograph from occurring. Natural river processes of meandering, marsh and backwater creation and destruction, and development of riparian areas are largely precluded. Because the river channel must act as a conveyance structure and not a natural river, these natural processes must be precluded from re-developing riverine habitats as was the case before diversions took the water.

Water levels in Lake Mead are significantly affected by increasing depletions from the Upper Basin. Some of these depletions are baseline, having completed section 7 consultation. Some are not, but may also have a Federal nexus and be subject to individual consultation so do not qualify as cumulative actions for this analysis. Other depletions may occur based solely on State use of its apportionment and are cumulative in nature. Information is not available to separate the three types of future depletions for this consultation. Because of Reclamation’s modeling inputs, the cumulative effects of these actions have already been included in the effects of the action. This consultation may represent the first time effects to Lake Mead are correlated with new depletions in the Upper Basin and how this issue is addressed in the future is unclear.

The MSCP for the LCR has completed a list of cumulative actions along the river and 100-year floodplain for their EIS development (Ogden 2000). The cumulative effects for ESA are likely a subset of these developed for NEPA compliance because of differences in projects and regulatory needs. This list includes many new housing developments, a landfill, bridges and roads, parks and recreation facilities, wastewater treatment facilities, power plants, fish and wildlife management actions, and other activities and is incorporated by reference. The effects of some of these projects is in the conversion of agricultural water uses to urban and suburban uses which changes the delivery amounts and timing. However, because these may involve changes to water service contracts, Reclamation may have some limited discretion, thus moving these changes to future Federal actions. Again, the discretion is in the delivery of water to a designated location, not in the actual diversion of that water from the river.

Within the three-State action area, urban and suburban development is going to increase. The limitation on water supplies from the Colorado River may eventually have an effect on this growth, however, we do not know when or how this will occur since there are a variety of other water sources available for use. Effects to endangered or threatened species in these areas may require future HCP development in areas where such programs do not currently exist.

The in-state components of the 4.4 Plan may have effects to existing water supplies and uses in California. The extent of these effects is not predictable at this time and will be addressed in future compliance actions. There are also some concepts in the 4.4 Plan that will require future Federal action and those will be handled under separate section 7 consultation as appropriate. These items include overruns, and delivery accounting methods.

VI. CONCLUSION

After reviewing the current status of the bonytail chub, razorback sucker, Yuma clapper rail and southwestern willow flycatcher, the environmental baseline for the action area, the effects of the proposed actions including conservation measures, and cumulative effects, it is the Service's biological opinion that the proposed actions are not likely to jeopardize the continued existence of the bonytail chub, 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.

This conclusion is based on the level of adverse effects to the listed species and critical habitat that remain after conservation measures included in the proposed action are implemented. For the bonytail chub, provisions to enhance the broodstock and captive rearing facilities may even provide a net benefit to this species. For the razorback sucker, provisions to study and potentially assist recruitment events in Lake Mead will be important to future management of this species. Additional augmentation of the population below Parker Dam, replacement of backwater habitats lost, and the opportunity to maintain or enhance conditions in Lake Mohave for this species are also significant to the finding. Significant adverse effects to constituent elements of critical habitat, especially in Lake Mead do not occur within the scope of the proposed action under consultation. Effects to Yuma clapper rails are largely negated by the replacement of marsh habitats lost to changing water levels due to the changes in points of diversion. Under the terms of the conservation measures, effects to occupied southwestern willow flycatcher habitat are likely to be avoided, or lost habitat will be replaced.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such and extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by Reclamation so that they become binding conditions of any grant or permit issued to the applicants, as appropriate, for the exemption in section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activity covered by this incidental take statement. If Reclamation (1) fails to assume and implement the terms and conditions or (2) fails to require the applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Reclamation and/or the applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)]

Amount or Extent of Take Anticipated

The Service has developed the following incidental take statement based on the premise that the amount of take will not jeopardize the continued existence of these species.

Bonytail chub and razorback sucker

The majority of incidental take for the proposed action is expected to be in the form of harm through habitat loss. The types of take likely to result from the implementation of the proposed action makes it unlikely that dead or injured individuals would be found. These species are generally wide-ranging, are rare in the system, and locating a dead fish in the Colorado River is extremely unlikely.

Take of individual fish via diversions of ISC and 4.4 Plan water will occur. Fish diverted into canals and pumping plants or going through the dams generally do not survive or return to the system. This type of take was addressed in the incidental take statement contained in the 1997 BO (USFWS 1997). ISC water taken by Nevada from Lake Mead would have an increased risk for razorbacks. ISC water taken by Arizona from Lake Havasu would have an increased risk to both razorbacks and bonytail. Risks to entrainment below Parker Dam for razorbacks would be reduced as less water was released for the IID to divert. The amount of this take cannot be given in known numbers of fish since population sizes, locations of fish versus diversion sites and amount diverted each year under these actions will vary. The one thing that can be said for certain is that as populations of fish rise (from augmentation and natural recruitment), the risk per unit of water diverted also rises.

