Other activities: 1823-1996

Especially in the last 40 or 50 years, other activities and events have had effects on the Colorado River and its floodplain. These include residential, urban and recreational facilities development, introduction and spread of salt cedar, changes to the fire cycle, and changes to runoff and nutrient loading through irrigation returns and wastewater treatment plant effluent. This is not an inclusive list, but it is clear that the LCR is at the center of a complex and interwoven set of Federal, State, tribal, local and private programs, needs and requisites. Additional mention of these activities is included in the section of this opinion that addresses socioeconomic and related factors in the environmental baseline, as well as in the species-by-species discussions of direct, interrelated/interdependent, indirect, and cumulative effects, below. The following discussion addresses key conservation activities in the action area for the bonytail chub and razorback sucker that various agencies have cooperatively undertaken in recent years.

The bonytail chub still occurs in Lakes Mohave and Havasu. Total numbers in each population are unknown, but are believed to be very small, less than 2,000 fish. In 1981, sex products were taken from ten wild fish taken from Lake Mohave. From that year class, part of the resultant year class were returned to Lake Mohave as fingerlings and the rest were retained for future brood fish. Since 1981, some 217,000 fingerling bonytail chubs have been reintroduced into Lake Mohave. Aged fish captured since introductions were initiated indicate some survival of these fish or successful recruitment from the small residual population that occurs in Lake Mohave. Because of some apparent success from these reintroductions, the Service, via a biological opinion, committed to producing 25,000 10-12 inch bonytail chub annually for five years for reintroduction into Lake Mohave. The goal of these reintroductions is to establish an adult population of approximately 25,000 adult bonytail in Lake Mohave. Through cooperative efforts by Reclamation, State conservation agencies, and other affected parties, a similar reintroduction program is being implemented in Lake Havasu. The goal of this effort is also 25,000 adult bonytail in Lake Havasu. If reintroduction efforts are successful, present commitments are expected to supplement small populations in Lakes Havasu and Mohave thereby establishing an adult population of 25,000 bonytails in each reservoir. The projected total population would be 50,000 adult fish by 2002. If reintroduction efforts fail, a small total population of perhaps 500 to 1,000 bonytail chubs may remain in the wild in the year 2002, with the species by then headed rapidly toward extinction in the wild.

The razorback sucker still occurs sporadically in the upper and lower basin of the Colorado mainstem. By far, the largest of the remaining populations occur in Lake Mohave. The current population in Lake Mohave is estimated to be some 20,000 fish, less than 50% of the estimated population a decade ago. Lack of recruitment from swimup fry to adult has been identified as the major threat to this species' existence in the wild. In 1989, a multi-agency group of State and Federal agencies agreed to a concerted effort to replace the aged and decreasing population of

razorback suckers in Lake Mohave. Initial efforts were to place adults in lake-side rearing ponds to promote natural production in an environment protected from non-native fish predators. Young fish would be allowed to grow to a minimum of 12 inches before reintroduction into Lake Mohave. Through trial and error, the effort has grown to removing naturally spawned fry from Lake Mohave and rearing them in hatcheries to fingerlings prior to their reintroduction into Lake Mohave as 12 inch fish. In 1996 some 60,000 fry were collected and approximately 40,000 fingerlings are ready for transfer to grow-out ponds before being released into Lake Mohave during late 1997. To date, some 5,000 advanced razorback sucker fingerlings have been reintroduced into Lake Mohave. Reintroduced fish are joining spawning aggregations as they return to known spawning areas. Similar reintroductions, on a smaller scale, are being made at Lake Havasu.

Through a biological opinion, the Service committed to assist cooperating State and Federal agencies in providing 10,000 12-inch razorback suckers annually for reintroduction into Lake Mohave. If efforts specified in the biological opinion are met and successful, the projected population of razorback suckers in the action area will be 25,000 to 50,000 young adults by 2002. If reintroduction efforts fail, the projected population would be perhaps 20,000 adult fish in 2002 with the species headed rapidly toward extinction in the wild. Against this backdrop of causative actions and activities, one can examine the present status of these native fish species in the LCR.

Status of the Species Within the Action Area

Listed species/critical habitat:

Bonytail Chub

Historic range of the bonytail chub is estimated at 2,300 miles (USFWS 1993a). Occupied habitat as of 1993 is approximately 344 miles (15% of the historic range). The designation of critical habitat included all occupied habitat. Thirty two percent of the critical habitat is within the action area. The bonytail chub has small populations in Lake Mohave and Lake Havasu made up primarily of old fish nearing senescence (Minckley 1973). The Lake Mohave population of bonytail chubs in 1996 consists of few young adults from repatriated stocks and very few old adults are captured. The fish in the Lake Mohave population provided the founders for the Lower Basin broodstock currently being used to provide young fish to augment the reservoir populations in Lakes Mohave and Havasu. There have been 174,000 fingerling and 28,000 larvae bonytail chubs repatriated to Lake Mohave since 1980. Their fate is uncertain, but a large majority have likely perished.

The discussion of historic habitats in the project area and the changes to those habitats has already documented the effects of past actions on these species. Both the amount and the quality of habitat have been compromised by physical and biological changes driven by water, power, agricultural and recreational development. Little of the action area is untouched by these changes.

Conservation efforts undertaken to date have concentrated on preventing extinction.

Razorback Sucker

Historic range of the razorback sucker is estimated at 3,500 miles (USFWS 1993a). Occupied habitat as of 1993 is approximately 1,824 miles, of which 336 miles is reintroduction habitats, (52% of historic range). The designation of critical habitat included most but not all of the occupied habitat. Fourteen percent of the designated critical habitat is within the action area, with 17% of the total occupied habitat accounted for there. Large adult razorback suckers were last widespread in the 1970's, being captured in Lakes Mead, Mohave and Havasu as well as the river below Parker Dam (Minckley 1985). Small populations persist in Lakes Mead and Havasu and below Parker Dam. The largest remaining population of razorback sucker is in Lake Mohave and is declining due to old age mortality. The Lake Mohave population has provided the broodstock for all Lower Basin recovery efforts and contains significant amounts of genetic variance. Razorback sucker augmentation efforts are ongoing in Lakes Mohave and Havasu and below Parker Dam. To date, over 8,000 razorback suckers have been released into Lake Mohave by the Native Fish Work Group.

The discussion of historic habitats in the project area and the changes to those habitats has already documented the effects of past actions on these species. Both the amount and the quality of habitat have been compromised by physical and biological changes driven by water, power, agricultural and recreational development. Little of the action area is untouched by these changes. Conservation efforts undertaken to date have concentrated on preventing extinction.

Critical Habitat of Bonytail Chub and Razorback Sucker

The constituent elements involved with the designation of critical habitat for the bonytail chub and razorback sucker include water, physical habitat, and the biological environment. For the razorback sucker, additional criteria were used: areas with known or suspected wild spawning populations; areas where juveniles have been collected; present or historically occupied areas considered necessary for recovery; areas required to maintain rangewide fish distribution and diversity under a variety of conditions; and areas needing special management including those areas that once met the habitat needs of the species and could be recoverable with additional protection and management. The preceding discussion has addressed the physical and biological changes to the Colorado River that have affected the constituent elements.

Southwestern Willow Flycatcher

The review of historic and current data on the distribution and abundance of the southwestern willow flycatcher, as well as data on productivity throughout this subspecies' range, presented above under Status of the Species (rangewide) 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, the effects of Federal actions that have undergone formal section 7 consultation, and the State, local, tribal, and private actions that are contemporaneous with the proposed action.

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 rangewide reduction in the southwestern willow flycatcher population reflects the widespread, continual loss and fragmentation of riparian habitats into smaller and more isolated remnants. Declines in willow flycatchers, however, have not been restricted to the subspecies *E.t. extimus*. Breeding Bird Survey data for 1965 through 1979 combined the willow and alder flycatchers into the "Traill's flycatcher" because of taxonomic uncertainty during the 15-year reporting period. These data showed fairly stable numbers in central and eastern North America, but sharp declines in the West, the region in which the alder flycatcher is absent and where *E.t. brewsteri, E.t. extimus,* and *E.t. adastus* occur (Robbins *et al.* 1986).

The timing and transformation of the LCR from a natural, dynamic aquatic and riparian 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 is described under the Environmental Baseline section for the bonytail chub and razorback sucker, above. Where the water table was relatively close to the surface, cottonwood-willow forests formerly extended away from the LCR 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% 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. Figure 24 of the BA provides a comparison of the current-day vegetation composition and extent near Blythe, California, with a reconstruction of habitat types and areal extent in the same area for 1879. That figure, in combination with historic photos compiled by Ohmart (1979) demonstrates the magnitude of loss of not only cottonwood-willow, but also of mesquite habitat. Figure 24 also shows the extent to which native riparian habitats on the LCR have been converted to saltcedar. In addition to invasion by saltcedar, much of the native habitat loss resulted from agricultural expansion in floodplain terraces (Ohmart *et al.* 1988).

The BA indicates that recent vegetation sampling documented a total of 43,623 ha (119,527 ac) of

riparian, marsh, and desert vegetation between the United States - Mexico border and Davis Dam. Of that total, 18,155 ha (42%) (44,843 ac) was saltcedar and 1,376 ha (3%) (3,398 ac) was cottonwood-willow. The total for cottonwood-willow does not include the 465 ha (1148 ac) currently at the inflow to Lake Mead. Adding the habitat at Lake Mead, the total area of cottonwood-willow, or predominantly native broadleaf forested riparian habitat, over the 663 km (412 miles) reach of the action area is approximately 1,841 ha (4,547 ac). That averages to approximately 2.8 ha (7.7 ac) of cottonwood-willow per km of river, including both sides of the river's floodplain. However, considering 25% of that habitat occurs in a four-km (2.5 mi) stretch at the inflow to Lake Mead, the actual amount of habitat downstream of the Lake Mead inflow is approximately 2.1 ha/km (10 ac/mile). When compared to historical data on the distribution and extent of cottonwood-willow habitat, these figures demonstrate the magnitude of habitat loss and fragmentation in the action area. The actual amount of suitable habitat for the southwestern willow flycatcher is likely far less than the 1,841 hectares (4,547 acres) of cottonwood-willow currently available, because the presence of surface water, plant physiognomy, and size of willow stands are important habitat components not characterized by Reclamation's current habitat classification system.

Of the total saltcedar acreage, 89% was classified as structural types IV and V, which are characterized by low stature, low vertical foliage diversity (i.e., most foliage and structure is in the lowest stratum), and generally poorer quality habitat for birds than structural types with several strata and high vertical foliage diversity. Despite the extensive channelization and large expanse of reservoirs on the LCR, native cottonwood-willow habitat still develops in certain reaches in response to flooding events. The BA documents approximately 931 ha (2299 ac) of cottonwood-willow regeneration that developed in response to large flood events occurring in the mid-1980s. That habitat, however, was lost due to desiccation and competition from saltcedar.

Reclamation continues to sponsor a riparian restoration program along the river, including native plant nurseries and demonstration projects. Although the BA does not document how past restoration projects have contributed to the total acreage of native riparian habitat, it does specify that several areas are currently under restoration and will contribute approximately 89 ha (220 ac). Several other projects are in the planning stage, including an 8 ha (22 ac) wetland restoration project at the lower end of Las Vegas Wash and a 30-year cost-share project to restore 1,200 ha (2,964 ac) of native riparian habitat along a 15 km (9.3 mi) stretch through the Imperial Division. The potential for these projects to successfully establish habitat suitable for the southwestern willow flycatcher is not known. However, because plantings are comprised mostly of cottonwood, are typically spaced in an open plantation style, and are relatively small (i.e., 10 ha [24.7 ac] or less), the probability that these areas will develop into suitable flycatcher habitat in the near future is low.

To date, southwestern 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 southwestern willow flycatcher. Areas well away from river channels that have no standing or flowing water during the flycatcher's breeding season have a low probability of attracting nesting flycatchers. Similarly, plantings done in narrow strips only a few trees wide also have a low probability of attracting flycatchers.

Approximately 465 ha (1,148 acres) of Goodding's willow occurs in the continuous patch spanning four km (2.5 mi) at the boundary of Grand Canyon National Park and Lake Mead National Recreation Area. Except for the South Fork Wildlife Area in Kern County, California, no other continuous patch of native willow habitat of this size is known to exist in the Southwest. The Lake Mead Delta willows have had their root crowns inundated for more than 16 consecutive months. Treefall resulting from inundation and loss of structural support provided by roots was responsible for the loss of at least three flycatcher nests in 1996 (R. McKernan, Riverside County Museum, pers. comm.). The mean depth of standing water at flycatcher nest trees during 1996 was 68.8 $\pm$ 5.8 cm.

Despite the numerous Federal agencies and actions involved, to date, no formal consultations have been initiated for the flycatcher on the LCR, except for Reclamation's current consultation. 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 flycatcher's baseline. For example, the availability of irrigation water spawned wide scale agricultural development on private lands in the Colorado River valley. More than 75% of Mohave, Parker, Palo Verde, and Yuma valleys has been converted to agriculture (USFWS 1986). These areas formerly contained the vast riparian forests noted by early diarists and captured in early photographs of the area that probably comprised the most important riparian corridor in the Southwest and provided significant stands of habitat suitable for the southwestern willow flycatcher. The effect of these losses on the flycatcher has also been great; today, nowhere on the Colorado River could an individual ply a two mile stretch and find 34 flycatcher nests as was done by Herbert Brown in June of 1902.

Water management operations on the LCR exacerbate potential effects to flycatcher reproduction by concentrating naturally occurring selenium. During 1996 monitoring efforts in southwestern Colorado, a southwestern willow flycatcher fledgling was found with a crossed bill, a symptom of selenium poisoning in birds (Beyer et al. 1996, Heinz et al. 1989, Heinz et al. 1987, Ohlendorf et al. 1986a). The deformity prevented this bird from normal foraging. This 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 pers. comm.). Portions of the LCR are known to have high levels of selenium.

Status of the Species Within the Action Area

The status of the southwestern willow flycatcher on the LCR is not fully known, in part because

all potential habitat has not been surveyed. Reclamation contracted for surveys and monitoring to be conducted throughout the LCR during the 1996 breeding season. That data was not presented in the BA; however, additional preliminary data have been made available to the Service by Reclamation (see Consultation History, above).

Combining surveys conducted through Arizona Partners In Flight since 1993 (including confluence areas at the Bill Williams and Gila rivers) and Reclamation's data collected in 1996, approximately 60 sites have been surveyed on the LCR for southwestern willow flycatchers (Muizneiks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996). Results from those surveys reveal a pattern of widely-separated, small breeding groups as found throughout the subspecies' range.

Migrant willow flycatchers, probably including *E.t. extimus*, were documented at eight sites along the LCR: Hunter's Hole (Yuma Co.), Gadsden Bend (Yuma Co.), Gadsden Pond (Yuma Co.), Martinez Lake (Yuma Co.), Imperial National Wildlife Refuge (Yuma Co.), and Havasu National Wildlife Refuge (Mohave Co.). Several locations in Yuma County (e.g., Hunter's Hole, Gadsden Bend) have had small, but relatively constant, numbers of flycatchers remaining on site early in the season for up to several weeks, but then disappear around mid-June (Muizneiks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996). The persistence and territorial behavior of these birds suggests they may have been attempting to attract mates and breed. However, neither breeding nor confirmed pairs have been documented at these sites. 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.

The first breeding confirmed on or near the LCR during this survey period was at the Bill Williams National Wildlife Refuge. One pair of flycatchers was observed feeding a brown-headed cowbird nestling in 1994 (Sferra *et al.* 1995).

Expanded efforts initiated by Reclamation in 1996 included survey and monitoring at 27 sites distributed in Yuma, La Paz, Mohave, Imperial, and San Bernardino counties. In total, southwestern willow flycatchers were found at 15 widely-distributed sites along the LCR. Twelve (80%) of the sites where flycatchers were found were comprised of single pairs; one site (6%) contained two pairs; an additional site contained an estimated five pairs; and the largest concentration was found at the inflow of the Colorado River to Lake Mead where ten territories (eight confirmed pairs) were documented in a random sample of plots within a 445 ha (1219 ac) area dominated by Goodding's 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 (R. McKernan pers. comm.).

Nesting was confirmed at two locations in 1996, Topock Marsh and Lake Mead inflow. One nest

was found at Topock Marsh. Seven nests were found at the Lake Mead inflow. Complete data on nest contents and nest success is not yet available. R. McKernan (pers. comm.) reported that none of the seven flycatcher nests at Lake Mead inflow was parasitized by cowbirds or depredated. However, as indicated previously, three flycatcher nests at the inflow were lost due to treefall resulting from willows that were saturated from prolonged inundation of root crowns (R. McKernan pers. comm.). All nests at Lake Mead inflow were placed in Goodding's willow. The mean nest height was 2.3 ± 0.15 m, and the mean height of nest trees was 6.9 ± 0.19 m. As indicated previously, the mean depth of standing water at nest trees (i.e., the depth at which nest trees were inundated above root crowns) was 68.8 ± 5.8 cm. The single nest found at Topock Marsh was 2.3 m up in a 7.6 m saltcedar that was inundated 2 cm above the root crown.

No data on the size of occupied sites was provided for areas outside of Lake Mead. However, aerial inspection of occupied sites revealed that, downstream from Lake Mead, flycatchers were found in very small riparian patches ranging between about 0.8 to 4 ha (2 to 10 ac).

Vegetation composition data was provided for 21 of the 27 sites surveyed on the LCR in 1996. Of the 21 sites sampled, seven (33.3%) were dominated by either Goodding's or coyote willow; eleven (52.4%) were dominated by saltcedar; and three (14.3%) were comprised of nearly equal mixtures of willow and saltcedar. Each of the sites dominated by saltcedar had at least some willow component. For example, the flycatcher nest at Topock Marsh was placed in a saltcedar located beneath one of the few large and widely-scattered Goodding's willows at that site. Other plant species, such as cottonwood, arrowweed, and cattail occurred to a much lesser degree at each of the sites.

Yuma Clapper Rail

Present-day marshes along the LCR are of two kinds. The first kind includes backwater marshes, which are defined as marsh areas adjacent to the river and which are either directly connected to the river or are connected by seepage. The second kind, which is more extensive, includes those marshes formed by impoundments such as the marshes in Mittry Lake, Imperial Reservoir, Lake Havasu, Topock Marsh, and other similar impounded areas. (For additional historical background on the development of the LCR, see the Environmental Baseline section for the bonytail chub and razorback sucker, above.)