This same situation for defining take was encountered in the 1997 BO. The incidental take statement in the 1997 BO did not specify numbers of fish likely to be taken as a result of Reclamation delivering water to the diversion points, but did provide figures under which take would be considered exceeded. Take would be exceeded if 2 or more bonytails and/or razorbacks were found dead over the first 2 years of the 5-year period covered. This level was increased over time by 1 fish per 1000 stocked into the river or the reservoirs. That level of take was not considered to jeopardize the species. If that level is translated to fish lost per unit of water diverted, it comes out to 1 fish per 7.5 maf for the first 2 years. The figure decreases per unit water as populations increase. There have been no reports of any dead fish found to date.

Using the same rationale as in 1997, the Service anticipates that the Arizona and Nevada portions of the increased water diversion, will increase the level of incidental take by 1 fish over the remaining life of the 1997 BO. Because California is not taking more water (since the Colorado River aqueduct will be maintained at present levels) there is no increase attributable to their ISC water. For the 4.4 Plan, the increase in risk in Lake Havasu is offset by the decrease in risk at Imperial Dam and no net change in take is expected from that established in 1997 for the period to 2002. It is important to note that actual diversion of fish into the canals or pipelines is take attributed to the water users, not to Reclamation.

The Service anticipates that up to 35 acres of river channel habitat of razorback sucker would be eliminated as habitat, causing harm through reduction in areas for spawning, nursery, feeding and sheltering. All razorbacks in these 35 acres would be taken. Loss of feeding, breeding and sheltering areas will result in injury to individuals through loss of eggs and young fish from stranding or reduction in available nursery habitats. Reduction in feeding areas due to changing water level effects on benthic organisms and detritus will adversely affect the health and growth of individuals. Changes to water quality (especially oxygen and temperature) in remaining backwaters due to the decreased flows may make the areas less usable to fish, and these habitats have been shown to be very important for razorbacks. There is no net loss of acreage of backwater habitats due to the conservation measure to replace the 17 acres that would be lost at 400,000 af, but adverse physical effects to habitats due to decreased size and flow in existing backwaters would continue even with the conservation measures.

There will also be harm to razorback suckers breeding in Lake Mead. Existing spawning and nursery areas will be unavailable somewhat more often under the ISC than at present and this may have effects on recruitment opportunities. These issues have been discussed previously in this biological opinion. The conservation measures included in the proposed action reduce the amount of this take to the extent practicable, although the potential for take to occur is not eliminated.

Yuma clapper rail

The loss of 28 acres of marsh habitat under the 4.4 Plan may cause harm to the clapper rail. Marshes provide breeding, feeding and shelter for clapper rails that would be eliminated by the change in flows resulting from the project. This could adversely affect the habitat use of all of the approximately 100 clapper rails within the Parker Dam to Imperial Dam reach of the LCR. Since the replacement of lost habitats by the conservation measures will be in specific areas and not spread evenly throughout the affected existing habitat, the amount of habitat may not be changed, but the quality of the remaining patches will be altered. This local habitat alteration causes harm to the resident birds, although the new habitats offset the total adverse effects to the population.

The conservation measures included in the proposed action reduce the amount of this take to the extent practicable, although the potential for take to occur is not eliminated.

Southwestern willow flycatcher

The Service anticipates that take of willow flycatchers will only occur in the unlikely event that implementation of the Tier One conservation measures are unsuccessful in maintaining occupied habitat. Only in a worst case scenario does the Service anticipate the take of willow flycatcher due to project-related activities in the form of riparian micro-habitat degradation and loss of suitable nesting habitat, and/or reduced nesting success in 372 acres of occupied habitat. Riparian micro-habitat degradation and loss of suitable nesting habitat is anticipated to occur by removing the moist soil component of the bird's nesting habitat resulting in reduced occupancy and/or success of nesting birds. This habitat loss is also anticipated to result in displacement of adults, reduced productivity, and reduced survivorship of adults and/or young. Therefore, the Service anticipates that all willow flycatchers inhabiting those 372 acres may be taken. As stated previously in the effects section, this 372 acres supports 9 currently occupied territories. The Service has inadequate information to quantify actual take of nests, reduced productivity, occupancy, and/or nesting success. However, when habitat is rendered unsuitable, population maintenance and expansion are precluded. Thus, young and adults that return to breed in areas that have been lost or degraded are less likely to find suitable habitat or find mates.

Effect of the Take

In the accompanying BO, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize impacts of incidental take of razorback sucker, bonytail chub, and willow flycatcher:

1. Reduce the changes in water level fluctuations below Davis Dam to protect razorback and bonytail populations.

2. Reduce changes in water level fluctuations below Parker Dam to protect razorback populations.

3. Provide for suitable spawning and nursery habitats for razorback in the Parker Dam to Imperial Dam reach.

4. Ensure that all suitable willow flycatcher nesting habitat between Parker and Imperial dams and surrounding Lake Mead are annually surveyed, searched for nests, and nest monitored.

5. Minimize impacts to nesting willow flycatchers.

Terms and Conditions

In order the be exempt from the prohibition of section 9 of the ESA, Reclamation and/or the applicants, as appropriate, must comply with the following terms and conditions, which implement the RPMs described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

To implement RPM 1 the following terms and conditions must be met:

a. Hourly, daily and weekly release schedules from Davis Dam will be reviewed for the new surplus water releases.

b. New release schedules will not increase the magnitude or range of fluctuations beyond what is seen under existing operating conditions as of January 2000.

c. Reclamation will provide the Service with documentation of the new schedules for water release from Davis Dam each year.

To implement RPM 2 the following terms and conditions must be met:

a. Hourly, daily and weekly release schedules from Parker Dam will be reviewed for the changes due to decreased water releases

b. New release schedules will not increase the magnitude or range of fluctuations beyond what is seen under existing operating conditions as of January 2000.

c. Reclamation will provide the Service with documentation of the new schedules for water release from Parker Dam each year.

To implement RPM 3 the following terms and conditions must be met:

a. Any future dredging of suitable spawning habitats will be focused on maintaining suitable area below the fluctuation zone to provide adequate spawning habitat area to offset declines in flows.

b. Shallow water areas that will not be dried out by changes in flows will be provided for in all replacement backwater and marsh habitats to provide for nursery habitats for razorbacks.

To implement RPM 4 the following terms and conditions must be met:

a. Reclamation will conduct presence and absence surveys for willow flycatchers in all suitable habitat between Parker and Imperial dams and surrounding Lake Mead (Virgin, Muddy, and Colorado River inflows) annually for up to 5 years after the implementation of all transfers. Once resident birds are found, nest searches and nest monitoring will occur to determine nesting distribution, abundance, success, and cowbird parasitism and predation rates. Detecting willow flycatcher presence/absence and nesting success, plus predation and cowbird parasitism rates are needed to implement management activities to reduce and minimize take described in RPM 5.

To implement RPM 5 the following terms and conditions must be met:

a. Reclamation will continue to protect occupied and unoccupied willow flycatcher habitat under their management between Parker and Imperial dams, and surrounding Lake Mead regardless of plant species composition. Protection actions will include, but not be limited to cowbird trapping in or near occupied habitat in coordination with ongoing research, protection of nesting willow flycatchers from predators, fire breaks, and measures such as road/lake closures to limit public access, the risk of fire, and/or habitat degradation.

b. In areas not under Reclamation management:

    1. Reclamation will continue to develop agreements and work with other agencies to develop closures, and protect sites from the effects of fire and recreation. For example, if willow flycatcher sites are found surrounding Lake Mead that can be accessed by watercraft, work with the National Park Service or other appropriate agencies to protect the area by closing the site with buoys.

    2. Based upon nest monitoring, if predation by mammals or reptiles is 25 percent or greater at willow flycatcher nests between Parker and Imperial dams, or surrounding Lake Mead, then seek out and if possible, initiate creative ways to lower predation with approval by the Service.

    3. Reclamation will continue to develop agreements with appropriate land management agencies to develop a cowbird trapping programs if necessary.

c. Triggers to initiate cowbird trapping:

1. Trapping would begin if monitoring of nesting willow flycatchers (all sites between Parker and Imperial dams) shows a 40 percent or greater parasitism rate in any one year, or averages more than 20 percent in any two or more consecutive years. Thus, if in year one there is greater than 40 percent parasitism, begin trapping in year two. If there was 20, 10, 25, and 0 percent parasitism in years one through four, no trapping is needed. If there was 20 and 25 percent parasitism in years one and two, begin trapping in year three.

2. Once trapping has been determined necessary based upon monitoring, Reclamation will continue with the cowbird trapping for 5 consecutive years and then evaluate (along with the Service) the need to continue.

3. If no nesting birds can be detected at occupied sites, then due to poor sub-population stability, trapping must be initiated at half of all occupied sites (those where residents have been detected at least once over the previous five years) and continued at an even rotation through all sites (i.e. trap at half the occupied sites in year one, the other half in year two, and repeat) for five years, or until monitoring can determine that less than 20 percent parasitism is occurring over an average of two or more years on all resident nesting pairs of birds. At the end of five years evaluate with the Service the effectiveness and the need to continue.

Reporting Requirements

Reclamation or the applicants, as appropriate, will provide the Service with annual reports on the implementation of the conservation measures and terms and conditions, on the amounts of water released under the surplus criteria and how it affected Lake Mead elevations and downstream flows, the amounts of water that have been successfully transferred to the new point of diversion, and the results of all biological monitoring for razorbacks and bonytails, groundwater and willow flycatcher habitat monitoring. These reports will be due to the Service on February 1 for the preceding calendar year. Willow flycatcher reporting deadlines (surveys and nest monitoring) are subject to dates determined in permit guidelines; typically September for survey data and October for nest monitoring information.