The construction of river control features, such as training structures, along the LCR has resulted in the formation of more permanent and expansive backwater marshes. There are over 400 backwater marshes along the LCR today from Davis Dam to Laguna Dam. Some of these marshes were created and are maintained specifically for mitigation for channel improvement projects. Reclamation actively pursues maintenance and restoration of backwater marshes not tied to mitigation on a cost-share basis. These backwater marsh habitats are subject to successional factors as were the historical marshes along the river. Under normal operating conditions, this succession

is greatly slowed because current river conditions and operating criteria result in less scouring and associated sediment movement. Bankline stabilization has reduced erosion and associated sediment accrual to the river. When exceptional conditions are encountered, such as the high flow releases which occurred in 1983-1985, channel scouring occurs with associated sediment deposition in those backwater areas. These exceptional conditions would be expected to promote accelerated succession to upland conditions which are dominated by saltcedar.

The majority of the banklines of the flowing river have been stabilized. This does not allow for natural marsh formation resulting from the river channel moving laterally, which would occur during high flows. Additionally, current river operating criteria reduce the opportunity for high flows (floods) which would also reduce natural marsh formation during those type of flows. A portion of the backwater marshes, which exist along the river today, are isolated from the main river channel, reducing the opportunity for flushing flows through them. However, it was observed during the high flows experienced on the river during 1983 through 1985, the isolated backwater marshes did not fill in with deposited sediment. Impacts which occurred to those isolated backwater marshes were a result of the main river channel scouring and the resulting drop in water table.

In 1986, the LCR floodplain supported over 12,000 acres of marsh associated habitat. Younker and Anderson (1986) classified the marsh communities into different types based primarily on the percentage of cattail, bulrush, common cane and open water. Of the total of more than 12,000 acres of marsh habitat found, nearly 50% (5,657 acres) was classified as type 1 which met the criteria of being nearly 100% cattail/bulrush with small amounts of common cane and open water. (For descriptions concerning the remaining amounts and type of marsh habitat observed by Younker and Anders, see Table 7 in the BA.)

Status of the Species Within the Action Area

The status of the Yuma clapper rail on the LCR is fairly well known because of an annual call count survey taken by all of the resource agencies with management responsibilities on the river. Most of the potential habitat on the river has been surveyed over the last few years. The largest populations of Yuma clapper rails on the river are found on the National Wildlife Refuges (NWR) and wildlife management areas operated by the State Game and Fish agencies. Small isolated populations are found in fragmented habitat areas throughout the action area. Also, approximately one half of the total population (Eddleman 1989) is found in the Colorado River delta area in Mexico.

According to Rosenberg et al. (1991), this species is limited by, and has come under threat of reduction from, river management activities such as dredging, channelization, and stabilization of banks by riprapping, all of which are detrimental to marsh habitat formation. They state that recent flooding has resulted in more pressure on water management agencies to increase

channelization and bank stabilization activities, which will result in a large reduction of available marsh habitat.

Recent contaminant studies on the Colorado River have indicated high levels of selenium (a trace metalloid) in tissues of the Yuma clapper rail. Selenium concentrations were determined from the livers of five adult birds and from two sets of eggs. The concentrations found in the livers equaled or surpassed those found in ducks at Kesterson NWR in California, an area of extreme selenium contamination (Ohlendorf et al. 1986b, Radtke et al. 1988, Kepner unpubl. data *in* Rosenberg et al. 1991). Rail eggs contained concentrations that were found, at Kesterson NWR, to result in a 20% chance of death or deformation in American coot embryos (Olendorf et al. 1986a, Kepner unpubl. data). Crayfish, a major rail food item, also had selenium concentrations that could cause toxic effects to their predators (Lemly and Smith 1987, Kepner unpubl. data). High selenimu levels in Yuma clapper rail tissues could result in hatching defects and reduced reproductive output (Rusk 1991). Selenium can cause extensive metabolic problems in birds and may affect reproductive success.

The source of selenium in the LCR is unknown at this time, but it appears to be from upstream sources and may be from natural weathering of seleniferous shales, combustion of high selenium coal at electrical generation stations, extraction of uranium and coal ore, or upstream irrigation-based agriculture (Radtke et al. 1988). Agricultural activities in the LCR valley proper do not appear to be contributing (Radtke et al. 1988).

Living in the dynamic, highly variable wetland habitats of the Colorado River, the Yuma clapper rail can likely tolerate a wide range of physical conditions. Some changes that have resulted from human development along the river have altered overall habitat quality. In recent years, the use of boats and personal watercraft has increased along the LCR. This has led to speculation that the disturbance caused by water recreation activities may have a negative impact on species of marsh dwelling birds.

The Yuma clapper rail is dependent upon wetland habitat that is both created and lost as a result of modifications and operations of the Colorado River. While clapper rails and the marsh plant species they use for nesting and foraging substrate have the ability to fairly rapidly colonize newly created habitat, this habitat continues to be negatively affected by water diversions, bank stabilization and other channel modifications, flood releases, and development in the floodplain. These actions have resulted in the loss of important wetland habitat used by the Yuma clapper rail and the resultant loss of the rails that inhabit it. However, the positive effects of backwater marsh management in combination with this species' ability to recolonize new habitat, apparently offset these negative effects, since the population continues to remain stable and is possibly expanding.

<u>Proposed species/critical habitat:</u>

Flat-tailed Horned Lizard

Project Location and General Vegetation Communities

The 5-mile zone is located in the Yuma Desert southeast of Yuma, Arizona and west of the Barry M. Goldwater Range. The vegetation community in which the project would be operated and maintained is classified as the lower Colorado River Valley subdivision of Sonoran desert scrub (Turner 1982). It is the largest and most arid subdivision of Sonoran desert scrub. Dominant perennial plant species in the more xeric examples of this vegetation community, such as at the project site, include creosote, white bursage, and galleta grass (Turner 1982, Rorabaugh, et al 1987).

Threats to Flat-tailed Horned Lizards and Their Habitat Specific to the Action Area

A general listing of threats that have contributed to the declining status of the flat-tailed horned lizard and that ultimately triggered the proposed listing of the species as threatened is presented in the section entitled "Status of the Species". These threats are primarily human-caused factors.

For the most part, areas used in maintenance of this project are highly disturbed by the presence and use of existing dirt roads. Other nearby uses and disturbances have adversely affected vegetation communities and wildlife habitat. Paved portions of County 23rd and Avenue B link San Luis with the Marine Corps Air Station (Yuma) and the eastern portion of the city of Yuma. The Arizona State Medium Security Prison lies immediately south of County 23rd and east of Avenue B. The County of Yuma Auxiliary 4 Airport, an old military airstrip located approximately five miles northeast of San Luis, is presently used primarily for "touch and go" landing exercises. There are no facilities at the airstrip, and on-the-ground activities are restricted primarily to repair of paved areas on the airstrip. City of Yuma Landfill operations, located along County 23rd immediately east of the Prison, include normal landfill operations, with the associated vehicular traffic to and from the landfill. Hillander C Irrigation District, located approximately three to six miles east of San Luis, is a privately owned irrigation district within the 5-mile zone. Farming activities are conducted within the confines of the district, with associated vehicular traffic to and from the area. The U.S./Mexico Cattle Crossing and Holding Facility straddles the U.S./Mexico border adjacent to Hillander C and functions as a quarantine holding facility for cattle being shipped to and from Mexico. The Sonora Substation and associated transmission lines are owned by Arizona Public Service Company and undergo periodic maintenance and inspection. The Arizona State Minimum Security Prison is operated by the State of Arizona and activities are primarily conducted within the facility confines. Security patrols may occur around the perimeter of the property. The U.S. Immigration and Naturalization Service patrols the 5-mile zone and adjacent areas to prevent illegal entry into the United States.

Approximately 23 to 27% of the historic flat-tailed horned lizard habitat in Arizona has been lost due to human uses, primarily urban and agricultural development (Service 1993b). Pesticide drift from croplands into adjacent flat-tailed horned lizard habitat may have reduced ant populations, the primary prey of the flat-tailed horned lizard (Service 1993b, Bolster and Nicol 1989). A variety of activities conducted by the Marine Corps on the western portion of the Barry M. Goldwater Range affect horned lizards and their habitat, although the extent of adverse effects is limited. Military activities that adversely affect the species are relatively few and small in areal extent. Marine Corps activities were addressed in a previous conference opinion (2-21-96-F-114) in which the Service found that ongoing and proposed activities would not likely jeopardize the continued existence of the flat-tailed horned lizard (Service 1996). In the Yuma Desert west and north of the Barry M. Goldwater Range, numerous proposed or ongoing activities threaten the habitat of the flat-tailed horned lizard. Recent Federal actions include proposed development of a Yuma County Administrative Center and rights-of-way for other roads and utilities. The Yuma Metropolitan Planning Organization has proposed a highway (the "Area Service Highway") from San Luis to Interstate 8 that would traverse County 23rd through parts of the project area. The Federal Highways Administration is lead Federal agency for the project. Several small disturbed areas and small trash piles are located near roadways and access routes adjacent to and through the 5-mile zone. Off-highway vehicle use is evident at scattered sites, particularly near San Luis and on the edge of the Yuma Mesa. Non-Federal activities are described in the Cumulative Effects section, below.

Reclamation maintains a sludge disposal facility for the Yuma Desalting Plant, a feature of its Colorado River Salinity Control Project, approximately one mile north of the intersection of County 23rd and Avenue B. The City of Yuma has a waste water sludge disposal facility in T11S, R23W, SE1/4 section 5, immediately north of County 23rd. The waste water site was apparently graded at some time in the past, but the vegetation is recovering. The above listed facilities and projects tend to increase the presence of predators mentioned in the section entitled Status of the Species Rangewide. Other activities such as on-and-off highway vehicle traffic cause flat-tailed horned lizard mortality. Mortality rate may be the most important factor affecting flat-tailed horned lizard population viability (Flat-tailed Horned Lizard Conservation Team, 1996).

Status of the Proposed Species Within the Action Area

About 6% of the total land area within the range of the species occurs in Arizona, 29% in Mexico, and the 65% in California. Much of the area in California, such as the Salton Sea and agricultural lands, is unsuitable habitat for the flat-tailed horned lizard. Among the most important habitat remaining for lizard conservation in the United States, about 39%, or 550 km^2 (212 mi^2), occurs in Arizona (draft Flat Tailed Horned Lizard Rangewide Management Strategy 1996).

Flat-tailed horned lizard relative abundance has been estimated using standardized transects in which observers count flat-tailed horned lizards and their scat. Numbers of scat and lizards

observed per hour is used as an index to the species' relative abundance. Criteria developed from Bureau of Land Management (1990) follows:

High relative abundance = >9 scat/hr or at least 1 *P. mcallii* observed

Medium relative abundance = 5 to <9 scat/hr

Low relative abundance = 1 to <5 scat/hr

Poor relative abundance or unoccupied habitat = <1 scat/hr

The Flat-tailed Horned Lizard Interagency Technical Advisory Team (ITAC), comprised of biologists and land managers from a variety of State and Federal agencies, met in April, 1993, to discuss research findings and the validity of this survey method. The ITAC concluded that scat counts may not provide a reliable index to the relative abundance of the flat-tailed horned lizard and should be used with great caution. The assumption of a correlation between scat counts and lizard density has never been tested. There appears to be more reliability when scat count data are used in combination with lizard observations and habitat characteristics to determine the importance of an area for this species (Rorabaugh 1994). A recently developed interim survey protocol authored by the Flat-tailed Horned Lizard Conservation Team (a committee assisting in preparation of the Rangewide Plan) uses both lizard and scat counts to determine presence or apparent absence of this species in a given area.

The Service is aware of approximately 40 records for flat-tailed horned lizard within the 5-mile zone; these include two 3.6 hectare flat-tailed horned lizard study plots monitored by Rorabaugh (1994) and three four hectare plots monitored by Hodges (1995).

In 1985, one-hour "section searches" were conducted within many sections (one square mile units) of the 5-mile zone (Rorabaugh et al. 1987). Section searches consisted of one-hour walks along a triangular route through a section in which observers counted all horned lizards and horned lizard scat. Data from the study plots are presented in **Table 10**. **Table 10** depicts lizards and scat observed per hour for section searches and for study plots on each section listed.

Data in **Table 10** combined with nearly 40 additional locality records from 1985 to the present (most since 1990) indicate the species occurs throughout the project area. As noted previously, using scat counts from section searches and the study plots to estimate flat-tailed horned lizard abundance is problematic. However, these data show relatively high scat counts in 13 sections within the 5-mile zone. Scat counts in these sections were well above the mean (13.2 scat/hr) documented by Rorabaugh et al. (1987) for the Yuma Desert. These areas are also comparatively undisturbed and the substrate appears more sandy or windblown in these eastern sections. Flat-tailed horned lizards are associated with and may be more abundant in areas with moderate

amounts of windblown sand (Muth and Fisher 1992, Rorabaugh et al. 1987).

The participating agencies to the draft Rangewide Management Plan will likely agree to manage several areas for viable flat-tailed horned lizard populations, including the Yuma Desert Management Area, which will likely include about 16,000 acres within the 5-mile zone and additional acreage in adjacent portions of the Barry M. Goldwater Range. In the 5-mile zone, the majority of the Yuma Desert Management Area will likely lie east of Hillander C Irrigation District and south of the County 23rd road. If implementation of the conservation strategy removes a significant number of the threats to the species, listing of the flat-tailed horned lizard as a threatened species may not be necessary.

Table 10: Results of section searches and monitoring of study plots in the 5-mile zone.

Section	Section Search[1]		Study Plots[2]	
	#lizards/hr	#scat/hr	mean lizards/hr	mean #scat/hr (May-June)
T10S R23W S30	1	4		
T10S R23W S31	0	4		
T10S R23W S32	0	0		
T10S R23W S33	1	9		
T10S R24W S25	0	5		
T10S R24W S26	0	5		
T10S R24W S27	0	1		
T10S R24W S33	0	2		
T10S R24W S34	1	1		
T10S R24W S35	0	1		
T11S R23W S1	0	0		
T11S R23W S2	0	31		
T11S R23W S3	0	43	0	30
T11S R23W S4	0	40		
T11S R23W S5	0	3		
T11S R23W S6	0	4	0.13	11
T11S R23W S7	0	4		
T11S R23W S8	0	3		
T11S R23W S9	0	26		
T11S R23W S10	0	21	0.03	42
T11S R23W S11	0	15	0	15
T11S R23W S12	0	15		
T11S R23W S13	0	18		
T11S R23W S14	0	5		
T11S R23W S15	0	22		
T11S R23W S17	1	5		
T11S R23W S18	0	0		
T11S R23W S19	0	1		
T11S R23W S20	0	0		
T11S R23W S21	0	4		
T11S R23W S22	0	12		
T11S R23W S23	0	43		
T11S R23W S24	0	57		
T11S R23W S25	0	50		
T11S R23W S27	0	7		
T11S R23W S28	0	3		

Additional Socioeconomic and Related Factors Affecting the Environmental Baseline

As stated previously, the environmental baseline includes past and present impacts of all Federal, State, and private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the effect of State and private actions which are contemporaneous with the consultation process. The various categories of non-Federal activities are summarized in **Table 11**, while the diversion and use of State waters by principal entitlement holders for 1993 are summarized in **Table 12**. It is anticipated that these contemporaneous non-Federal actions will continue during the next five years, and the potential effects of such actions, where they affect the action area, are discussed for the species consulted on here under Cumulative Effects. Additionally, these actions are expected to be addressed in the MSCP for the LCR.

The socioeconomic context in which the proposed action fits, and other key factors pertinent to this BO likely to impact the action area in the next five years, are summarized under five topic areas below. They are: 1) human population, 2) economic development, 3) visitation/recreation, 4) environmental contaminants, and 5) wildfire frequency. Information on some aspects of these topics is limited.

Table 11. Non-Federal activities that may affect the resources of the Lower Colorado River area.

Affecting the mainstem river and its reservoirs	• diversion of state entitlement waters • potential decrease in water quality by: - municipal effluent discharge - storm water runoff - agricultural drainage - recreational waste - other non-point discharges • trash accumulation • increased recreational use: - fishing - hunting - boating - swimming
Affecting the river's adjacent floodplain	• agricultural development: - land conversion - pesticide/herbicide applications - soil erosion/minimum tillage - cropping patterns benefitting certain species - land fallowing • municipal and industrial development: - land conversion - air pollution (dust, automotive and industrial emissions) - natural area management - solid waste disposal (landfills) • trash accumulation • increased wildfire frequency - reduced native riparian habitat/saltcedar expansion •increased recreational use: - hunting - camping - hiking - off-road vehicles
Affecting areas away from the lower Colorado River and its floodplain	• agricultural development: - land conversion - pesticide/herbicide applications - water pollution (of ground or surface waters) - soil erosion/minimum tillage - land fallowing - air pollution (dust and smoke from burning field residues) - cropping patterns benefitting some species - water conservation and reuse • municipal and industrial development: - land conversion - air pollution (automotive and industrial emissions) - water pollution (of ground or surface waters) - solid waste disposal (landfills) - water conservation and reuse • increased recreational use: - resource impacts (off-road vehicles, trampling, etc.) - management plans - developed recreational sites

SOURCE: Bureau of Reclamation Biological Assessment.

Table 12. Amounts and uses of water diverted by principal U.S. water entitlement users in 1993.

Diversion Project	Irrigation Supply (acre-feet of water)	Acres Irrigated	Municipal and Industrial Supply (acre-feet of water)	Population Served
Ak-Chin Indian Community AZ	72,239	14,655		
Coachella Valley CA	304,174	58,579		
Imperial Valley CA	2,677,597	461,642	45,410	99,610
Cibola Valley AZ	22,184	3,557	37	199
Lake Havasu AZ			12,666	32,144
MWD			1,207,329	15,000,000
Arizona, miscellaneous	10,798	1,952	34,384	56,140
Mohave Valley AZ	37,741	4,186	6,394	12,050
Nevada, miscellaneous			31,455	7,000
Central Arizona Project	384,425	143,641		
Wellton-Mohawk (Gila Valley) AZ	291,817	56,814	876	1,605
Yuma Mesa (Gila Valley) AZ	316,743	33,360		
Southern Nevada Water Project			295,120	854,565
Palo Verde Irrigation District CA	219,780[a]	121,000[a]		
Fort Mojave Indian Reservation CA,	129,767[a]	20,076[a]		
Quechan Indian Reservation CA	51,616[a]	7,743[a]		
Cocopah Indian Reservation AZ	9,707[a]	1,524[a]		
Chemehuevi Indian Reservation CA	11,340[a]	1,900[a]		
CRIT CA, AZ	717,148[a]	107,588[a]		
TOTAL	5,257,076	1,038,217	1,633,671	16,063,313

[a] SOURCE: Bureau of Reclamation Biological Assessment. Figures are for amount of entitlement, which is not necessarily the amount actually diverted or irrigated.