Disposition of Dead or Injured Listed Animals

Upon finding a dead or injured threatened or endangered animal, initial notification must be made to the Service's Division of Law Enforcement, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona (602/261-6443) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph, and any other pertinent information. Care must be taken in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible condition. If feasible, the remains of intact specimens of listed animal species shall be submitted as soon as possible to the nearest Fish and Wildlife Service or State game and fish office, or other institution holding the appropriate State and Federal permits. Arrangements regarding proper disposition of potential museum specimens shall be made with the institution before implementation of the action. A qualified biologist should transport injured animals to a qualified veterinarian or other suitable facility in the case of injured fish. Should any treated listed animal survive, the Service should be contacted regarding the final disposition of the animal.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not represent complete fulfillment of Reclamation's section 2(c) or 7(a)(1). In furtherance of the purposes of the ESA, we recommend implementing the following actions:

1. Monitor development of cattail/bulrush marsh habitats around Lake Mead and survey appropriate areas for Yuma clapper rail occupancy.

2. Monitor CRIT canals yearly for presence of razorback suckers. Also provide surveys in the Parker Strip for potential spawning habitat.

3. Reduce the amount of maintenance dredging in the Parker Dam to Imperial Dam reach to maintain a variety of spawning habitats, especially at wash fans and other gravel/cobble areas.

4. Evaluate how the LCR could be operated to more closely imitate a natural hydrograph.

REINITIATION NOTICE

This concludes formal consultation on the proposed action. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is liste or critical habitat designated that may be affected by the action. Changes to the Tier lines at the 5 year reviews that result in lowering the level at which a surplus is declared would qualify for reinitiation under (3). In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates the efforts of Reclamation in the development and preparation of this document. Any questions or comments on this BO should be directed to Tom Gatz, Lesley Fitzpatrick or Greg Beatty in our office.

/s/ David L. Harlow

cc: Director, Fish and Wildlife Service, Arlington, VA (AES)
Regional Director, Fish and Wildlife Service, Albuquerque, NM (AES)
Manager, California/Nevada Operations Office, Fish and Wildlife Service, Sacramento, CA
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Table 1: Bonytail Stockings in the Upper Basin				
Species	Date	River Section	Number	Size (mm)
Bonytail	10/98	Colorado	3,280	125
	10/98	Lower Green	3,000	125
	3/99	Colorado	15 (radio tags)	250
	4/99	Colorado	10,000	100
	4/99	Lower Green	10,000	100
	3/00	Lower Green	13	none given
	4/00	Lower Green	19,987	100-175
	4/00	Colorado	15,037	75
	7/00	Yampa	5,000	100
	7/00	Middle Green	5,000	100
Total			71,332	

Table 2: Razorback Sucker Stockings in the Upper Basin				
Species	Date	River Section	Number	Size (mm)
Razorbacks	9/98	Gunnison	249	225
	10/98	Middle Green	125	150-200
	10/98	Gunnison	126	400
	4/99 and 8/99	Middle Green	6,659	100-200
	5/99	Middle Green	est. 57,900	<25
	5/99	Middle Green	35 (radio tags)	>250
	6/99	Middle Green	738	250-400
	5/99 and 11/99	Gunnison	2,772	200
	9/99 and 10/99	Colorado	3,498	200
	4/00	Colorado	3,875	100-150
	6/00	Old Charlie	9,599	<25
	6/00	Middle Green	79	425
	6/00	Stewart Lake	145	300
	6/00	Old Charlie	2,106	>150
	8/00	Colorado	3,845	100-325
	8/00	Gunnison	1,640	75-325
Total			96,693	

Table 3: Razorback Sucker Stockings into Lake Mead by NDOW

Year	Source	Location Stocked	Number
1994	FLSP	Las Vegas Bay	26
1995	FLSP	Echo Bay	14
1996	larvae	Las Vegas Bay	1
1997	FLSP	Las Vegas Bay	6
1998	FLSP	Las Vegas Bay	8
	FLSP	Echo Bay	3
1999	larvae	unspecified	39

(FLSP is Floyd Lamb State Park)

Table 4: Razorback suckers captured in the Parker Strip/CRIT Canals area, 1980-1998

DATE	NUMBER	LENGTH RANGE (mm)	WEIGHT RANGE (gms)
1-12-80	1	323	339.6
1-26-80	1	371	567
?-?-80	2	323-371	n/a
9-9-81	2	300	n/a
1-16-86	1	375	680
1-19-86	1	343	566
1-19-86	1	318	454
1-28-86	1	368	680
11-5-87	2	350-450 (estimate)	n/a
1-10-87	3	n/a	n/a
1-11-87	7	234-330	145-455
1-12-87	11	245-310	141-286
1-15-87	4	285-331	270-468
1-23-87	13	211-320	109-409
1-11-88	1	438	900
1-13-88	1	450	1040
1-16-88	1	465	1360
1-10-89	28	425-536	1069-1757
1-6-93	5	522-615	794-1134
1-8-93	1	n/a	n/a
10-14-96	5	n/a	n/a
4-10-98	1	n/a	n/a

Table 5: Yuma Clapper Rail Survey Data 1997-2000

Year	Number of Rails Counted in USA
1997	716
1998	553
1999	607
2000	464

Table 6: Range-wide population status for the southwestern willow flycatcher based on 1996 survey data for New Mexico and California, 1997 survey data for Colorado and Utah, 1998 survey data from Nevada, 1999 survey data for Arizona, and personal communication of 1999 and 2000 survey data.[1]

State	Number of sites with resident WIFLs	Number of drainages with resident WIFLs	Number of territories within site			
			≤5	6-20	>20	Total number of territories
Arizona	47	12	33	11	3	289
California	11	8	7	2	2	91
Colorado	7	6	2	4	1	69
New Mexico	19	6	16	2	1	209
Nevada	10	4	8	2	-	46
Utah	5	4	5	0	0	8
Texas	?	?	?	?	?	?
Total	99	40	69	21	7	712 [2]

[1]Based on surveys conducted at >800 historic and new sites in AZ (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, Sferra *et al.* 1995, 1997, Sogge 1995a, Sogge *et al.* 1995, Spencer *et al.* 1996, McKernan 1997, McKernan and Braden 1998, Paradzick *et al.* 2000); CA (Camp Pendleton 1994, Whitfield 1994, Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, San Diego Natural History Museum 1995, Whitfield and Strong 1995, Griffith and Griffith 1996, M.Sogge pers. com.); CO (T. Ireland 1994 *in litt.*, Stransky 1995); NM (Maynard 1995, Cooper 1996, 1997, Parker 1997, Skaggs 1996, Williams 1997); NV (C. Tomlinson 1995 *in litt.*, 1997, M.Sogge pers. com, B.McKernan pers. com., McKernan and Braden 1999); UT (McDonald *et al.* 1995, 1997, Sogge 1995b). Systematic surveys have not been conducted in Texas.

[2] Personal communication from Mark Sogge (USES, unpubl. data) indicates that as of the end of the 1999 breeding season just over 900 willow flycatcher territories are found at 143 sites throughout it’s range.

Table 7: Agency actions that have undergone formal section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher range-wide.

Action (County)	Year	Federal Agency[1]	Incidental Take Anticipated
Arizona			
Cedar Bench Allotment (Yavapai)	1995	Tonto NF	Indeterminable
Tuzigoot Bridge (Yavapai)	1995*	NPS	None
Windmill Allotment (Yavapai)	1995	Coconino NF	Loss of 1 nest annually /for 2 years
Solomon Bridge (Graham)	1995	FHWA	Loss of 2 territories
Tonto Creek Riparian Unit (Maricopa)	1995	Tonto NF	Indeterminable
Eastern Roosevelt Lake Watershed Allotment (Maricopa)	1995	Tonto NF	Indeterminable
Cienega Creek (Pima)	1996	BLM	1 nest annually by cowbird parasitism
Glen Canyon Spike Flow (Coconino)	1996	USBR	Indeterminable
Verde Valley Ranch (Yavapai)	1996*	Corps	Loss of 2 willow flycatcher territories
Modified Roosevelt Dam (Gila/Maricopa)	1996*	USBR	Loss of 45 territories; reduced productivity/ survivorship 90 birds
Lower Colorado River Operations (Mohave/Yuma)	1997*	USBR	Indeterminable
Blue River Road (Greenlee)	1997	A/S NF	Indeterminable
Skeleton Ridge (Yavapai)	1997	Tonto NF	Indeterminable
White Canyon Fire – Emergency Consultation (Final)	1997	BLM	Harassment of 4 pairs
U.S. Hwy 93 Wickenburg (Mohave/Yavapai)	1997	FHWA	Harassment of 6 birds in 3 territories and 1 bird killed/decade
Safford District Grazing Allotments (Greenlee, Graham, Final, Cochise & Pima)	1997	BLM	Indeterminable
Lower Gila Resource Plan Amend. (Maricopa, Yavapai, Pima, Final, La Paz & Yuma)	1997	BLM	Indeterminable
Storm Water Permit for Verde Valley Ranch (Yavapai)	1997	EPA	Indeterminable

Table 7: Agency actions that have undergone formal section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher range-wide.