1. Human Population Impacting the Action Area.

Much of the action area is adjacent to rapidly expanding human populations. The Las Vegas/Henderson area in Nevada is the fastest growing metropolitan area in the United States. Riverside County, California, and Mohave County, Arizona, are two of the fastest growing counties in the country. **Table 13** provides various available population numbers and projections for areas associated with or adjacent to the LCR from 1995 through the year 2000. Projected growth rates for various human population centers range from 10.8% to 114.3%.

2. Economic Development Impacting the Action Area.

Tied with the rapidly growing human population has come rapid land and water development. The major types of development associated with the LCR area are: urban, suburban, and vacation residential areas and supporting infrastructure; commercial developments, including some manufacturing, but with an emphasis on retail establishments; water-oriented recreational developments such as marinas, docks, and boat ramps; and casinos and gaming-oriented hotels and resorts in the Nevada portions and associated with the Indian reservations along the LCR. Extensive agricultural development of the Mohave, Parker, Palo Verde, Imperial, and Yuma Valleys has occurred as irrigation water has been made available, occupying about three-quarters of the floodplain below Davis Dam as of 1986 (USFWS 1986).

Permits are administered along the LCR by the COE for developments that affect the water and shoreline (USACOE 1996). Examination of the 151 activities permitted from Jan. 1, 1994, through Nov. 12, 1996, indicates the types of development that have occurred recently or are ongoing (these are listed in order of their frequency; several permits involve more than one category of activity):

- dock construction (single and multiple) - 56 projects
- boat ramps - 24 projects
- minor developments (e.g., water/sewer lines, revegetation) - 22 projects
- bulkhead or riprap placement or maintenance - 19 projects
- dredging - 14 projects
- major developments (e.g., subdivisions, RV parks, power line) - 12 projects
- marina construction - 3 projects
- mining - 1 project

These developments often involve alteration to the river bank such as excavating for dock pilings, dredging to construct and maintain marinas, and grading and filling to create boat ramps and bulkheads. Conversion of floodplain or bankside lands has in many cases destroyed riparian vegetation and eliminated opportunities to restore historic wetlands and floodplain habitats (USFWS 1993a).

Table 13. Population projections for selected locations along the Lower Colorado River.

Location	Population 1995	Population Projection for Year 2000	Projected Population Increase	Percent Population Increase
Mohave Co., AZ	126,350	154,325	27,975	22.1%
La Paz Co., AZ	16,525	18,600	2,075	12.6%
Yuma Co., AZ	123,050	139,975	16,925	13.8%
Yuma City, AZ	61,466	68,445	6,979	11.4%
Blythe, CA	21,500	24,000	2,500	11.6%
Needles, CA	5,700	6,931	1,231	21.5%
Clark Co., NV	1,039,000 (est.)	1,151,460	112,460	10.8%
Boulder City, NV	14,090	16,467	2,377	16.9%
Henderson, NV	117,933	66,900	48,967	41.5%
Laughlin, NV	7,000 (est.)	15,000	8,000	114.3%

Note: Figures are from various State and local information packets; comparable projections are not available for other locations. The Clark Co. estimates includes Las Vegas.

3. Visitation/recreation Impacting the Action Area

Tourism drives much of the economy of the area, with gambling attracting the majority of the tourists to the Nevada portion of the LCR and warm winter weather as a major attraction in southwestern Arizona and southeastern California. Local tourism-oriented agencies aggressively market opportunities for fishing, boating, water and jet skiing, windsurfing, swimming, hunting, wildlife observation, and water project visitation, in particular, the Hoover Dam. The increasing tourism along the river, together with the increasing resident population, are driving a steady increase in recreational use of the LCR.

Las Vegas attracts more than 28 million visitors per year and the visitation continues to increase. The Bullhead City/Laughlin area attracts more than six million visitors per year. Lake Havasu City draws almost one million visitors per year. Estimates are lacking for other urban areas, but

clearly many hundreds of thousands of people per year altogether visit the other towns along the river, such as Yuma, Arizona. The Bureau of Land Management oversees two heavily-used recreational districts on the river. In FY 1996, the Parker Strip area had more than 1.5 million visitors, and the Havasu North area had more than 750,000 visitors. Additional recreational use of the river and adjacent shorelines is ascertainable from visitation statistics for national recreational areas and wildlife refuges on the LCR (**Table 14**). Changes in monthly visitation rates from 1995 to 1996 range from a 0.4% decrease to a 219% increase, with four of the five areas registering an increase.

4. Environmental Contaminants Impacting the Action Area.

Recent research has revealed the impact of organochlorine (pesticides and industrial compounds) and other synthetic contaminants on carp in Las Vegas Wash and Las Vegas Bay in Lake Mead (Bevans et al. 1996). The sex-steroid hormone responsible for male spermatogenesis was present at significantly lower levels in male carp collected in these areas than in male carp from an uncontaminated reference area. Further, tissue changes found in carp livers and kidneys from Las Vegas Wash and Bay were consistent with long-term chronic exposure to a toxicant or combination of toxicants. These carp abnormalities were documented in parts of Lake Mead known to be razorback sucker spawning areas (Bevans et al. 1996).

In a study of contaminants in fish caught in backwater lakes on the Cibola, Havasu, and Imperial National Wildlife Refuges on the LCR, high, near-toxic, concentrations of selenium were found (King et al. 1993). Elevated levels of arsenic, cadmium, copper, lead, and zinc were also found in some fish samples.

In a separate study, contaminants found in wildlife carcasses from various sites in the southern LCR area were elevated above background levels, but did not exceed thresholds associated with poisoning or reproductive problems; these include DDE, aluminum, arsenic, chromium, cadmium, copper, and selenium (King and Andrews 1996). However, selenium was present in one killdeer liver at potentially toxic levels.

5. Wildfire Frequency in the Action Area.

Lightning and human-induced burning of southwestern floodplain environments appear to have increased markedly as native willow/cottonwood vegetation has been replaced by saltcedar - a fire-adapted non-native species - and other shrubs (Busch 1995). From 1981 through 1992, 183 fires burned 16,300 hectares (approximately 37%) of riparian vegetation along the LCR (below Davis Dam) and the Bill Williams River. Plant cover data suggest that saltcedar and arrowweed have dominated other types of vegetation after these fires (Busch 1995).

Table 14. Visitation to selected areas along the Lower Colorado River.

Notes: Abbreviations are: LMNRA - Lake Mead National Recreation Area (which includes Lake Mohave); BWNWR - Bill Williams National Wildlife Refuge; CNWR - Cibola National Wildlife Refuge; HNWR - Havasu National Wildlife Refuge. The averages presented are based on data provided by the administrators of the areas involved, which is incomplete in some cases.

Location	1995 Monthly Avg.	1996 Monthly Avg.	Change 1995-1996
LMNRA	849,628	846,300	- 0.4%
BWNWR	580	1,855	219%
CNWR	3,343	3,688	10.3%
HNWR	46,910	48,212	2.8%
INWR	8,988	9,992	11.2%

Previous and Ongoing Section 7 Consultations

1. Lower Colorado River Mainstem

Since 1973, Reclamation has informally and formally consulted under section 7 of the ESA for various projects that potentially may have had direct or indirect effects on threatened and endangered species and critical habitat along the LCR (**Table 15**). Although the projects have varied substantially, as have the effects, the Service has concluded that the projects consulted on would not jeopardize the continued existence of any species or its critical habitat. In some consultations, incidental take was addressed by reasonable and prudent measures (RPMs). These consultations are considered part of the environmental baseline.

Table 15. Bureau of Reclamation's section 7 consultations for threatened and endangered species on the Lower Colorado River.

Project Name	Species Involved	Fish and Wildlife Service Consultation Results	FWS Written Determination
Topock Marsh Dike Construction	Yuma clapper rail Peregrine falcon Bald eagle	"Non-jeopardy" with RPM's	09/13/84
Parker II Division Channel Modification	Bald eagle Yuma clapper rail	"Non-jeopardy" with RPM's	01/27/86
Mittry Lake Water Delivery System	Yuma clapper rail	"Non-jeopardy" with RPM's	10/29/87
Yuma Division Channel Modification and Levee Project	Yuma clapper rail Bald eagle	"Non-jeopardy" with RPM's	07/07/88
Nevada's Full Water Allocation	Desert tortoise	"Not likely to adversely affect"	02/21/92
Mittry Lake - Florida Largemouth bass Stocking	Yuma clapper rail Razorback sucker	"Will not likely affect"	05/07/92
Backwaters Dredging Restoration A-10	Bald eagle Yuma clapper rail Razorback sucker	"Will not likely affect"	05/08/92
Havasu Pumping Plant Recreation	Razorback sucker Yuma clapper rail Bald eagle Peregrine falcon	"No effect"	07/14/92
Backwaters Dredging Restoration C-10	Bald eagle Yuma clapper rail Razorback sucker	"Will not likely affect"	09/17/92
Parker II Channel Modification (Project continuation)	Razorback sucker	"Will not adversely affect"	08/09/94
Management of Lake Mohave Water Elevations	Bonytail Razorback sucker	"Not likely to adversely affect"	12/28/94
Hoover Dam Powerplant Uprating	Razorback sucker Bonytail Bald eagle Peregrine falcon Desert tortoise	"Not likely to adversely affect"	03/10/95

Project Name	Species Involved	Fish and Wildlife Service Consultation Results	FWS Written Determination
Southern Nevada Water Authority Treatment and Transmission Facility	Bonytail* Southwestern willow flycatcher* CA brown pelican* CA least tern* Bald eagle** Peregrine falcon** Razorback sucker** Mojave Desert tortoise***	* "No effect" ** "Not likely to adversely affect" *** "Likely to affect	Informal 06/05/95; Formal consultation on tortoise due 9/3/96
Black Canyon Bridge Crossing (PROJECT CANCELED)	Peregrine falcon Bald eagle Bonytail Razorback sucker Desert tortoise	"May affect" Desert tortoise and Peregrine falcon; "Will not affect" other species	06/19/91
White amur stocking	Yuma clapper rail	"No effect"	05/09/90
Dredge - RM 30.6 to 35.0	Yuma clapper rail	"No effect"	04/18/84
Title I, A-22 Disposal Site	NONE	"NONE"	EA written 12/26/85
Havasu Division Dredging RM 217.6 - 218.5	Yuma clapper rail	"No effect" (see note b)	EA written 05/13/85
Bank Stabilization Parker II Critical Areas	Yuma clapper rail	Reclamation BA concluding No effect	Letter to FWS 09/13/84
Senator Wash Reservoir Veg. Removal	Yuma clapper rail	CF-50-85	1985
Mittry Lake Mitigation - Title I	Yuma clapper rail	"No effect"	07/16/86
Nevada Levee Extension	No listed species		11/14/85
Dredge Imperial National Wildlife Refuge	Bald eagle Yuma clapper rail	"No effect" (see note b)	Provided
Three-Fingers Lake	FWS	FWS	
Yuma Division Project	CANCELED	CANCELED	CANCELED
No Name Lake	Razorback sucker	"Not likely to adversely affect"	01/09/95
Irrigation facility Quechan Tribe	BIA	BIA	BIA
Quarries	Peregrine falcon Bald eagle Brown pelican Yuma clapper rail	"No effect" (see note b)	EA/FONSI 06/03/83

Project Name	Species Involved	Fish and Wildlife Service Consultation Results	FWS Written Determination
Backwater Restoration C-8	Bald eagle Yuma clapper rail Razorback sucker	"Not likely to adversely affect"	10/14/94
Backwater Restoration C-5 & A-7	Bald eagle Yuma clapper rail	"Not likely to adversely affect" (see note b)	EA 01/91
Quarries	Desert tortoise and others	Ongoing	
Maintenance activities/Irrigation facilities - Imperial & Riverside Counties CA	Desert pupfish	"No effect"	06/18/86
Imperial Division Enhancement Project	Razorback sucker & critical habitat	"May affect, not likely to adversely affect" - No adverse modification	11/21/95
Imperial Division Enhancement Project	Yuma clapper rail	"Not likely to adversely affect"	02/06/96
Spring Canyon Pumped Storage	Bald eagle Peregrine falcon Bonytail Humpback chub Colorado Squawfish Woundfin	"No effect"	04/16/87
Hoover Dam Spillway Modification	Peregrine falcon Bald eagle Bonytail Devil's Hole pupfish	"No effect"	02/27/85
Bullhead City and Lake Havasu City increased water allocations	Peregrine falcon Bald eagle Yuma clapper rail	"No effect"	Provided
All-American Canal Lining	Yuma Clapper rail Razorback sucker and critical habitat	"No effect on LCR habitat or species"	02/08/96
Southern Nevada Water System Facilities Improvement Project	Mojave desert tortoise	"Non-jeopardy" w/RPM's	12/6/94

[a] The biological assessment was written in the Environmental Assessment. Reclamation concluded No effect, with no negative comments by the Service after reviewing the EA and the Finding of No Significant Impact.

[b] Reclamation concluded in the Environmental Assessment that there were no endangered or threatened species in the area.

SOURCE: Bureau of Reclamation Biological Assessment.

2. Other Baseline Projects

In addition to Reclamation activities that were evaluated for direct or indirect effects on the mainstream of the Colorado River, section 7 consultation and National Environmental Policy Act compliance have been completed or are in the process of being completed for authorized projects that provide facilities for the States to divert and distribute State waters confirmed by previously discussed court decrees. The Central Arizona Project (CAP) and Robert B. Griffith Water Project (southern Nevada) are summarized below as part of the environmental baseline.

a. Central Arizona Project Havasu Diversion

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

Reclamation has consulted formally and informally on over 50 CAP-associated projects. In April of 1994, after three years of intensive formal consultation with Reclamation , the Service issued a final BO on the Transportation and Delivery of Central Arizona Water to the Gila River Basin (Hassayampa, Aqua Fria, Salt, Verde, San Pedro, middle and upper Gila Rivers, and associated tributaries) in Arizona and New Mexico. The opinion found that deliveries of CAP water would jeopardize the continued existence of the spikedace (*Meda fulgida*), loach minnow (*Tiaroga cobitis*), Gila topminnow (*Poeciliopsis occidentalis*), and razorback sucker and would adversely modify the critical habitat of the spikedace, loach minnow, and razorback sucker. Reclamation is now in the process of implementing the reasonable and prudent alternatives (RPAs) presented in the opinion. Reclamation's Phoenix Area Office is also preparing a biological assessment on the delivery of water into the Santa Cruz River Basin.

The CAP begins at the Havasu Intake and Pumping Plant, located at the lower end of Lake Havasu downstream of the Bill Williams River Delta and within the Havasu National Wildlife Refuge. The Havasu Pumping Plant has the capacity to lift 2.2 maf per year of Colorado River water 800 vertical feet to the Hayden-Rhodes Aqueduct. Each of the six pump units has a capacity of 500 cfs. Trash racks with openings 6 x 16 inches cover the pump intakes, and estimated water velocity in front of the trash racks is 1.1 feet per second.

Reclamation's Havasu Intake environmental impact statement (EIS) (Jan. 1973) addressed native, rare, and endangered species, concluding that "...very few fish in comparison to the overall fish population on Lake Havasu will move through the intake channel and be adversely affected by pumping operations. These fish would be types oriented to open water movement and feeding, such as threadfin shad and striped bass." The EIS stated that there would be a monitoring program to assess losses of fish and other aquatic biota in Havasu and "...data obtained in this initial phase and subsequent phases will be evaluated to determine whether protective measures

are required." The emphasis at that time was clearly on sport fishes. The Fish and Wildlife Coordination Act (FWCA) Report from the Service, dated June 30, 1976, also recommended studies to determine the extent of any fishery losses. At the time of the EIS and the FWCA report neither the bonytail nor the razorback sucker were on the endangered species list.

In 1989, the Service, Arizona Game and Fish Department, and Reclamation cooperatively submitted a report on the Lake Havasu Fishery Study. Sampling was conducted on either side of a half-mile long dike that forms an embayment leading to a cement-lined channel and the pumping plant. Seasonal sampling was conducted from the spring of 1984 to December 1985. No razorback suckers were found during this study. However, adult razorback suckers were observed in the CAP canal in 1986 (Mueller 1989).

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

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

Improvements to the Southern Nevada Water System (SNWS) were identified in the 1994 Final Environmental Assessment of the Colorado River Commission's Proposed SNWS Facilities Improvement Project. The improvements are associated with existing facilities. As part of the environmental compliance, Reclamation entered into formal section 7 consultation with the Service on Aug. 31, 1994, for the Mojave desert tortoise, a federally listed threatened species. On Dec. 6, 1994, the Service rendered its BO that the SNWS Improvement Project is not likely to jeopardize the continued existence of the threatened Mojave population of the desert tortoise and no proposed critical habitat will be destroyed or adversely modified. An Incidental Take Statement was issued with RPMs to minimize take.

A draft EIS for the proposed Southern Nevada Water Authority Treatment and Transmission Facility (SNWA-TTF) was provided for public review and comment in November 1995. A final EIS is expected soon. Reclamation initiated formal consultation on the desert tortoise on Aug. 15, 1995, and received a draft BO on Dec. 18, 1995. Because of a number of project refinements, Reclamation requested a number of extensions to incorporate these changes into the final BO. The additional information and comments were provided to the Service on June 26, 1996, and a final BO was completed on September 16, 1996.

The BO found that the proposed project is not likely to jeopardize the continued existence of the threatened Mojave desert tortoise population and no critical habitat will be destroyed or adversely modified. An Incidental Take Statement was issued with RPMs to minimize take.

3. Salton Sea and the Endangered Desert Pupfish

A summary of past ESA consultations on the endangered desert pupfish in the Salton Sea area is provided below. Following listing of the desert pupfish as an endangered species in 1986, a BO

was issued by the Service (June 18) on the effects of agricultural drain maintenance on this species. The opinion found that both agricultural drain maintenance activities and the introduction of sterile grass carp would not jeopardize the continued existence of desert pupfish. The opinion allowed for unlimited incidental take of the species during drain maintenance.

When the desert pupfish was listed as an endangered species (March 31, 1986), critical habitat was designated for the species along San Felipe Creek/San Sebastian Marsh, an intermittent stream and marsh complex on the west side of the Salton Sea. Reclamation purchased all of the private land holdings within the critical habitat area for $300,000 and turned this land over to the California Fish and Game Department under a quitclaim deed in 1990.

In June 1992, a second BO was issued regarding drain maintenance and its affect on desert pupfish. The consultation involved the Salton Sea National Wildlife Refuge drains maintained by Imperial Irrigation District. The opinion again found that the drain maintenance would not jeopardize the desert pupfish; however only a limited incidental take was allowed due to recent observations of increased pupfish populations in the drains. This opinion also covered effects on Yuma clapper rails and California brown pelicans. Similar to the desert pupfish, the Service was of the opinion that drain maintenance would not jeopardize the continued existence of either species.

4. Operation of Glen Canyon Dam

The operation of Glen Canyon dam by Reclamation affects the timing and amounts of water and sediment flows to Lake Mead, at the upstream end of the action area currently under analysis. A BO was prepared by the Fish and Wildlife Service, on the proposed action to operate the dam according to operating and other criteria of the Modified Low Fluctuating Flow Alternative. This alternative was described as the Preferred Alternative in the Final EIS on the operation of Glen Canyon Dam issued in March, 1995, and was selected for implementation in the Secretary of Interior's Record of Decision dated Oct. 9, 1996. The BO (dated Jan. 7 , 1995) found that the dam operations were likely to jeopardize the continued existence of the humpback chub and the razorback sucker and were likely to destroy or adversely modify designated critical habitat for the two species. The BO noted the connection between the Glen Canyon dam operations and the potential for razorback sucker recovery downstream, including Lake Mead (in the action area currently under analysis), with primary adverse effects due to altered temperatures, flow regimes, and, possibly, sediment load. A reasonable and prudent alternative was developed to limit jeopardy to the endangered fish. The impacts of the operation of Glen Canyon Dam on the southwestern willow flycatcher are to be addressed in a later consultation.

5. Spring 1996 Beach/Habitat-Building Flow, Glen Canyon Dam

The BO by the Fish and Wildlife Service, dated Feb. 16, 1996, addressed the potential effects of flood-mimicking flows from Lake Powell through the Glen Canyon Dam designed to build beaches and improve wildlife habitat downstream. The final opinion found no jeopardy or adverse modification of critical habitat. RPMs for addressing incidental take were imposed for the southwestern willow flycatcher. The measure called for specific surveys and monitoring, and the initiation of formal consultation by February, 1997.

6. Fish and Wildlife Service Intra-Service Formal Consultation on Division of Federal Aid Transfer of Funds to Arizona Game and Fish Department for Stocking of Sportfish

The BO, dated Oct. 31, 1995, was on the Service's Federal Aid funding of Arizona Game and Fish Department's non-native fish stocking in 90 locations across the state, including the LCR, for the period 1995-1999. Following further informal consultation, the Division of Federal Aid submitted only the stocking sites and fish species for which it found no effect or not likely to adversely affect. The Service's Division of Ecological Services concurred with those findings.

7. Lake Havasu Fisheries Improvement Partnership Program Formal Consultation

This BO, dated February 18, 1993 addressed the Bureau of Land Management and cooperating agencies and entities' plan to: (1) improve fishing facilities; (2) place fish habitat structures; and, (3) augment existing bonytail chub and razorback sucker populations in Lake Havasu over a five to ten year period. Cooperators included Reclamation and the Service. The augmentation program for native fish would put 30,000 young bonytail chub and 30,000 young razorback suckers into the reservoir. The Service found that the proposed action, including the augmentation program, was not likely to jeopardize the continued existence of either species or adversely modify designated critical habitat for the bonytail chub. RPMs to minimize incidental take, especially from anglers, were included in the incidental take statement.

8. Fish and Wildlife Service Intra-Service Formal Consultation on Division of Fisheries and Federal Assistance on Stocking of Rainbow Trout and Channel Catfish

The Service proposed to stock catchable size rainbow trout and channel catfish into selected area of the LCR from below Hoover Dam to the international border to enhance recreational fishing. According to the BO issued July 1, 1994, the proposal would neither jeopardize the razorback sucker or bonytail chub nor would it adversely modify their critical habitat. An RPM was imposed to minimize the opportunity for contact between the trout and the endangered fish. Terms and conditions to implement the RPM included the introduction of 10,000 advanced fingerling razorback suckers a year to Lake Mohave for five years (1995-1999) and 25,000 advanced fingerling bonytail chub a year to Lake Mohave for four years (1996-1999) to augment declining populations of these species in the reservoir.

EFFECTS OF THE ACTION

This section addresses the proposed action's effects on the species under consultation. It also considers cumulative effects on these species in the action area, which include the effects of future State, local, tribal, and private actions that are reasonably certain to occur in the next five years. Future Federal actions that are unrelated to the proposed action are not considered here because they would require separate consultation pursuant to section 7 of the ESA.

Listed species/critical habitat:

Bonytail Chub and Razorback Sucker with Critical Habitat

The effects analysis is driven by the description of the proposed action. Reclamation defines the action in the BA as including only those activities for which Reclamation has discretion. Unlike most section 7 consultations where the proposed action has not been implemented, significant adverse effects to native fish species and habitats began to occur as much as 100 years ago due to the actions of Reclamation, other Federal agencies, and a variety of non-Federal parties with rights or interests on the river. The operation and maintenance program of the proposed action largely maintains the existing conditions of the LCR.

The analysis will be done in two stages. The first will examine the effects of activities included in the environmental baseline. The second will examine the proposed action for five years into the future, looking at direct (including effects of interrelated and interdependent actions), indirect, and cumulative effects. Unless the proposed management would result in a change to an effect arising from the baseline, all effects from the first stage analysis are presumed to carry forward into the second stage, in other words, they are additive. The analyses of effects for both the environmental baseline and the five-year period for the bonytail chub, the razorback sucker, and their designated critical habitats are nearly identical. These analyses have been combined into one to reduce duplication.

Effects of the Environmental Baseline

As described in the environmental baseline and the BA, the LCR is a managed river with three large dams (Hoover, Davis and Parker) and five small dams (Headgate Rock, Palo Verde, Imperial, Laguna and Morelos) that provide diversions for agricultural and municipal uses serving three states and the Republic of Mexico. All but one (Morelos) were built by or are operated by Reclamation. Hydropower produced by the system is partially used within the project area, but most is exported. Channelization and levee construction has allowed much of the floodplain to be developed for agricultural, recreational, residential and commercial uses. In addition to physical changes, non-native fish, invertebrates (crayfish and Asiatic clams), and trees (*Tamarix sp.*) have become established to the detriment of many native species of plants and animals.

Construction and operation of Hoover, Davis, and Parker dams had effects to the river both upstream and downstream of the dams themselves. The specific operation of these dams and their associated reservoirs differs between facilities. These large dams are barriers to fish migration and produce fragmented habitats and populations. Dams may not be complete downstream barriers, but are complete upstream barriers to fish migration. The severity of this effect depends on the location of the fish populations relative to the barrier and essential habitats. For example, leaving a few fish on one side and many on the other exposes the smaller population fragment to larger risks of extirpation. Spawning and nursery habitats may not be equally available on either side of the barrier, further stressing both populations. The construction of the three large dams on the LCR isolated populations of bonytail chub and razorback sucker, prevented most upstream movements (the exception being from Lake Mead into the Grand Canyon), and reduced access to

essential habitats especially in the floodplains. These effects resulted in degradation to constituent elements of the physical environment for the bonytail chub and razorback sucker.

The large dams provided a means to control flood events and provide for water on demand for agricultural and municipal purposes. Disruption of the natural hydrograph modified natural flows and created large reservoirs; thus, interrupting the biological behavior for native fish, while enhancing habitat conditions for non-native fish. The new release schedules largely eliminated the spring-early summer floods and provided higher than normal releases through the late summer to late fall to accommodate agricultural and other needs. Without the high spring to summer flows, bottomlands important for adult razorback suckers as feeding areas and nursery areas for the young of the year either remained impounded behind dams or were not flooded, thereby interfering with the ability of adult fish to recruit successfully to replenish existing populations. Floods were also the dominant force in creation, refreshment and destruction of marshes, backwaters, and riparian vegetation on the terraces. Without high flows, this cycle of habitat succession became impaired (Carlson and Muth 1989). Cues for migration and reproduction based on rising or falling water levels also have been lost. Retention of higher flows for longer periods in the summer may have improved water quality in the shallow backwaters and channels by allowing for more water circulation, but more extreme short-term water level fluctuations may have negated all improvements of habitat for native fish. The pattern of releases also became regular, varying in a set pattern on a daily, weekly and monthly basis, although the actual amount of fluctuation was less downstream as peaks were attenuated. Daily variations could be extreme depending upon the water release schedule power production and other needs. Below dams, over a 24-hour period, changing water depths and velocities could strand fish in adjacent shallows or drain backwaters and marshes, and alter the form of the river channel itself through changes in sediment transport and channel modification. These effects degraded the critical habitat constituent elements provided by water and the physical environment.

Water released from large dams is clear and picks up sediment from below the dam and transports it further downstream. This transport is uneven due to the changing flows created by dams. These flows eventually lead to armoring of the river bottom in the tailrace (Moffett 1942, Dill 1944, Carlson and Muth 1989) and deposition of sediments downstream. Clear water and hard substrate in the armored tailrace provides sites for aquatic plants, especially filamentous algae, to become established. A variety of aquatic insects colonize plant beds. Before the dams, the main channel was not very productive due to turbidity and unstable substrates. With sediment and the organic materials carried with it being trapped in reservoirs, the river lost its capacity to transport nutrients downstream to backwater and ponded areas. Thus, the amount of sediment transported or available to be transported to downriver nursery areas is now greatly reduced.

Hoover and Davis dams release cold water from the hypolimnion located in reservoirs immediately upstream. Water temperatures are relatively constant at the base of each dam and do not reflect seasonal changes that occurred historically. Although water temperatures increase gradually as flows continue downstream, temperatures may vary from seasonal changes that occurred historically. Water temperature-related cues to trigger spawning behavior may be impaired throughout much of the lower river. The new water temperatures of 12-16°C (below Hoover) are within the range of temperatures normally experienced by bonytail chub and razorback sucker in the Colorado River (5-30°C or higher) (Carlson and Muth 1989). However,

the modified flows do not reach water temperature levels necessary for bonytail chub reproduction, as this fish spawns at no less than 18°C (USFWS 1990). Razorback suckers however, spawn at water temperatures of 10°C to 20°C (Bestgen 1990), well within the temperature range of water coming from Lake Mead. Additionally, adult razorback suckers have been found within the area of influence of the cold water releases below Hoover Dam during the spawning season. After hatching, larval razorback suckers prefer warmer water, 21-24°C (Sigler and Miller 1963), found in flooded bottomlands, backwaters, and shallow water margins of the channel. Temperatures such as these are not normally attainable in the tailraces, however depending upon the extent of larval drift (itself influenced by the changing flow conditions), such temperatures could be present downstream. Bonytail chub have occasionally been found in the colder water areas, but with their very low population size, more definitive information on use of these coldwater areas is not available. These changes to water temperature have degraded this constituent element.

Downstream effects caused by large dams adversely impacted the bonytail chub and razorback sucker populations in the river. However, at the same time, more aquatic habitat was provided by the new flow regimes, more warm water temperatures were available in reservoirs, and local increases in productivity and decreases in turbidity may not have eliminated the constituent elements needed by native fish to survive through time. These native fish species had demonstrated their ability to thrive in the great extremes in physical conditions characteristic of the LCR historically. However, these changes also improved and greatly increased habitat for non-native fish species that were either already present or soon to be introduced into newly created reservoirs and thus adversely modified the biological environment constituent element for native fish.

As changes occurred to the water and physical environments, non-native fish and invertebrates prospered. Introduced fish species generally compete with or prey on native fish, especially, eggs, larvae and juveniles. Other introductions, such as threadfin shad (*Dorosoma petense*) and the Asiatic clam, were likely competitors and added to populations of non-native predators by providing an additional forage base. Thus, introduction, establishment, and maintenance of non-native competitors and predators further impaired the opportunity of native fish to adapt and survive in a river system where physical environments and water constituents are altered.

Carp have been identified as significant predators on razorback sucker eggs. Carp were introduced to the LCR before the large dams were constructed. While carp live successfully in turbid waters (LaRivers 1962, Lee et al. 1980), early observations noted these species in clearer backwater areas (Grinnell 1914). Whether carp could survive and expand in sizable numbers in the high sediment loads of the LCR mainstem is not clear. In the Upper Basin, larger populations of carp are found near backwaters (Joseph et al. 1977). Growth rates for carp in riverine areas in general are lower than in reservoirs (Carlander 1969). Water temperatures in the cold tailraces are generally too low to provide spawning habitat for carp, but are well within their survival range (Carlander 1969). Although sediment loads increased downstream from the dam, they settled out again at the next downstream reservoir, backwater or ponded area, thereby enhancing carp habitat. Dam construction and subsequent impoundment has increased the aquatic habitat in the Colorado Basin from some 15 maf of riverine habitat to 60 maf of reservoir and riverine habitat; under these conditions, carp populations have expanded dramatically.

Channel catfish prey on small fish and were present in the LCR by the 1900's. Within their native range, channel catfish are found in a wide variety of habitats, although there may be a preference for clear water rivers of various sizes (Miller 1966, Allan and Roden 1978, Minckley 1979, Lee et al. 1980). Habitat data from a number of locations indicates that sediment load is not a major factor in defining channel catfish habitat (Dill 1944, Miller 1966). Channel catfish utilize mainstem-type habitats such as deep pools or riffles, depending upon size and age of individual fish (Miller 1966). Water temperatures in the cold tailraces are not an impediment to channel catfish occupancy (Dill 1944), but are too cold for spawning. However, ample opportunities for successful catfish spawning elsewhere in the modified river are available. The increased productivity of filamentous green algae and aquatic invertebrates provided additional feeding opportunities for this species.

Upstream of the large dams, riverine, backwater, marsh, and riparian vegetation in the floodplain was lost to inundation as water backed up behind the dams, adversely affecting the physical habitat. These habitats were replaced by large reservoirs (Lakes Mead, Mohave, and Havasu). Water levels in all three reservoirs now fluctuate over the year in patterns resulting from flood control requirements, consumptive use of water downstream, and hydropower generation. Fluctuations in water levels can strand eggs or larvae and force young fish out of cover provided by vegetation and shallow water; thus increasing the risk of predation. Razorback suckers spawn in late winter and early spring, but young-of-the-year are subject to predation when levels begin to recede. The voluntary reduction of fluctuations to protect growout coves for razorback suckers in Lake Mohave has provided opportunities to implement short-term recovery actions for this species. At the same time, stabilized water levels also benefit later spawning non-native fish, which put additional pressures on bonytail chub and razorback sucker eggs and fry not in "protected" coves. Reservoir water level management has effects to the constituent elements of water, and the physical and biological environments.

Because of water level fluctuations, stands of riparian vegetation around reservoir shorelines are limited. Lake Havasu, because of the less severe annual fluctuations, has the most extensive marsh area of any of the three large reservoirs. Backwaters in reservoirs are of two types; the first are shallow coves fully connected to the reservoir proper, the second are small waters cut off from the reservoir except perhaps during times of very high water. Both types of backwaters are adversely affected by falling water levels in reservoirs and thus the value of these shallow waters can be diminished depending upon specific operations at each dam. Generally, falling water levels that expose fish eggs and protective cover for young fish, or that reduce the size of isolated nursery areas during the difficult summer months, have a negative impact on native fish.

Historically, the LCR mainstem was not extremely productive for aquatic plants and animals. However, adjacent backwater areas were extremely productive. Low productivity of the mainstem was due in large part to high turbidity and unstable substrates. As noted previously, large dams allowed for greater productivity in the main channel due to armoring of substrates and increased water clarity. Available nutrients carried downstream from the modified channel area deposit either in remaining riverine stretches or in reservoirs. Some of the organic material remains suspended in the water, but some becomes trapped in the sediments deep in the reservoirs and thus becomes unavailable to aquatic organisms or for further transport downstream to backwater areas. Overall, reservoir productivity is generally not high, with LCR reservoir averages generally in

the mesotrophic range (Paulson et al. 1980. Roline and Lieberman 1984). Since historically much of the productivity of the LCR was provided from off-site sources and carried downstream through the system, this interruption of nutrient flow (most of which has settled out in upstream reservoirs) has affected productivity in Lower Basin reservoirs and remaining backwater areas. Elimination of riparian, marsh and backwater conditions by creation of reservoir pools may have contributed to declines in productivity also. As with other large reservoirs, productivity in the LCR reservoirs has decreased over time, but in the years immediately after high water levels inundated shoreline areas in Lake Mead, higher production of fish was noted (Jonez and Sumner 1954, Allan and Roden 1978).

Bonytail chub and razorback sucker adults utilize reservoir habitats with considerable success, as has been shown by the persistence of adult populations in Lakes Mead, Mohave, and Havasu. But, reservoirs also produce carp, channel catfish, and a host of other species introduced to and maintained in reservoirs for sport fishing. Populations of largemouth bass, bluegill, rainbow trout, threadfin shad and striped bass are in the LCR in considerable numbers because of large reservoirs. Largemouth bass prefer non-flowing water habitats such as ponds, lakes, and backwaters with clear water and some type of aquatic vegetation (Emig 1966, Carlander 1969). Bluegill prefer similar habitats (Carlander 1969), while green sunfish are habitat generalists (McKechnie and Tharratt 1966, Lee et al. 1980). Declining water levels increase the risk of non-native predation on young native fish if they are forced out of cover (Carlander 1969, Allan and Roden 1978). After high water years, largemouth bass populations increased due to inundation of usually dry lands at Lake Mead (Jonez and Sumner 1954, Allan and Roden 1978).