Action (County)	Year	Federal Agency[1]	Incidental Take Anticipated
Gila River Transmission Structures (Graham)	1997	AZ Electric Power Coop. Inc.	Indeterminable
Arizona Strip Resource Mgmt Plan Amendment (Mohave)	1998	BLM	Harm of 1 nest every 3 years
CAP Water Transfer Cottonwood/Camp Verde (Yavapai/Maricopa)	1998	USBR	Indeterminable
Cienega Creek Stream Restoration Project (Pima)	1998	BLM	Harassment of 1 bird
Kearny Wastewater Treatment (Final)	1998	FEMA	Indeterminable
Fort Huachuca Programmatic (Cochise)	1998	US Army	None
SR 260 Cottonwood to Camp Verde (Yavapai)	1998	FHWA	Indeterminable
Wildlife Services (ADC) Nationwide consultation	1998	Wildlife Services	in consultation
Alamo Lake Reoperation (LaPaz, Mohave)	1998	ACOE	Loss of 1 nest w/ 2 eggs in 20 years due to projected inundation
Grazing on 25 allotments on the Tonto NF (Various)	1999	USFS	in consultation
Mingus Avenue Extension (Yavapai)	1999	ACOE	Indeterminable
The Homestead at Camp Verde Development	2000	Prescott NF/EPA	in informal consultation
Wikieup/Big Sandy Caithness power plant	2000	WAPA/BLM	in informal consultation
Interim Surplus Criteria, CA Water- lower Colorado River	2000	USBR	in consultation
Tonto Creek Crossing - Tonto NF (Gila County)	2000	USFS	in consultation
Big Sandy/Santa Maria Grazing Allotments (La Paz)	2000	BLM	in consultation
California			
Prado Basin (Riverside/San Bernardino)	1994	Corps	None
Orange County Water District (Orange)	1995	Corps	None
Temescal Wash Bridge (Riverside)	1995	Corps	Harm to 2 willow flycatchers

Table 7: Agency actions that have undergone formal section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher range-wide.

Action (County)	Year	Federal Agency[1]	Incidental Take Anticipated
Camp Pendleton (San Diego)	1995	DOD	Loss of 4 willow flycatcher territories
Lake Isabella Operations 1996 (Kern)	1996	Corps	Inundation 700 ac critical habitat; reduced productivity 14 pairs
Lake Isabella Long-Term Operations (Kern)	1997	Corps	Indeterminable
H.G. Fenton Sand Mine and Levee near Pala on the San Luis Rey River (San Diego)	1997	Corps	None
Colorado			
AB Lateral - Hydroelectric/Hydropower Facility, Gunnison River to Uncompahgre River (Montrose)	1996	USBR	None
TransColorado Gas Transmission Line Project, Meeker, Colorado to Bloomfield, New Mexico	1998	BLM	None
Nevada			
Gold Properties Resort (Clark)	1995	BIA	Harm to 1 willow flycatcher from habitat loss
Las Vegas Wash, Pabco Road Erosion Control Structure	1998	Corps	Harm to 2-3 pairs of willow flycatchers
New Mexico			
Corrales Unit, Rio Grande (Bernalillo)	1995	Corps	None
Rio Puerco Resource Area	1997	BLM	None
Farmington District Resource Management Plan	1997*	BLM	None
Mimbres Resource Area Management Plan	1997*	BLM	1 pair of willow flycatchers
Belen Unit, Rio Grande (Valencia)	1998	Corps	Consultation in progress

BIA = Bureau of Indian Affairs; BLM = Bureau of Land Management; Corps = Army Corps of Engineers; DOD = Dept. of Defense; EPA = Environmental Protection Agency; FEMA = Federal Emergency Management Agency; FHWA = Federal Highway Administration; NF = National Forest; NPS = National Park Service; USBR = U.S. Bureau of Reclamation; USFS = U.S. Forest Service.

* Jeopardy opinions.

Table 8: Biological Opinions Issued on Lower Colorado River since 1997

Number	Name of Project	Date BO Issued
2-21-96-F-161	Blue Water Resort, Casino and Marina	March 21, 1997
2-21-99-F-231	Desert Pupfish Refugium, Cibola NWR	June 25, 1999
2-21-99-F-205	Laughlin Lagoon Dredging Project	August 19, 1999
2-21-00-F-041	Desert Pupfish Refugium, Imperial NWR	December 16, 1999

Table 9: Significant Projects on Lower Colorado River with May Affect, not Likely to Adversely Affect Findings since 1997

Number	Name of Project	Date Finding Issued
2-21-98-I-436	Offstream Storage of Colorado R. Water	August 19, 1998
2-21-99-I-121	Beal Lake Improvement Project	February 2, 1999
2-21-99-I-301	Headgate Rock Tailrace Dredging	May 28, 1999
2-21-99-I-322	River Mile 33 Dredging	September 10, 1999
2-21-99-I-263	City of Yuma Riverfront Park	October 1, 1999
2-21-98-I-040	Phase II CRFRP-Morelos Dam	December 10, 1999
2-21-00-I-130	USFWS Giant Salvinia Control	February 8, 2000
2-21-00-I-156	BLM Giant Salvinia Control	February 25, 2000

Table 10: Years with Lake Mead Rising Water Elevations				
Year	February	March	April	Amount of Rise
1935	708.70	701.70	752.4	43.70 ft
1936	908.40	906.90	922.2	13.80 ft
1937	1026.20	1031.00	1044.60	18.40 ft
1938	1094.85	1100.20	1109.20	14.35 ft
1939	1157.40	1158.20	1162.90	5.50 ft
1941	1167.55	1170.35	1175.85	8.30 ft
1942	1176.75	1171.25	1182.9	6.15 ft
1943	1179.6	1177.00	1180.6	1.00 ft
1947	1130.10	1135.38	1134.49	4.39 ft
1960	1163.78	1164.26	1169.94	6.16 ft
1962	1156.51	1154.69	1165.75	9.24 ft
1965	1090.63	1088.31	1094.57	3.94 ft
1968	1132.54	1132.79	1134.15	2.61 ft
1969	1140.67	1139.34	1140.79	0.12 ft
1973	1174.73	1178.78	1186.14	11.41 ft
1983	1210.25	1211.59	1211.26	1.01 ft
1986	1202.72	1202.45	1204.78	2.06 ft
1992	1179.42	1180.31	1179.78	0.36 ft
1993	1189.88	1193.46	1193.04	3.16 ft
1997	1196.51	1199.10	1200.01	3.50 ft

Table 11. The relative abundance of southwestern willow flycatcher pairs along the lower Colorado River and its tributaries from 1996 to 2000 (McKernan and Braden 1997,1998,1999, pers. com.).

Study Area	1996 pairs	1997 pairs	1998 pairs	1999 pairs	2000 pairs
Pahranagat, Meadow Valley, NV	ns	ns	18	16	24
Littlefield, AZ, Virgin River	ns	0	0	ns	0
Mesquite, NV (old site), Virgin River	ns	6	4	0	0
Mesquite, NV, west (new site)	ns	ns	ns	ns	20-22
Riverside, NV, Virgin River	ns	2	0	0	0
Mormon Mesa, NV (north), Virgin River	ns	6	6	11	10-11
Mormon Mesa, NV (south), Virgin River	ns	6	12	11	10-11
Virgin River Delta, NV, Virgin River	ns	12	6	0	2
Muddy River	ns	4	ns	ns	2
Lake Mead Delta, CO River	10	6	ns	ns	ns
Grand Canyon, CO River	ns	2	16	17	14
Hoover Dam					
Topock Marsh, AZ, CO River	10	25	36	32	30
Topock Gorge, CA-AZ, CO River	2	1	0	0	0
Lake Havasu, AZ, CO River	2	0	0	2	0
Bill Williams River, AZ	2	2	6	2	4
Parker Dam					
**Headgate Dam, CA, CO River	ns	0	2	2	0
[1]Hall Island, CA, CO River	ns	0	1	0	[1]
Big Hole, CA, CO River	ns	ns	ns	2	2
**Ehrenberg, AZ, CO River	4	0	0	2	2
**Cibola Lake, AZ, CO River	0	0	0	0	0
Cibola NWR, AZ, CO River	2	0	0	0	0
**Walker Lake, CA, CO River	3	0	0	0	2
Draper Lake, CA, CO River	2	0	0	0	0
**Paradise Valley, CA, CO River	0	0	0	0	0
**Adobe Lake, AZ, CO River	4	2	0	0	2
Taylor Lake, CO River	2	0	0	0	0

Table 11. The relative abundance of southwestern willow flycatcher pairs along the lower Colorado River and its tributaries from 1996 to 2000 (McKernan and Braden 1997,1998,1999, pers. com.).

**The Alley (Island Lake/Mile Marker 65), CO River	0	0	0	0	0
Picacho west, CA, CO River	2	2	0	0	2
**Picacho Camp Store, CA, CO River	ns	0	1	0	2
**Ferguson Lake, CA, CO River	2	0	0	0	1
**Imperial NWR, AZ, CO River	1	0	0	0	0
Imperial Dam					
Mittry Lake, AZ, CO River	0	0	0	2	0
South of Laguna Dam, AZ, CO River	ns	0	0	0	0
South of Laguna Dam, AZ (old Colo. Riv), CO River	ns	ns	0	0	0
Gila R/Colorado R. Confluence, AZ, CO River	ns	0	0	4	2
Gila River, AZ	2	0	1	2	2
Morales Dam, CO River	ns	ns	ns	4	0
Hunters Hole, CO River	ns	ns	0	0	0
Gadsden Bend, CO River	ns	ns	2	2	0
Gadsden, CO River	ns	ns	0	0	0

[1]Habitat at Hall Island has degraded and was not suitable
** Areas that may be negatively affected by the proposed action
ns - not surveyed

Table 12: Hydrology at southwestern willow flycatcher study areas, Parker to Imperial Dams, lower Colorado River, 1996 to 1999 (Reclamation 2000).