The five smaller dams do not have the magnitude of effects that larger dams do; but, the same types of effects exist. Flows downstream of the smaller dams do not fully mimic the natural hydrograph, and are often smaller than the flows reaching the dam due to withdrawals via diversion dams and associated canals. Water temperatures do not change due to stratification because there is no hypolimnion in the reservoir. If water storage occurs, it is limited and resembles a pond or small lake habitat rather than that of a large reservoir. Water behind the dam is ponded, and the ponding effect offsets some of the fluctuations resulting from varying releases upstream. Aquatic plants grow well in impounded waters; emergent plants such as cattails and rushes also do well near reservoir shorelines. The largest of these areas is behind Imperial Dam and contains several backwaters, as well as the ponded area of the channel. Conditions in these areas are probably suitable for bonytail chub and razorback sucker, but they also support large populations of non-native fish species including carp, channel catfish, largemouth bass, green sunfish and bluegill that are more competitive and flourish in reservoir environments. Minckley (1979), after surveys of the Colorado River downstream of Davis Dam, determined that the non-native fish fauna preferentially occupied the more lentic portions of the river, including ponded areas. Thus, small dams also have an adverse effect on the three primary constituent elements of water, physical environment and biological environment.

Movement of sediments through the system had always been a concern for water users. With dam construction, sediment deposition behind small dams and at the heads of large reservoirs became a management issue. This concern was first apparent at Laguna Dam, which silted in within a year following its completion.

The first project to address deposited sediments took place at the head of Lake Havasu. As water velocities dropped due to the effects of lake elevation, the slowing water deposited sediments at the head of Lake Havasu. These depositional areas supported riparian and marsh vegetation and a meandering river channel with associated backwaters (Beland 1953). Water continued to back up above the depositional area and, as described in the BA, measures to protect the town of Needles were undertaken. The effect of these measures was to re-route the Colorado River to a new, straight channel and eliminate the old, meandering channel with its associated backwaters, marshes, and riparian areas (Beland 1953). The new channel was completed in 1951 and cut off the old river channel and its associated aquatic and riparian habitats. Elimination of most of the marsh area removed a source of non-native fish to other parts of the river, but it also eliminated preferred habitats for native species. The constituent element for physical environment was adversely affected. The higher water velocity in the new channel generally kept suspended sediments from being deposited before they reached Lake Havasu. Some down-cutting of the channel occurred also, further stressing water levels in the remaining marshes on the other side of the levee separating the two (Minckley 1979). Protection of the remaining marsh required a dike and headgate system to retain water levels and flows. The smaller marsh area provided suitable habitat for non-native fish species adapted to still, clear water situations. All native fish utilizing the same area were subjected to predation and competition stresses, thereby resulting in adverse effects to the biological environment element.

Virtually all the riverine reaches remaining after the construction of the large and small dams were channelized or stabilized to some degree. In areas such as upstream from Lake Havasu, as well as near Palo Verde and Cibola, new river channels were cut in the former floodplain to divert almost the entire flow from the old, meandering channel to the new straight one. Other projects straightened, dredged and stabilized banks within the existing channel. The intent of these activities was to provide faster, more efficient transport of water to downstream users, with flood control and safety issues also playing a role. In so doing, backwaters and marshes were isolated and sometimes dried up, as flows could no longer reach them, and thus the heterogeneity of the main channel habitats was lost (Minckley 1979). Generally, such reaches lack mid-channel bars and are almost uniformly deep and swift, with little seasonal variation over the year (Beland 1953, Ohmart et al. 1988). Areas containing aquatic plants are rare in these reaches too, and invertebrate populations are depauperate (Minckley 1979).

While main channel habitats were utilized extensively by bonytail chub and razorback sucker, backwater areas were also very important. The main channel was used extensively when moving from backwater to backwater, when moving to spawning, rearing, and nursery areas, and as refuges during periods of low flows when backwaters were either not suitable or available. With new flow regimes from the dams, there were changes to the main channel. Thus, the constituent elements of water and physical habitat were significantly affected by channelization and stabilization programs.

For non-native fish, reductions in flood events may have had a positive effect, as did clearing of the water and changes in sediment transport. Although all non-natives seemed to prosper, channel catfish and perhaps carp prospered disproportionately, as abundance of both species became more apparent after 1930. Channelization activities did not improve habitats for non-native fish. The most modified areas of the channel (deep water with linear currents and shifting fine-grained

substrates) were the least occupied by all fish (Minckley 1979); examples of these types of areas are in the Mohave Valley, Topock Gorge, Parker, Palo Verde, Cibola, and Imperial Divisions of the LCR. Only in the Topock Gorge Division can these conditions be tied to natural features of the river. There was some use of channelized reaches by several species including carp, channel catfish, largemouth bass and green sunfish (Minckley 1979), but use was less than in less modified habitats or lentic environments. Lentic habitats such as backwaters and low-current portions of the channel were preferred by most non-native fish species (Minckley 1979). The deleterious habitat overlap between non-native and native fish species was shown in this joint preference for backwater-type habitats.

There is little specific information on habitat quality of backwaters prior to development of facilities on the LCR. Historically, backwaters could be completely isolated, partially isolated or connected to the main channel of the river. Flooding might temporarily have re-connected isolated or partially isolated backwaters to the river, thereby providing for water exchange and fish movement into and out of the backwater areas. Flooding might also have created, enhanced or obliterated backwaters. Seasonal changes in water levels in the main channel also influenced water levels in backwaters. Naturally low flows in the hot summer months increased water quality problems, water temperatures, influenced productivity by exposing aquatic plant beds and substrates supporting invertebrate populations, and dried up backwaters permanently or temporarily. Fish in isolated backwaters had no escape if conditions became too harsh, but fish in connected backwaters could move from backwaters into the main channel. Because of the natural historical flooding regime, the physical state of backwaters was constantly being adjusted or altered. The habitats were very dynamic and were extensively used by bonytail chub and razorback sucker.

Today, many backwaters are isolated behind dikes or levees, and water flow is through permeable dikes. Some backwaters may have simple inlet-outlet structures, while others retain an opening to the river. The magnitude of the connection has a significant influence on how quickly or to what extent water levels in the backwater fluctuate. Backwaters connected to the river are most affected by fluctuations, since the connections allow them to fill and drain rapidly as water levels rise and fall (Kennedy 1979). Water levels in isolated or partially isolated backwaters may not be as affected by daily fluctuations due to reduced water exchange capacities with the river, but are affected by weekly and monthly changes in flow levels. Water quality problems such as high salinity and high temperatures in these backwaters are exacerbated by limited inflows and lack of seasonal refreshing floods. Fluctuations in water levels affect the potential for stranding fish or eggs, affect benthic productivity (invertebrates and plants), influence water quality and temperatures, and may increase predation of fish forced out of shallow water cover into deeper, more open situations (Kennedy 1979). While the longer term effects observed are largely the same as in the historic period, the patterns of daily and monthly fluctuations in the main channel have been altered significantly. These alterations have increased short-term (daily) changes, maintained higher levels for longer into the summer, and eliminated spring-summer peak flows. Attenuation of fluctuations downstream of dams or diversions, serves to reduce the daily changes, although diversion of water also reduces the total flow available. Thus, the further downstream a backwater is, the less water flows past, and the less potential there is for flushing to improve water quality, for rebuilding of stream morphology, or for providing access to the main river's habitats.

Operations on the river today influence the aging of backwaters, the gradual infilling that reduces areal size and depth over time. In the absence of flooding, maintenance of existing backwaters is through human intervention. "New" or enhanced natural backwaters are created by dredging at the site of old backwaters, perpetuating existing patterns of habitat. Many of these new or enhanced backwaters were created as mitigation for channelization projects on the river that possibly had destroyed other natural backwaters along the meandering channel. Mitigation under the National Environmental Policy Act and the Fish and Wildlife Coordination Act for these channelization projects was directed towards creating fish and wildlife habitats to offset losses. The program has been very successful at providing secure, physically diverse habitats along the river. However, non-native fish have inadvertently been the primary benefactors from mitigation projects. It is not a question of habitat appropriateness, because both bonytail chub and razorback sucker use backwaters extensively, rather it relates to the clear overlap in habitat preference by the two groups for backwaters, and a fisheries management regime that favors recreational fishing supported by non-native species. As long as habitat conditions improve for non-native fish, efforts to provide for recruitment of native fish are largely unproductive. Projects in which portions of created backwaters are blocked off for native fish refugia can be beneficial to short-term efforts where native fish are raised for release and thus replacement/maintenance of existing populations; such projects may not be effective in a long-term conservation strategy. Overall, past mitigation for channelization projects on the LCR has not provided overall benefits for the bonytail chub or razorback sucker. While backwaters are clearly part of the water and physical environment constituent elements of the habitat, the creation of stable and permanent backwaters that provide long-term habitat for non-native fish degrades the biological environment constituent element of native fish habitat. In other words, the habitat values of backwaters to native fish are negated to a large degree by the subsequent invasion of non-native fish.

With less and less water available to the lower river divisions (Laguna, Yuma and Limitrophe), there is a significant reduction in the amount and diversity of aquatic habitats available. The Limitrophe Division is now essentially dry, whereas historically there was much aquatic habitat. Extensive bank stabilization in the Yuma Division effectively prevents flows from meandering or forming backwaters or marshes even if the flow was sufficient. Water quality in these lowest divisions can be poor because of low inflows, high salinity irrigation returns, and high evaporation rates. Both the water and physical environment constituent elements have been adversely affected.

Water quality has also changed due to use and reuse of river water as it travels downstream. Agricultural return flows contain various residuals from fertilizers and pesticides as well as salts leached from the soils. Salinity in the river has increased measurably as a result of water usage and evaporation (Minckley 1979). Levels are not to the point where they pose a risk to fish health; however, increased salinity causes levels to be higher in areas of significant evaporation such as isolated and partially isolated backwaters. Without the types of flushing flows historically experienced by these areas, water quality remains less than optimal. The increase in salinity is to some extent degrading the physical environment constituent element. Other types of pollutants in the system have similar effects.

Reclamation includes several activities under endangered species conservation as part of the proposed action. Since all these projects are ongoing, they have a place in the environmental baseline. The implementation of these and other projects has improved the baseline condition of

the bonytail chub and razorback sucker in the LCR.

Through the Native Fish Work Group, Reclamation began the first significant efforts to restore razorback suckers to Lake Mohave. Reclamation's Boulder City Golf Course Native Fish Rearing Project also supports this program. These projects continue to be extremely important to the survival over the short-term of this species. Reclamation states that the goal of the NFWG is to put 25,000 bonytail chub and 50,000 razorback suckers into Lake Mohave by 2005 and 2000 respectively. In the BA, Reclamation also includes a provision for augmenting the Lake Havasu bonytail chub and razorback sucker populations with the release of 25,000 young fish of each species over the next ten years as part of its conservation actions. Also in the BA, Reclamation commits to providing the resources necessary to achieve at least half, if not more, of the quantified augmentation goals for the two reservoirs.

For the most part, these efforts on the part of Reclamation qualify as conservation actions under section 7(a)(1) of the ESA since these are voluntary efforts using existing authorities. The only portion that would not qualify would be whatever stake, as an official cooperator, Reclamation originally had in the Lake Havasu program being led by the Bureau of Land Management (BLM). However, what are conservation actions as far as Reclamation is concerned, are not actually conservation actions when all factors are examined. Reclamation's conservation actions have become interlinked with other projects that have undergone formal section 7 consultation, that include the production of bonytail chub and razorback sucker for Lakes Havasu and Mohave. These projects are the Lake Havasu Fishery Improvement Partnership Program led by BLM and the Service's rainbow trout stocking on the LCR (see Previous Section 7 Consultations section under Environmental Baseline, above.). The BLM and its cooperators and the Service are committed to the production of young native fish; indeed, if they are not produced as stated in the project description or the terms and conditions, then reinitiation of formal consultation would be required under the reinitiation standards included in regulations for section 7. Production of native fish is an integral part of these two actions and was a significant factor in the final analysis of the effects of those actions. Reclamation, by voluntarily increasing its involvement in the Lake Havasu program and assisting the Service in the retrofit of Willow Beach National Fish Hatchery and other tasks, so these fish production goals can be met, has undertaken conservation actions in the current proposed action that would benefit the fish, but Reclamation is not providing any more fish to the river than are already committed to by BLM and the Service under these two projects. Presumably these goals could be met without Reclamation's conservation actions; it is to Reclamation's credit that it has chosen to contribute resources to assist. The situation involving these same fish is further complicated with the additional funding to accelerate production that Reclamation and the Service provided as part of the first year interim conservation measures for the MSCP (see Appendix G of the BA). These additional resources may assist in meeting the goals of the Lake Havasu and Lake Mohave augmentation programs, but do not provide for any increase beyond attainment of these goals.

Non-Federal parties have had significant effects to the river and the floodplain through development of agricultural lands within the old floodplain, actual diversion of water from the river, and construction of homes, recreation areas, and businesses along the shorelines and adjacent lands, as well as maintenance of sport fisheries, and other types of developments that rely on the river in some form for success.

The actual diversions and associated canals that are located within the action area, but are not part of the proposed action, provide some aquatic habitats for fish. Although both native and non-native fish utilize canals for habitat, management of the canal system may provide opportunities for successful recruitment of razorback suckers. Young razorback suckers were found in the Colorado River Indian Tribe's (CRIT) canal system when that system was dewatered for maintenance. It may be that populations of non-native fish are suppressed by this canal management enough for the young razorback suckers to grow beyond the size of greatest risk from predation. Considerably more information is needed to understand why razorback sucker fry survived and grew to subadults in these canals.

The introduction of some fish species, such as rainbow trout and striped bass (*Morone saxatilis*), would not have occurred without the habitat changes provided by the construction of the large water storage dams. Largemouth bass, bluegill, green sunfish, black crappie, or threadfin shad may be similar, since their introductions were tied to sport fishing opportunities provided by the creation of reservoirs. Carp and channel catfish also spread successfully in the project area, partially due to alterations in aquatic habitats. Without the physical changes to the habitat resulting from the dams and other facilities, other development along the river would not have occurred to the extent that it has. Thus, there would have been fewer people and less reason for agencies to develop, maintain, and enhance recreational fisheries for an expanding human populace.

The introduction of the Asiatic clam and crayfish to the system are tied to the overall development of the river and its resources. The Asiatic clam provides an abundant food supply, especially for carp (Minckley 1979) that may be supporting populations of this species at a higher level than otherwise possible. Carp are a serious predator on razorback sucker eggs. Crayfish may provide an important resource of food for the Yuma clapper rail, but crayfish are also predators on small fish and are themselves prey for larger fish.

Information from the less modified habitats of the Upper Basin provides some insight. Aquatic habitats have been significantly affected by grazing, mining, dams and diversions, channelization and other actions similar to those in the Lower Basin. There are, however, several areas that have been less impacted by these actions in which native fish continue to exist. Self-sustaining populations of the Colorado squawfish and humpback chub are known (USFWS 1993a), and recent evidence of recruitment of razorback suckers exists (USGS 1996). Such populations are found primarily in riverine sections of the drainage where influence of reservoirs is less.

Even with the real and significant gains accomplished as part of conservation actions and other commitments in the environmental baseline, the status of bonytail chub and razorback sucker in the project area is far from secure. Just as no one agency or group can be held solely responsible for the present conditions on the LCR, no one action can be held solely responsible for the declines in the native fish populations. The changes to water, the physical environment and the biological environment that have resulted from the activities of Federal, State, local, tribal, and private parties have had significant adverse effects to bonytail chub, razorback sucker and the constituent elements of their critical habitats.

Effects of the Action

This analysis addresses the programs and activities proposed by Reclamation for the next five years. Because there are no fundamental changes to management proposed, the effects will be the same as the ones that have created the 1996 baseline. The same suite of Federal and non-Federal parties whose activities contributed to the development of the 1996 environmental baseline are expected to be involved in activities over the next five years.

Reclamation asserts that it has significant discretionary control over the front work and levee system maintenance. No new areas are proposed for treatment in the five year period, so additional effects to shorelines are not anticipated. Repairs to existing projects are not expected to result in net change in conditions existing at the time of the 1996 environmental baseline. Other discretion exists in maintenance methods for facilities, but no changes are expected in the proposed action. Any new dredging projects proposed for the next five year period may require additional consultation.

Another area of significant discretion is in voluntary conservation measures for threatened and endangered species. As described previously, Reclamation has provided considerable resources in funds, equipment and manpower for these activities.

The BA identifies two areas of effect to bonytail chub and razorback sucker that may result in take. Water level fluctuations in the reservoirs over the five-year period are not likely to cause the stranding of eggs or larvae, or reduce levels to the extent that a loss of cover for young fish would be a significant issue. In the riverine sections, seasonal and daily fluctuations are large enough that spawning and nursery areas for both species could be exposed, perhaps on a daily basis. For bonytail chub, the riverine area of interest is upstream from Lake Havasu, and for razorback suckers the riverine areas are those below Davis Dam and Parker Dam. Fluctuations below Hoover Dam are absorbed into Lake Mohave before any spawning or nursery habitat can be compromised.

The second area of effect is entrainment into canals via diversion facilities in the action area and passage of fish through dam powerplants and other operational water releases. While passage through dams may not be automatically fatal, as is clear from the way various non-native fish species have spread in the system, there is a mortality component. In addition, while the receiving water's population may be augmented by the survivors, there is a corresponding loss to the originating population. There is no information on the likelihood of passage through the dams, so the magnitude of this effect is difficult to assess. The risk could be higher with more fish in the population, as is projected to occur over the five-year period.

Entrainment into canals is the most likely effect of the proposed action to occur. Information already exists on razorback suckers being found in the Central Arizona Project (CAP) canal and in some of the irrigation canals on the CRIT agricultural areas. Historically, we know that both species moved up canals and were lost to the population. Fish can move between certain types of canals (for example, those on the CRIT) and the river, and may not be lost to the population. Most of the large irrigation canal systems may fall under this category. The big diversions for the CAP and Metropolitan Water District of Southern California are very different because of the

method of diversion and ultimate destination of the water. Once fish are in these systems, their return is unlikely. Again, as bonytail chub and razorback sucker populations increase over the five year period, the potential for fish to enter any of these types of canal systems increases.

Inter-related and inter-dependent actions and their effects are those tied somehow to the proposed action. Within the confines of the river and floodplain, these are somewhat limited. With Reclamation maintaining the existing facilities and programs over the next five years, additional urban development will proceed along existing lines. No significant changes in types of development or water diversion would be expected.

Indirect effects are those effects likely to occur in the future as a result of the proposed action. Because there is no significant change in management proposed, no new indirect effects are likely to occur in the five year period and existing ones would continue.

Several programs are controlled by other Federal or non-Federal agencies and Reclamation asserts limited discretion over them. In the case of the other party being a Federal agency, section 7 consultation with that agency would be needed to address the effects of those actions. There are two main areas involved.

Flood control is the joint responsibility of Reclamation and the Army Corps of Engineers in various forms at points along the river. Changes to the existing flood control operations are not anticipated during the five year period, so there are no changes to the effects described in the environmental baseline analysis.

Hydropower production and distribution from the dams is the responsibility of Reclamation and the Western Area Power Administration, with all power contract holders indirectly involved. Information on the power program is not adequate to determine if there would be changes in the five year period, especially as regards new power contracts. Changes to the effects cannot be quantified. Effects in this analysis assume no changes will occur to the hydropower program during the five year period covered by this consultation.

Storage and delivery of entitlement waters involves Reclamation, the three Lower Basin states, other Federal agencies, the Republic of Mexico and all other entitlement holders. In the next five years, there may be adjustments made in the amount of water taken by an entitlement holder or in the point of diversion. For Federal agencies, section 7 consultation may be needed to address the effects. For non-Federal parties, development of a habitat conservation plan under section 10 of the ESA, as is envisioned under the MSCP, would address the effects of those actions to listed species. Changes to these effects over the next five years largely will involve changes in amount of water diverted and perhaps the specific location of the diversion, although the latter is outside the scope of this proposed action and may require separate section 7 compliance. Adjustments made to the water storage program via Reclamations Annual Operating Plan are unknown and cannot be analyzed in this BO.

Over the next five years, there will be additional demands on the remaining resources of the LCR. Losses of shoreline habitat due to development of recreational, residential or commercial facilities will occur but be only partially considered under the Federal review of the Clean Water Act.

Specific users and amounts of water used will change and these changes may affect portions of the action area through either higher or lower flows. There is insufficient information to quantify this. Further effects to the bonytail chub and razorback sucker are discussed under Cumulative Effects, below.

Cumulative Effects: Bonytail Chub and Razorback Sucker

a. Cumulative effects of human population growth

Growth is projected to generally be between 10% and 20% in the next five years in urban areas along the LCR, with some areas experiencing more explosive growth, such as Henderson (41.5%) and Laughlin (114.3%) (**Table 13**, above). This dynamic growth will drive the other factors discussed below that may affect the bonytail chub and razorback sucker, that is, it will lead to increased development, increased visitation/recreation (including fishing, boating, and other water-related activities), increased contamination, and could lead to increased non-Federally supported stocking of non-native fish, such as "bait bucket" releases not authorized by State fish and wildlife agencies.

b. Cumulative effects of economic development

Future alterations to the river bank in the next five years, such as excavating for dock pilings, dredging to construct and maintain marinas, and filling to create boat ramps and seawalls, will be subject to Federal section 7 review of COE section 404 permits; therefore these future alterations are not considered here for their potential cumulative effects on bonytail chub, razorback suckers, and their critical habitats.

Further economic development of the private upland areas near, but not directly affecting the river, will generally be free from Federal permitting. This development should act in combination with continuing population growth to lead to more public use of the river and shoreline areas. Also, further conversion of floodplain and nearshore lands should continue to eliminate opportunities to restore historic wetlands and floodplains for fish habitat.

c. Cumulative effects of future visitation/recreation

Visitation and recreation along LCR have steadily increased in the past; this trend likely will continue in the next five years. Future increases in mechanized uses of the river will result in increased spills of petroleum products and other contaminants, as well as in discharge of both treated and untreated sewage effluent (USFWS 1993a). These should adversely affect water quality. Increased visitation and recreation also should cause increased disturbance of the fish and their spawning areas.

d. Cumulative effects of environmental contaminants

Organochlorines and industrial contaminants are known to have adversely affected the reproductive organs of male carp in razorback sucker spawning areas in parts of Lake Mead (Bevans et al. 1996). Reproduction, and thereby long-term viability, of the razorback sucker may

be adversely affected in these areas, but further research is needed to assess actual effects, if any. Further downstream, in backwater lakes on the national wildlife refuges, high selenium concentrations in fish may continue to pose a risk to razorback suckers (King et al. 1993). Continued irrigation water returns to the LCR will contain higher levels of organics from fertilizers and pesticide and herbicide residuals than the water contains when it is diverted.

e. Cumulative effects of non-Federally supported stocking of non-native fish

Private entities likely will continue to introduce non-native fish and other organisms into the LCR for various reasons, including sport fishing, insect and weed control, and dumping of unwanted aquarium and aquaculture fish. Accidental introductions through the use of live bait fish may occur. Private individuals may continue to make unauthorized stockings of fish, possibly in habitats that were previously free of non-native fish and that are appropriate for razorback sucker and bonytail chub restoration. These types of augmentation of non-native fish populations could exert increased competitive and predatory pressure on the razorback sucker and bonytail chub.

Southwestern Willow Flycatcher

For the purposes of this consultation, activities outside the 100-year floodplain that are enabled by Reclamation's operations on the LCR (e.g., urban expansion) are considered as they relate to the status of the southwestern willow flycatcher rangewide. Reclamation's operations will continue to enable and maintain, or increase, the scope and magnitude of those activities. Combined with the effects of interrelated and interdependent actions and the cumulative effects of State, tribal, and private actions, the Service anticipates that the flycatcher's low status outside the action area will further decline. Within the action area, discretionary and non-discretionary actions by Reclamation, and the cumulative effects of State, tribal, and private actions, are also anticipated to further depress the flycatcher's status and result in take of flycatchers and loss of habitat to a degree that compromises the survival and recovery of the flycatcher, resulting in effects both within the action area and rangewide.

Direct take of flycatchers due to water management occurred at the Lake Mead Delta in June of 1996 when Goodding's willows subjected to prolonged inundation of root crowns lost the structural support of their root systems and fell into Lake Mead. At least three southwestern willow flycatcher nests were lost to this phenomenon. The average depth of inundation of willow root crowns at the time of nesting was 68.8 cm (27 inches). Reclamation data indicate that willows throughout the inflow area have been inundated above root crowns since at least September, 1995 (see below), and Reclamation anticipates willows will remain inundated over the five year consultation period. A site visit during September, 1996, revealed that treefall is widespread throughout the delta (R. Marshall, pers. obs.). Thus, if trees survive into the 1997 breeding season and flycatchers return to breed at the site, additional take in the form of nest loss due to treefall is likely. Because the inflow backs up into Grand Canyon National Park, take is also anticipated to occur for flycatchers nesting in the portions of Grand Canyon National Park that have been flooded continually.

Mortality of willow trees at Lake Mead or habitat modification that results from prolonged

inundation (e.g., reduced foliage volume) is also likely to result in take of flycatchers. Available data on willow tolerance to inundation and Reclamation's projections for lake elevations at Mead during the consultation period indicate there is a high probability that, without specific measures to manage for willow survival, trees will begin to die off during the 1997 growing season. Shrader (1995, pers. comm) found that willow communities established along the Rio Grande in New Mexico and the LCR persisted under a regime of intermittent flooding, but experienced complete mortality when root crowns were inundated for more than 24 months. Similarly, Knighton (1981) demonstrated experimentally that three willow species (*Salix gracilis, S. discolor, S. bebbiana*) inundated for two consecutive growing seasons with just 15 cm (6 in.) of water suffered nearly complete mortality. In a review of the tolerance of woody species to flooding, Gill (1970) concluded that

> "...even the most flood-tolerant species generally need to be unflooded for at least 55-60% of the growing season... Year-round root inundation can be tolerated in isolated years."

Finally, Hunter et al. (1987) documented the loss of a 120 ha (296 ac) stand of cottonwood-willow near the confluence of the Bill Williams River and the Colorado River in 1981 after 24 months of continual inundation of root crowns.

Based on data provided by Reclamation in the BA and after completion of the BA, the average base elevation of willow trees in the vicinity of flycatcher nests at Lake Mead is between 360 m (1180 ft.) and 361 m (1184 ft.). The mean depth of inundation of root crowns measured at 27 locations throughout the inflow area on October 4, 1996 was 1.9 $\pm$ 1.2 m (range = 0.4 m to 3.7 m) (mean = 6.3 $\pm$ 3.9 ft.; range = 1.2 ft. to 12.3 ft.). These data indicate that despite significant variation in the topography of the inflow, none of the root crowns was exposed. Since 1990, the year Reclamation estimates willows were established at the inflow, the month's-end elevation of Lake Mead has exceeded 361 m during two periods: (1) for 15 consecutive months from February 1993 to April 1994 (encompassing one growing season), and; (2) for 16 consecutive months from September 1995 through December 1996 (encompassing one growing season). Furthermore, lake levels have exceeded or been within 0.5 m of 360 m (1180 ft.) since January of 1995. Thus, at the 360 m elevation, most, if not all, root crowns of willows used by flycatchers have been inundated for 24 months. Reclamation anticipates that lake levels will continue to inundate willow root crowns at the inflow during the consultation period and that willow mortality will be observed during the 1997 growing season. In the BA, Reclamation projected that during the consultation period (and for the next 15 years) water levels at Lake Mead will exceed 361 m (1184 ft.) at least 75% of the time, and will exceed 360 m (1180 ft.) 86% of the time (Figure E27 in BA). Based on the above analyses, the Service believes that, under current operations, the 465 ha (1,148 ac) of willow-dominated habitat currently occupied by southwestern willow flycatchers at Lake Mead will experience significant, if not complete, mortality sometime between the 1997 and 1998 growing seasons.

The Service believes that a loss of this magnitude, both in the amount of habitat involved and the potential rapid rate of loss, is catastrophic when the status of the flycatcher and riparian habitat on the LCR and in the southwestern U.S. are considered. Mearns (1907) estimated that the LCR contained more than 161,943 ha (400,000 ac) of riparian habitat at the onset of the 20th Century.

Thus, the 1,841 ha (4,547 ac) that remain today represent a tiny remnant of the habitat potential on the LCR. The small amount of native riparian habitat on the LCR, the paucity of relatively large, contiguous tracts of native riparian habitat throughout the flycatcher's current range, the flycatcher's isolated distribution, and the predominance of small breeding groups are all factors that compromise the survival and recovery of this species. These factors also point to the critical need to protect breeding flycatchers and their habitat at Lake Mead. Reversing the trend of habitat loss and population fragmentation on the LCR is critical to improving the probability of survival of this species.

Indirect take of flycatchers may result from degradation of willow nesting habitat, either through structural modification (e.g., reduced foliage volume) or outright willow mortality. This would reduce habitat suitability and may cause flycatchers to abandon the Lake Mead breeding site. Some southwestern willow flycatcher breeding groups exhibit site fidelity, even when conditions appear unsuitable (e.g., near-completely inundated habitat and newly burned habitat). Flycatchers that establish territories at Lake Mead in adjacent, marginal habitat are not likely to attract mates, but are likely to eventually disperse outside the area (Hubbard 1987, Paxton et al. 1996). Given that Lake Mead contains one of the largest and most significant native riparian tracts in the Southwest, there is a high probability that dispersing flycatchers would settle into smaller, more isolated, habitat patches. Emigration to isolated habitat patches combined with the delay that dispersal entails reduces the probability that flycatchers would obtain mates and breed successfully, and may reduce adult and juvenile survivorship.

The Service recognizes that variation in individual fitness of flycatchers probably translates to variation in responses to habitat loss/degradation and subsequent survivorship and reproductive success. Thus, not all flycatchers are likely to perish as a result of displacement and not all flycatchers are likely to fail to attract mates and breed. The more likely result would be a regional phenomenon of "loss-disperse-decrease" whereby: (1) large habitat patches occupied by the larger breeding groups are lost either by stochastic (e.g., fire) or deterministic processes (e.g., permitted Federal action); (2) surviving birds are forced to disperse elsewhere, most likely into smaller habitat patches; and (3) this dispersal causes decreases in the probabilities of survival, of obtaining mates, and of reproducing successfully. This conclusion is based on the assumption that there is a negative correlation between habitat fragmentation/isolation and flycatcher survival and reproduction. This phenomenon could actually lead to a short-term increase in the number of sites occupied regionally while masking an overall, long-term decrease in population size and fecundity. The combined effect of small breeding group sizes, the survival costs of dispersal in a highly fragmented system, the reduction in fecundity and survivorship of young caused by delays in breeding, and the role of stochastic demographic, environmental, and genetic events on small populations are probably the ultimate factors governing southwestern willow flycatcher populations in the short-term.

In the remainder of the action area, Reclamation anticipates further habitat loss and degradation during the consultation period due to desiccation, fire, encroachment by saltcedar, agricultural development, and recreation, according to the BA; however, those losses are anticipated to be minimal. That assessment is based, in part, on the presumptions that riparian resources are ephemeral and that native revegetation efforts will balance out losses. With the large losses of cottonwood-willow that have occurred on the LCR, the significance of even small losses to fire,

desiccation, or other causes increases dramatically, because they continue the trend of habitat loss and fragmentation in a river system for which no comprehensive plan exists to enable recruitment and regeneration of large, contiguous tracts of native cottonwood-willow.

Although Reclamation's BA acknowledges that fire has played a role in riparian habitat loss, it does not factor in fire in projections of habitat loss during the next five years. Reclamation's projected declines in cottonwood-willow habitat during the next five years appear to be based on demographic patterns of extant vegetation patches (i.e., age of trees and successional patterns). Busch and Smith (1993) and Busch (1995) documented 166 individual fires that burned more than 11,800 ha (29,146 ac) between 1981 and 1990. Busch and Smith (1993) argue that fire was a relatively infrequent phenomenon in native riparian habitats and that the advent of saltcedar brought about episodic burning events which create favorable conditions for recolonization by saltcedar. Since the remaining cottonwood-willow habitat on the LCR is virtually surrounded by saltcedar, the potential for fires started in saltcedar to affect cottonwood-willow habitat remains very high. Without modifications to the extent of recreation activities (e.g., restrictions on camp fires and access to Reclamation service roads), fire frequency is not likely to decrease. Combined with the extent and distribution of saltcedar, recreational activities are a major threat to the frequency and distribution of fire events on the LCR. Thus, the Service believes that both fire and recreational activities remain a major threat to both occupied and unoccupied southwestern willow flycatcher habitat on the LCR.

The ultimate factor affecting southwestern willow flycatchers and their riparian habitat below Lake Mead is that Reclamation's continuing operations and maintenance preclude the development and persistence of large, contiguous tracts of cottonwood-willow habitat in the large floodplain areas that historically contained such habitat. Reclamation operates and maintains the dams, hydropower facilities, diversions, banklines, and levees that take up space on the river that otherwise would be occupied by aquatic and riparian floodplain habitats and that largely preclude the overbank flooding that creates and sustains riparian habitats. For example, Reclamation maintains 452 km (281 mi) of bank lines and levees that "train" the river and eliminate or significantly restrict floodplain development. Some of the bank line actually reinforces levees, so the actual river mileage from which floodplain development is precluded is slightly less.

Water diversions and flood control promote agricultural development within the 100-year floodplain which also results in habitat loss. The BA acknowledges that the loss of 121,457 ha (300,000 ac) of riparian habitat along the LCR to agricultural development is one of the key reasons why the southwestern willow flycatcher is endangered. That area encompasses more than 75% of Mohave, Parker, Palo Verde, and Yuma valleys which historically contained vast floodplain habitat. However, the effects of agricultural development of floodplains are not limited to habitat loss. Agricultural developments attract brown-headed cowbirds. The extent of cowbird parasitism on the LCR is not well documented for the flycatcher, but significant levels of parasitism for other riparian nesting species on the LCR have been documented (Averill 1996). Nevertheless, cowbird parasitism is having a significant effect on flycatcher reproduction throughout the Southwest and it is likely occurring, possibly at high levels, on the LCR. The first recent evidence of flycatchers breeding on the LCR was the observation of an adult willow flycatcher feeding a brown-headed cowbird fledgling near the confluence with the Bill Williams River. Brown (1988), Sogge and Tibbitts (1992), Sogge et al. (1993), and Sogge and Tibbitts

(1995) documented high, sustained levels of cowbird parasitism on flycatchers breeding upstream of the action area in Grand Canyon National Park. Conversely, McKernan (unpubl. data) documented no parasitism for the nests monitored in the relatively large (465 ha), contiguous patch of willows at the inflow to Lake Mead, well away from agriculture and most recreational disturbances, during 1996.

Agriculture along the LCR relies on pesticide use, which may have effects to flycatcher reproduction and endocrine systems. Additionally, during 1996 monitoring efforts in southwestern Colorado, a southwestern willow flycatcher fledgling was found with a crossed bill, a classic symptom of selenium poisoning in birds. The deformity prevented this bird from foraging. This flycatcher was reared in the Escalante State Wildlife Area, which drains agricultural lands and for which high levels of selenium have been detected in past monitoring (M. Sogge pers. comm.). Reservoir and channel maintenance, including dredging, as well as irrigation runoff, tend to concentrate selenium and expose it to the biotic environment.

The development and continued operation and maintenance of LCR water resources and related facilities as set forth in Reclamation's proposed action, primarily for flood control, power generation, and urban and agricultural development, precludes the system from sustaining riparian resources of the magnitude (i.e., areal extent, distribution, and species composition) found prior to the advent of major water development projects. The results of past and current water developments and operations are loss of a natural river dynamic and riparian habitat modification and fragmentation on a scale unprecedented in the arid Southwest. This loss, which continues today, has contributed significantly to the extremely precarious status of the southwestern willow flycatcher, both within the action area and rangewide. Without significant changes in land-use patterns and the apportionment of water, the river's potential to sustain its natural dynamic is minimal, and the maintenance of even limited native riparian habitat will require continual restoration projects that are expensive, limited in scope, and may not adequately mimic the habitat they are to replace. Current operations subject to this consultation, which include bankline and levee repair, controlled flows, diversions, and so on, continue to limit development of native riparian habitats, and thus contribute to the maintenance of a highly-fragmented riparian system vulnerable to fire, encroachment by exotics, desiccation, lack of recruitment of native cottonwood-willow communities, and tree mortality due to prolonged inundation. This vulnerability is far greater than the system's current capacity to develop and sustain large tracts of riparian habitats by natural or simulated processes.

Reclamation's proposed action would contribute to depressing the already low population status of the flycatcher; this presents the Service, as well as other Federal and State agencies, with a significant challenge to ensure the survival and recovery of this species. Habitat loss of the magnitude anticipated at Lake Mead is catastrophic and rapidly negates gains in riparian flycatcher habitat made elsewhere.

Haig et al. (1993) observed for the red-cockaded woodpecker, an endangered bird that still numbers from only one thousand to several thousand pairs, that,

> "...species with such small populations are easily 'nickel and dimed' to extinction. That is, loss of a few small populations does not cause concern, but the cumulative

> effects of these losses could be dramatic. Therefore, a first step to species' recovery will be to stop these local extinctions."