Study area	% site w/ surface water	Average depth of surface water	Distance from surface water	% of site w/ saturated soils (excluding area with surface water)
	1996/97/98/99	1996/97/98/99	1996/97/98/99	1996/97/98/99
Ehrenberg (21.5 ac)	30/50/20/10	2cm/2cm/5cm/1cm	5m/5m/5m/5m	50/100/80/50
Headgate Rock (48 ac)	10/10/10/20	5cm/5cm/10cm/10cm	30m/30m/30m/30m	30/50/20/20
Imperial NWR (39.3 ac)	50/30/10/20	1cm/1cm/1cm/1cm	60m/60m/60m/60m	25/25/25/25
Lower Walker Lake (334 ac)	30/30/30/30	30cm/20cm/20cm/5cm	10m/10m/10m/10m	100/100/100/100
Cibola Lake (61 ac)	70/70/50/50	10cm/20cm/20cm/5cm	5m/5m/5m/5m	25/25/25/25
Adobe Lake (185.6 ac)	10/10/10/10	5cm/5cm/10cm/10cm	10m/10m/10m/10m	50/50/50/50
Paradise Valley (104.4 ac)	20/20/30/30	1cm/1cm/1cm/1cm	25m/25m/25m/25m	100/100/100/100
The Alley (244 ac)	70/70/50/50	30cm/20cm/20cm/5cm	5m/5m/5m/5m	100/100/100/100
Picacho/Camp Store (44.1 ac)	50/50/30/30	5cm/5cm/10cm/10cm	10m/10m/10m/10m	100/100/100/100
Draper Lake (248 ac)	20/20/30/30	30cm/20cm/20cm/5cm	25m/25m/25m/25m	100/100/100/100
Ferguson Lake (130.6 ac)	70/70/50/50	5cm/10cm/10cm/10cm	5m/5m/5m/5m	100/100/100/100

Table 13: Lake Mead Water Levels: Number of Runs over the Stated Elevation

Year	75R 1180	CP 1180	75R 1150	CP 1150	75R 1135	CP 1135	75R 1120	CP 1120
2000	85	85	85	85	85	85	85	85
2001	83	74	85	85	85	85	85	85
2002	72	65	85	85	85	85	85	85
2003	64	59	85	83	85	85	85	85
2004	66	54	85	78	85	85	85	85
2005	57	44	83	77	85	83	85	85
2006	52	43	82	69	85	82	85	85
2007	51	36	82	67	85	78	85	85
2008	50	35	77	62	84	75	85	83
2009	50	35	75	59	83	71	85	79
2010	50	34	79	56	80	67	85	77
2011	43	32	70	55	81	64	84	74
2012	39	31	69	48	77	62	84	71
2013	39	30	68	48	76	59	82	70
2014	38	30	68	45	74	55	81	66
2015	37	31	63	42	75	52	79	65
2016	37	30	63	43	74	53	77	64
2017	35	33	59	42	73	50	75	65
2018	35	33	59	43	70	54	75	65
2019	35	32	57	42	69	57	75	63
2020	36	32	57	41	69	58	73	64
2021	33	31	56	40	65	58	73	64
Year	75R 1180	CP 1180	75R 1150	CP 1150	75R 1135	CP 1135	75R 1120	CP 1120

Table 13: Lake Mead Water Levels: Number of Runs over the Stated Elevation

2022	30	31	56	39	62	57	70	63
2023	32	32	56	38	61	55	67	62
2024	31	32	54	39	61	53	65	62
2025	31	31	51	40	62	53	66	61
2026	29	30	50	41	61	52	65	59
2027	32	31	49	42	59	52	65	58
2028	33	31	48	42	58	51	65	58
2029	29	29	47	42	57	52	64	58
2030	31	31	46	42	54	52	64	58
2031	32	31	43	42	53	52	63	58
2032	31	31	43	42	51	49	62	58
2033	33	32	41	40	52	50	58	56
2034	32	34	40	41	49	50	57	58
2035	32	30	40	39	50	48	57	55
2036	32	30	40	41	49	47	56	53
2037	30	29	39	39	46	45	55	53
2038	31	31	38	38	44	44	52	51
2039	31	30	39	38	43	43	51	51
2040	30	30	37	38	41	42	51	51
2041	31	29	37	41	41	43	49	49
2042	31	30	37	37	40	41	48	48
2043	31	30	37	37	40	40	49	49
Year	75R 1180	CP 1180	75R 1150	CP 1150	75R 1135	CP 1135	75R 1120	CP 1120
2044	31	29	39	37	43	40	50	48
2045	29	30	35	36	38	40	46	47

Table 13: Lake Mead Water Levels: Number of Runs over the Stated Elevation

2046	30	30	37	36	38	38	46	46
2047	28	29	36	36	40	40	44	44
2048	29	29	37	36	39	39	44	44
2049	29	29	37	36	39	39	45	45
2050	29	29	36	36	38	37	44	44