Losses of flycatcher habitat have been widespread, significant, and continue today. Recent comparisons of field data and computer simulation models shed further light on the dilemma small populations face in an increasingly fragmented landscape. Hanksi et al. (1996) compared estimates of minimum viable metapopulation sizes derived from population models with a long-term data set on the persistence of the Glanville fritillary (*Melitaea cinxia*), a butterfly that inhabits remnant grasslands in Finland. Based on the pattern and trend of habitat loss and population response documented for the fritillary, they concluded that extinction was likely because continued losses of habitat would result in a network of habitat patches smaller than the minimum area of suitable habitat needed for the fritillary. They predicted, however, that extinction would take

> "...tens or even hundreds of years. The inevitable decline to extinction may be temporarily halted for long periods, with the number of occupied patches fluctuating without any obvious trend. The final decline to extinction is slow because the last populations to go are typically the largest ones with the smallest risk of extinction. The delay would be smaller if the dynamics were greatly affected by regional stochasticity."

However, for the southwestern willow flycatcher, both stochastic and deterministic events are affecting some of the largest breeding groups rangewide, increasing the potential rate of decline and probability of extinction. Those losses include areas with the largest breeding groups, such as Roosevelt Lake and the San Pedro River in Arizona, as well as areas with significant native riparian habitat, such as Lake Isabella in California. Weins (1996) noted that habitat loss is probably the most important factor governing population dynamics when the landscape still contains a high proportion of suitable habitat, but "at a certain threshold of habitat loss, patch isolation may quickly come to dominate population dynamics."

The primary effect of Reclamation's activities, despite ongoing riparian restoration efforts, will continue to be habitat loss and prevention of new habitat development and protection on a large scale. The southwestern willow flycatcher evolved in a system that was highly dynamic and best characterized as one where local losses of "ephemeral" riparian habitat were buffered by a regional abundance of habitat and a scale of habitat continuity that is difficult to imagine in today's highly fragmented landscape. Renewal and regeneration was as much a part of that dynamic as was destruction and loss. However, natural flood events that renew and sustain significant areas of riparian forest are not incorporated into the proposed management of the river.

This continuing habitat loss without significant renewal has occurred throughout the southwestern willow flycatcher's range on private, tribal, State, and Federal lands. Although changes in land management practices have lead to some recent gains in riparian habitat (e.g., San Pedro National Riparian Conservation Area), most gains are small in extent and often quickly negated by catastrophic events, such as fires, inundation, and unauthorized agricultural expansion in floodplains that have eliminated flycatcher breeding areas during the last several years (Paxton et al. 1996; USFWS, unpubl. data). Continual isolation of breeding groups and fragmentation of

habitat has left flycatcher populations extremely vulnerable to extirpation from random demographic, environmental, and genetic events. Extinction of the southwestern willow flycatcher is foreseeable. This low status rangewide, as well as in the action area, indicates a critical need to aggressively protect existing populations and to expand and enhance native riparian habitat and the suite of environmental conditions that promote such habitat. Additional habitat loss and forced emigration/population fragmentation is inconsistent with the need to ensure the survival and recovery of the southwestern willow flycatcher.

Cumulative Effects: Southwestern Willow Flycatcher

a. Cumulative effects of human population growth

As with the fishes discussed above, the rapid human population growth in the LCR area will drive the other factors, below, that may affect the southwestern willow flycatcher.

b. Cumulative effects of economic development

Localized impacts on southwestern willow flycatchers and their habitats from further clearing, human disturbance, and predatory pets, especially domestic cats, likely will continue. Also, cowbird parasitism of southwestern willow flycatcher nests is expected to increase with habitat fragmentation. Some of the following could have Federal actions related to them that would draw them away from the cumulative effects section, although presently the cases and degree to which this may be so is unknown, hence their inclusion here. A number of water transactions that would result in Colorado River flow depletions are being considered by States, tribes, and private organizations. A number of these transactions could have water diverted at Lake Havasu instead of at the lower river near Yuma. This could diminish the flows in the river for over 140 river miles, possibly negatively affecting the riparian vegetation.

c. Cumulative effects of future visitation/recreation

As visitation and recreational use increase, more disturbance of southwestern willow flycatchers will result. A number of tribes and private groups are proposing to build large casinos and recreation facilities on the river. This will increase the number of people fishing, swimming, skiing, hunting, and boating on the river. This will impact many of the habitat areas used by the southwestern willow flycatcher.

d. Cumulative effects of environmental contaminants

As indicated, a southwestern willow flycatcher fledgling in southwestern Colorado was found with a crossed bill, a classic symptom of selenium poisoning in birds. The flycatcher was reared in the Escalante State Wildlife Area, which drains agricultural lands and for which high levels of selenium have been detected in past monitoring (M. Sogge pers. comm.). Selenium and other contaminants have been found in elevated levels in other birds within the LCR (King and Andrews 1996). Continuing exposure to selenium and other contaminants may threaten southwestern willow flycatchers in the LCR.

e. Cumulative effects of wildfires

As indicated, as human activity in riparian zones along the LCR increases, fire frequency is also likely to increase (Busch 1995). As fire frequency increases, and as saltcedar and arrowweed continue to dominate post-fire recovery, more disturbance of southwestern willow flycatchers and adverse effects to their habitats likely will occur.

Yuma Clapper Rail

Almost the entire population of Yuma clapper rails on the Colorado River in the United States, and approximately one half of the total population of this species, occurs within the action area. Most of the entire remaining half resides downstream on the Colorado River and its delta in Mexico. Therefore, the proposed action has the potential to significantly affect almost the entire range of the species.

The operation and maintenance of the LCR is an ongoing action occurring on a daily and hourly basis and it includes the five year period covered by the project description. The direct effects of the action include water releases that affect daily and seasonal surface elevations. These fluctuations affect river flows, depths, and water surface elevations which can result in the loss of nest and wetland habitat needed for the survival of the Yuma clapper rail in the action area. These losses can also occur from flood control releases that result in sediment deposition and scouring. Also, the releasing of water on a demand basis results in decreased flows in the lower sections of the river resulting in less habitat areas for use by the rail.

The routine maintenance of banklines, levees, river control structures and bankline roads can result in the loss of riparian and wetland vegetation. This maintenance can also increase the sediment load in the river. These actions can result in the loss or degradation of habitat used by the Yuma clapper rail.

Proposed dredging operations include an on-going program (see **Table 15**, above) aimed at maintaining backwaters for wildlife purposes. This work is planned and directed by the various resource agencies on the river, with an active role by Reclamation. Marshes tend to evolve, through natural succession, into terrestrial types of plant communities. Without the maintenance of hydric conditions these areas lose their attractiveness to birds such as the rail. Rosenberg et al. (1991) emphasize that without such management, increased channelization of the river will result in a decrease in marsh habitats because more concentrated, swifter flows deepen the flow channel, lower the water table, and prevent the growth of emergent plants.

The operation of the Yuma Desalting Plant would result in a decrease in water flows to the Cienega de Santa Clara, a marsh complex located in Sonora, Mexico near the Sea of Cortez, that provides habitat to a large population of Yuma clapper rails. No other interrelated or interdependent actions are expected to affect the Yuma clapper rail.

Cumulative Effects: Yuma Clapper Rail

a. Cumulative effects of human population growth

As with the fish discussed above, the rapid human population growth will drive the other factors, below, that may affect the Yuma clapper rail.

b. Cumulative effects of economic development

Localized impacts on Yuma clapper rails and their habitats from further clearing, human disturbance, and predatory pets, likely will continue. Some of the following could have Federal actions related to them that would draw them away from the cumulative effects section, although presently the cases and degree to which this may be so is unknown, hence their inclusion here. A number of water transactions that would result in Colorado River flow depletions are being considered by States, tribes, and private organizations. A number of these transactions could have water diverted at Lake Havasu instead of at the lower river near Yuma. This could diminish the flows in the river for over 140 river miles, possibly negatively affecting the riparian vegetation.

c. Cumulative effects of future visitation/recreation

As visitation and recreational use increase, more disturbance of Yuma clapper rails will result. A number of tribes and private groups are proposing to build large casinos and recreation facilities on the river. This will increase the number of people fishing, swimming, skiing, hunting, boating on the river. This will impact many of the habitat areas used by the Yuma clapper rail. This increase in use could also result in a decrease in water quality, diminishing rail prey to some degree.

d. Cumulative effects of environmental contaminants

As discussed under Status of the Species in the Action Area, above, selenium and other contaminants have been found in potentially harmful elevated levels in Yuma clapper rails in the LCR (Ohlendorf et al. 1986b, Radtke et al. 1988, Kepner unpubl. data in Rosenberg et al. 1991, see also King and Andrews 1996).

e. Cumulative effects of wildfires

As human activity in riparian zones along the LCR increases, fire frequency is also likely to increase (Busch 1995). As fire frequency increases, and as saltcedar and arrowweed continue to dominate post-fire recovery, more disturbance of Yuma clapper rails, and adverse effects to their habitats, likely will occur.

Proposed species/critical habitat:

Flat-tailed Horned Lizard

Mortality and Injury of Flat-tailed Horned Lizards During Operation, and Maintenance of the Roads and Ancillary Facilities

Flat-tailed horned lizards occur in the action area and would be subject to mortality or injury

during operations and maintenance activities. Animals could be crushed by vehicles or equipment while in their underground, shallow burrows, or while on the surface. When approached, flat-tailed horned lizards often stop and freeze, rather than flee. Thus, they are especially susceptible to crushing by moving vehicles and other equipment.

Vehicle use in and between Reclamation-maintained sites in the 5-mile zone is expected to result in ongoing mortality and injury to lizards. For instance, of twelve flat-tailed horned lizards observed on paved portions of County 23rd and Avenue B, all but two had been crushed by vehicles. Fifteen of the approximately 40 locality records discussed in the Status of the Proposed Species in the Action Area section, above, were of dead horned lizards on dirt or paved roads within the 5-mile zone (USFWS, unpubl. data).

Roads can act as mortality sinks for small animals (Boarman et al. 1992, Klemens 1989, Rosen and Lowe 1994). During a four-year study of snake mortality along a 27.4-mile section of Route 85 in southern Arizona, Rosen and Lowe (1994) recorded snake mortality estimated at equivalent to the estimated snake population normally found in a 1.93 mi^2 area. They also estimated mortality to be equivalent to eliminating all snakes within 213 feet of the road. Effects on flat-tailed horned lizards from similar activity may be similar, as both snakes and these lizards cross roads, use roads for thermoregulatory purposes, and have limited ability to flee oncoming traffic. Desert tortoise populations are depleted up to a mile or more on either side of roads where average daily traffic is greater than 180 vehicles (Nicholson 1978a & 1978b). The tortoise and this lizard are similarly unlikely to escape oncoming vehicles. These two studies on snake and desert tortoise mortalities are all that is available on reptile mortality in this area; thus, the following discussion of take effects is derived from them as models.

Recent analysis suggests that flat-tailed horned lizard population viability is particularly sensitive to mortality (Flat-tailed Horned Lizard Conservation Team 1996). The mortality of flat-tailed horned lizards expected from maintenance activities in the 5-mile zone could affect populations for significant distances away from the roadways and the "footprints" of project sites. Periodic maintenance of the roadways could also result in occasional mortality or injury of horned lizards. Regrading of road shoulders could result in crushing of animals in burrows or on the surface. The amount of use of these sites by Reclamation averages a few monthly visits or less (J. Romero, pers. comm.), far less than the 180 vehicles/day in the desert tortoise example, cited above, by at least two orders of magnitude.

If scat and lizard counts provide a reasonable index to abundance, then relative abundance can be estimated for each Reclamation project feature in the 5-mile zone following the criteria from the BLM (1990):

Site	Horned Lizard Relative Abundance
Sludge disposal	low
242 well field	low-high
Powerline	medium-high
Drainage Channel	low-medium
Routes to the above	low-high

Hodges (1995) estimated that between 212 and 222 mi^2 (135,680-142,080 acres) of flat-tailed horned lizard habitat occurs in Arizona. Limited information exists to quantify densities of flat-tailed horned lizards; however, estimates have ranged from .06 to 1.5 per acre (Turner et al. 1978, Muth and Fisher 1992, Rorabaugh 1994, Wone and Beauchamp 1995). The lizards within the immediate vicinity of the project sites could be subject to death or injury proportionate to the acreage impacted and the density range indicated above. Lizards could be depleted within roughly 200 feet on each side of a road or other facility in a hypothetical "maximum case" scenario with a high degree of traffic (Rosen and Lowe 1994). The total habitat directly affected by the above aspects of the proposed action, including its interrelated and interdependent effects and indirect effects, in the hypothetical "maximum case" represents less than 1% of available habitat in Arizona. Approximately 1,295 acres reduced in horned lizard density to some degree suggests take of 78 to 1,360 lizards. As vehicle use is much less than that which would create the hypothetical "maximum case" scenario, take figures of two orders of magnitude less are more likely, perhaps in the range of (0.8 to 13.6) 1 to 14 lizards taken annually.

The approximately 16,000 acre (25 mi^2) portion of the 5-mile zone to be managed as part of the Yuma Desert Management Area would protect 11.8% of Arizona's flat-tailed horned lizard habitat to a great degree. The result would be to limit many deleterious uses.

Cumulative Effects: Flat-tailed Horned Lizard

Because much of the flat-tailed horned lizard habitat in the vicinity of the action area is managed by Reclamation, the Department of Defense, or BLM, many of the activities likely to occur in this area will be Federal actions subject to section 7 of the ESA. However, considerable private and State lands supporting flat-tailed horned lizards occur within a few miles or even adjacent to the action area. Continued development of non-Federal lands for residential, industrial, and agricultural purposes is expected. Several square miles of habitat could be lost in the foreseeable future. Pesticide drift from croplands will likely continue. If the flat-tailed horned lizard is subsequently listed, the effects of non-Federal actions, including residential and other development, will be addressed through the section 10(a)(1)(B) permit process. The effects of economic and development expansion will continue in flat-tailed horned lizard habitat in Mexico, particularly on the east end of San Luis, Sonora, as well as in the adjacent United States.

SUMMARY

Listed species/critical habitat:

Bonytail Chub and Razorback Sucker

Projects and actions in the environmental baseline have significantly changed the yearly flows, temperatures, habitat availability and diversity, and fish fauna of the LCR. These harmful effects on the bonytail chub and razorback sucker will be continued during the five year period of the proposed action. Neither significant increases in these pre-existing effects nor new types of effects are considered likely to occur in the five-year period. Similarly, pre-existing harmful

effects to critical habitat constituent elements will be continued.

Reductions in harmful effects in the action area are unlikely. Indeed, cumulative effects of actions by parties other than Reclamation that affect the action area, especially those actions driven by human population growth and economic development, are likely to increase. Population augmentation projects for the bonytail chub and razorback sucker will provide benefits over the short term in preventing extirpation of existing populations.

Southwestern Willow Flycatcher

The environmental baseline encompasses an overwhelming change in the historical availability and extent of native riparian habitat on the LCR, which resulted in a decline in the southwestern willow flycatcher population. Remaining native habitats are a slight remnant of historic potential. Large tracts of cottonwood-willow that have developed after flooding remain threatened by dessication, prolonged inundation, fire, recreation, and development. A catastrophic loss of approximately 465 ha (1,148 ac) of willow habitat at the inflow to Lake Mead is anticipated during the consultation period as a result of Reclamation's operations. Downstream from Lake Mead, declines in native riparian habitat observed during the last 20 years probably will continue. The magnitude of the expected loss is uncertain because fire and saltcedar invasion are the predominant threats. Given the small remaining amount of habitat, however, small losses could be significant. Maintenance of dams, diversions, banklines, and levees will continue to impede the development and maintenance of large, continuous tracts of native riparian habitat on the LCR. The overall effect to the southwestern willow flycatcher will be continued declines in numbers and reproductive success resulting directly from cowbird parasitism, predation, and nest loss, and indirectly from dispersal away from habitat rendered unsuitable by Reclamation's operations.

Yuma Clapper Rail

Adverse effects of the proposed action are relatively minor in terms of anticipated take within the five year consultation period. Positive effects include Reclamation's on-going rail habitat maintenance program and their proposal to avoid rail habitat during their other maintenance activities. Cumulative effects will not be major over the five year consultation period.

<u>Proposed species/proposed critical habitat:</u>

Flat-tailed Horned Lizard

Adverse effects of the proposed action are relatively minor in terms of take and the portion of the species' range affected. No new land disturbance is proposed. Positive effects include Reclamation's proposed management of a large portion of the 5-mile zone as part of the Yuma Desert Management Area, including a host of beneficial actions. Cumulative effects will not be major over the five year period. If the Yuma Desert Management Plan is approved and implemented, the overall effect will be an improved environmental baseline for the species.

CONCLUSION

Listed species/critical habitat:

Bonytail Chub and Razorback Sucker with Critical Habitat

After reviewing the current status of the bonytail chub and razorback sucker in the action area and throughout the remaining range of these species, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that Reclamation's proposed action for operation and maintenance of facilities on the LCR is likely to jeopardize the continued existence of the bonytail chub and razorback sucker, and is likely to destroy or adversely modify designated critical habitat for both species.

Basis for the Analyses

The Service must utilize all information about the status of a species throughout its range when making the determination of jeopardy or destruction/adverse modification of critical habitat. This holds regardless of who or what is responsible for the actions that have adversely affected the status of the species. The analysis must consider conservation and recovery actions as well as those actions found to have adverse effects. The sum of the positive and negative factors is the status of the species. The analysis must also look at both the survival and recovery of the species as affected by the proposed action and all other relevant factors.

Regulations implementing section 7 of the ESA define "jeopardize the continued existence of" as:

> "...to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers or distribution of that species."

Under this standard, survival of an endangered species is jeopardized when an action, along with relevant factors above, appreciably reduces or compromises a species' ability to reach threatened status. Recovery is jeopardized when an action impairs or precludes an essential conservation effort, such as those identified in an approved recovery plan for the species.

Regulations implementing section 7 of the ESA define "destruction or adverse modification" as:

> "...a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical."

Under this standard, survival of a species is compromised when the critical habitat unit cannot achieve its assigned conservation goal due to an appreciably diminished capability of the constituent elements. Survival in this case is a long-term consideration. Recovery is compromised when the action appreciably diminishes or precludes beneficial management of a

constituent element.

Bonytail Chub

Effects to the bonytail chub from water-based activities in the entire Colorado River Basin have already exceeded the jeopardy threshold. The species has been eliminated from at least 85% of its historic range and populations in the remaining 15% are very small (USFWS 1993a). Recruitment is virtually non-existent in the remaining wild populations. Actions called for in the recovery plan (USFWS 1990) are focused on preventing extinction in the wild as the primary, or most immediate, goal.

The LCR in the action area was once an important habitat for the bonytail chub and the species was at least common. Actions that are part of the environmental baseline have been directly and indirectly responsible for the collapse of the bonytail chub population, from being common in the river to only a few wild-born individuals surviving in two reservoirs. This collapse can be attributed to the combined factors of habitat alteration and introduction of non-native fish species that have precluded successful recruitment by the wild population. The continuation of these adverse physical and biological conditions impairs and precludes conservation efforts that would lead to the recovery of the species.

The small size of the extant bonytail chub population in the action area limits the extent to which the activities undertaken by Reclamation can have effects. Commitments by other agencies and Reclamation discussed in the proposed action will put 25,000 young fish into Lake Havasu and Mohave. This will not create adult populations of those levels due to mortality of individuals from various causes. What are likely small losses of individuals into canals or aqueducts or through powerplants may increase as population augmentation continues. This source of mortality is additive to natural losses that will reduce the population over time. Nonetheless, the increase in population size resulting from the proposed action does reduce the imminent threat of extinction in the wild and provides a respite in which to address issues affecting survival. The augmentation itself may, in the future, create an additional concern since the young fish will mostly be within ten years of age of each other and thus reach senescence at about the same time.

Without providing for recruitment to existing or re-established populations, recovery cannot occur. The maintenance of the bonytail chub in the wild by continual stocking provides for the survival of the species but not the recovery. Further, given that the number of wild-born adults available for the broodstock is very small, maintenance of what genetic variation remains for the species is critical. Very exacting procedures are needed in a hatchery setting to ensure that inbreeding and loss of genetic diversity do not occur. It is far simpler and success is more likely to occur in a free-breeding, recruiting, population. The proposed action does not change the existing situation for recruitment; thus, essential conservation efforts continue to be impaired or precluded.

Razorback Sucker

Effects to the razorback sucker from water-based activities in the entire Colorado River Basin have already exceeded the jeopardy threshold. Less than one-third of the historic range contains

natural populations (USFWS 1993a) and all but one of these are very small. Recruitment to all remaining populations, if it occurs at all, is not sufficient to maintain the populations. There is no final recovery plan, however, actions currently being implemented for the species focus on preventing extinction in the wild.

The LCR in the action area was once an important habitat for razorback suckers and the species was recorded as abundant. Actions that are part of the environmental baseline have been directly and indirectly responsible for the collapse of the razorback sucker population, from being abundant to less than 25,000 old adults in Lake Mohave and a few wild-born individuals in the reservoirs and riverine sections. This collapse can be attributed to the combined factors of habitat alteration and introduction of non-native fish species that have precluded successful recruitment by the wild population. The continuation of these adverse physical and biological conditions impairs and precludes conservation efforts that would lead to the recovery of the species.

Augmentation efforts have added young wild- or captive-born, cove-reared razorback suckers to the populations, but have not reached a replacement level. Commitments by other agencies and Reclamation discussed in the proposed action will put 25,000 young fish into Lake Havasu and 50,000 into Lake Mohave. This will not create adult populations at those levels due to mortality of individuals from various causes. What are likely small losses of individuals into canals or aqueducts or through powerplants may increase as population augmentation continues. This source of mortality is additive to natural losses that will reduce the population over time. Nonetheless, the increase in population size resulting from the proposed action does reduce the imminent threat of extinction in the wild and provides a respite in which to address issues affecting survival. The augmentation itself may, in the future, create an additional concern, since the young fish will mostly be within ten years of age of each other and thus reach senescence at about the same time.

Without providing for recruitment to existing or re-established populations, recovery cannot occur. The maintenance of the razorback sucker in the wild by continual stocking provides for the survival of the species but not the recovery. Using wild-born fish in the Lake Mohave efforts reduces the risk of genetic problems in the hatchery, but there is a chance of not capturing the range of characters in the population if the full breeding period and all spawning locations are not included in the effort. Having a free-breeding, recruiting, population reduces the risk further. There is some evidence to suggest that at least limited recruitment occurred recently in or above Lake Mead and below Parker Dam. We do not know the specific circumstances that allowed for this recruitment. Unusual events likely were involved. The proposed action does not change the existing situation for recruitment, thus essential conservation efforts continue to be impaired or precluded.

Critical Habitat

Critical habitat for the bonytail chub in the action area consists of Lakes Havasu and Mohave. Critical habitat for the razorback sucker consists of Lakes Mead and Mohave, and the river between Parker and Imperial Dams. Designation of an area as critical habitat is not precluded if a constituent element has been compromised by past activities. The ESA acknowledges such cases likely would exist by identifying areas requiring special management or protection in order to

provide all constituent elements and contribute to survival and recovery. The Service, in designating critical habitat for the bonytail chub and razorback sucker, recognized that natural features of the river habitat had been significantly altered. However, the persistence of these species was determined to be important enough to override the deficiencies then existing.

The importance of Lake Mohave to the survival and recovery of the bonytail chub lies first with the presence of the extant population and second with providing lacustrine and cool water habitats. Lake Havasu has the added advantage of possessing areas of marsh, tributary inflow and riverine habitats largely lacking in Lake Mohave. The largest remaining population of razorback suckers is in Lake Mohave and the importance of that population is extremely high. The reservoir habitats can support a large population of adult fish. The Lake Mead population can access the Grand Canyon and habitats located in that portion of the river outside of the action area. The Parker-Imperial reach of critical habitat contains habitats that are closest to the historic conditions in the action area. The presence of these different habitats may assist in future studies on habitat needs and competition and predation related to non-native fish.

The Service recognizes that adult bonytail chub and razorback sucker can successfully live in the existing habitats. Both fish reproduce, but there is virtually no recruitment to the population. Under Reclamation's proposed operations and maintenance, few options to manage the river differently in order to correct deficiencies in the constituent elements are available. The ability to beneficially manage for constituent elements and contribute to recovery is diminished or precluded.

Southwestern Willow Flycatcher

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed operations and maintenance program along the LCR from Lake Mead to the SIB and the cumulative effects, it is the Service's biological opinion that the operations and maintenance program along the LCR from Lake Mead to the SIB, as proposed, are likely to jeopardize the continued existence of the southwestern willow flycatcher. The proposed action continues the depressed distribution, numbers, and reproduction of the species in the action area, which is already beyond the jeopardy threshold, and significant levels of take are likely. No critical habitat has been proposed or designated for this species in the action area, therefore, none will be affected.

Yuma Clapper Rail

After reviewing the current status of the Yuma clapper rail, the environmental baseline for the action area, the effects of the proposed operations and maintenance of the Colorado River, and the cumulative effects, it is the Service's biological opinion that the action as proposed is not likely to jeopardize the continued existence of the Yuma clapper rail. No critical habitat has been designated for this species, therefore, none will be affected.

Our conclusion is based on the following rationale: The numbers of this species are stable on the LCR and are increasing in some areas of California where new habitat has been created. Stable population levels for this species have persisted in the presence of long-term water project

operations and several researchers believe that this species has actually expanded its range northward as a direct result of dam construction which created new marsh habitat with relatively stable water levels (Conway 1990, Rosenberg et al. 1991, Thelander and Crabtree 1994), although Todd (1986) disagrees.

A stable population of rails, perhaps moving toward recovery, occurs in the presence of the on-going operations and maintenance program on the LCR. Consultations on past individual projects of this program have not resulted in any jeopardy opinions. Only a relatively small amount of disturbance is likely in the form of occasional harassment of birds from recreation and from operations and maintenance activities and from the possibility of nest inundation due to water operations. No large construction projects are proposed during the five year period. Additionally, Reclamation proposes to avoid wetland areas during maintenance actions and to continue to maintain rail habitat.

Proposed species/proposed critical habitat:

Flat-tailed Horned Lizard

After reviewing the current status of the flat-tailed horned lizard, the environmental baseline for the action area, the effects of the proposed operations and maintenance program along the LCR from Lake Mead to the SIB and the cumulative effects, it is the Service's conference opinion that the operations and maintenance program along the LCR from Lake Mead to the SIB, as proposed, is not likely to jeopardize the continued existence of the flat-tailed horned lizard. No critical habitat has been proposed for this species, therefore, none will be affected. Our conclusion is based on the following rationale:

1) The proposed action would affect a relatively minor portion of the species' range.
2) A very small amount of take is likely.
3) During the five year period, no new disturbance will occur in the 5-mile zone.
4) Reclamation proposes to include approximately 16,000 acres of the 5-mile zone as part of the Yuma Desert Management Area for the flat-tailed horned lizard.

REASONABLE AND PRUDENT ALTERNATIVE

Regulations (50 CFR §402.02) implementing section 7 define reasonable and prudent alternatives (RPAs) as alternative actions, identified during formal consultation, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented in a manner consistent with the scope of the action agency's legal authority and jurisdiction, (3) are economically and technologically feasible, and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in destruction or adverse modification of critical habitat.

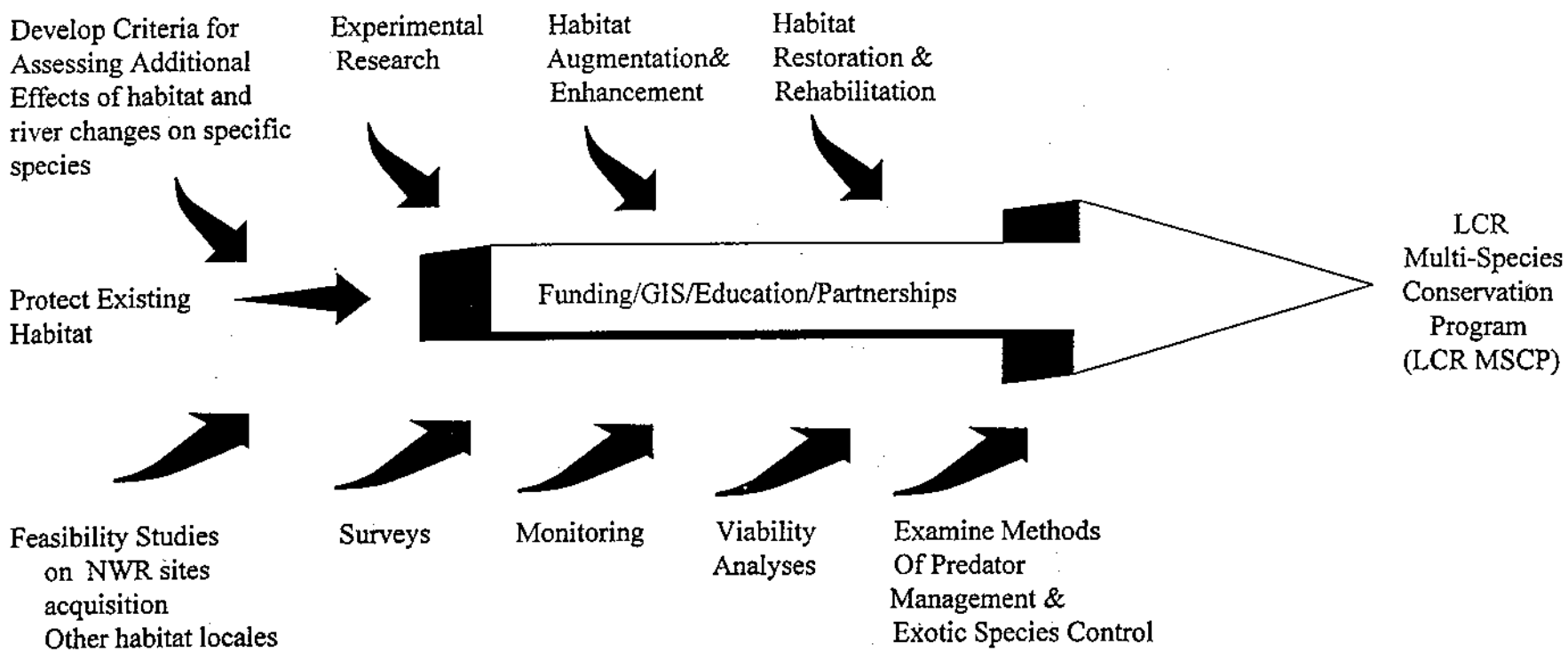
Development of an RPA for the proposed action is a complex undertaking. The existing jeopardy

and adverse modification of critical habitat for the endangered fish species and the southwestern willow flycatcher have not occurred solely due to the actions of Reclamation either now or in the past. Many Federal laws, regulations, treaties, court decisions and other policies have shaped the LCR environmental baseline. The needs of the States and local governments, quasi-governmental agencies, tribes, businesses and private individuals have contributed to the creation of the Federal structure governing the LCR.

The Service expects that the short and long-term provisions in the RPA will improve the baseline so that the status of the bonytail chub, razorback sucker, and southwestern willow flycatcher will improve to a point below the jeopardy threshold in the long-term, within the time frame of the MSCP. Reclamation's current conservation activities and the activities required under the RPA herein comprise a portion of the activities involved in the MSCP (depicted generally in **Fig. 12**), but Reclamation cannot accomplish these activities alone. On August 2, 1995, Reclamation and other MSCP parties agreed to a long-range program designed to conserve habitat, work toward recovery of listed plant and animal species that occur along the LCR, and accommodate current water diversions and power production to the extent consistent with law. During the next five years, this long-range MSCP will be developed and it is anticipated that the MSCP will be initiated by the time this short-term interim consultation period concludes. The long-term requirements of this RPA are expected to be a part of the suite of actions implemented under the MSCP.

This RPA has been developed to address the jeopardy and destruction/adverse modification of critical habitat for the endangered bonytail chub and razorback sucker and their critical habitats in Lakes Mead, Mohave and Havasu and the mainstem of the LCR between Parker Dam and Imperial Dam, and to address the jeopardy for the endangered southwestern willow flycatcher along the mainstem LCR from Lake Mead to the SIB with Mexico.

Fig. 12. How Reclamation's conservation activities for the bonytail chub, razorback sucker, and southwestern willow flycatcher fit into long-term LCR MSCP.



<u>Bonytail chub, razorback sucker, and southwestern willow flycatcher:</u> The RPA provisions for the bonytail chub, razorback sucker, and southwestern willow flycatcher consist of the following short-term and long-term provisions, all of which must be implemented by Reclamation:

a. Short-term Provisions:

BONYTAIL CHUB AND RAZORBACK SUCKER

1. **<u>Augmentation.</u> Reclamation will provide resources to expand grow-out facilities in the Lower Basin sufficient to augment the razorback sucker population below Parker Dam. The intent is to provide at least 50,000 fish over a five year period. These fish need not come from wild fry dipped from Lake Mohave. Once approval for bonytail chub reintroduction to the lower river has been obtained, these facilities will be maintained for production of the required number of fish for that effort.**

   Efforts elsewhere on the river are utilizing all available juvenile rearing pond space, preventing the augmentation of this population in designated critical habitat. This component will also provide fish to be used in radio/sonic tracking studies looking at habitat use, predation/competition, and other research efforts.

2. **<u>Review and evaluation.</u> In cooperation with the Service and with appropriate State fish and wildlife agencies, Reclamation will review and evaluate all of its fish and wildlife programs involving backwaters, maintenance dredging projects and wetland/riparian restoration projects to ensure that efforts to maximize the conservation of bonytail chub and razorback sucker are achieved.**

   No additional backwaters will be designed for sport fishing. The review and evaluation shall be completed within six months of the date of completion of this BO.

3. **<u>Impoundments.</u> As proposed in the Service's draft Lower Colorado River Basin Management Plan (LCRBMP), Reclamation will identify sites, and design and build at least three impoundments for native fish habitats totaling approximately 600 acres in the old floodplain of the river (a lesser area may be accepted by the Service if Reclamation establishes that a 600 acre total area is not feasible, but in no case shall fewer than 300 acres be accepted). These impoundments are to be prototypes for expansion to other sites (but are not the endpoints for recovery needs); their configurations, depths, locations, etc., are to be designed in the most efficient manner possible for construction. These habitats can be on refuge lands, or any other lands Reclamation can find, provided these lands are not compromised by toxic loads of salts, pesticides or herbicides resulting from agricultural activity.**

These correspond to projects that stabilize population size and structure and re-establish native fish stocks, as proposed in the draft LCRBMP. These projects may use existing flatwater areas provided that: a) the existing backwater area is at least 100 surface acres, and b) the existing backwater can be effectively isolated from recreationists, thus minimizing the opportunity for non-native fish to be introduced.

4. **Research funding. Reclamation will provide funds for research into habitat use and habitat preferences of native and non-native fish in the river with the goal of managing to reduce conflicts detrimental to native fish caused by the presence of non-native fish. The amount of funding will be negotiated between the Service and Reclamation and shall begin within one year of the date of the final BO.**

This includes habitat preferences, habitat management opportunities, and exploration of options for competitor/predator management in the river. Portions of this will require input and approval by the State game and fish agencies and other appropriate entities.

SOUTHWESTERN WILLOW FLYCATCHER

5. **Immediate habitat protection/restoration. Reclamation shall immediately initiate a program to protect approximately 1,400 ac (565 ha) of currently unprotected riparian habitat that is currently used by southwestern willow flycatchers, preferably in the LCR area, but if insufficient land is available, then elsewhere within the southwestern willow flycatcher's range. If insufficient seasonally occupied habitat can be identified to be in need of protection, then unoccupied, but high potential, habitat may be protected instead. All the required protections for at least 500 ac (202 ha) must be in place by January 1, 1999, and any necessary ecological restoration of the newly protected sites, including, but not limited to, cottonwood/willow reforestation, must be initiated by that date; all the required protections for the remaining areas necessary to comprise 1,400 ac total must be in place by January 1, 2001, and any necessary ecological restoration of the additional newly protected sites must be initiated by that date.**

Protection can occur through acquisition, easements, partnerships, ecological restoration, etc., that result in long-term preservation of the habitat from destruction and from alteration in ways that would decrease its value as flycatcher habitat. The order of priority shall be: 1) occupied habitat on the LCR, 2) occupied habitat elsewhere in the flycatcher's range, 3) unoccupied, potential habitat on the LCR, and 4) unoccupied, potential habitat elsewhere in the flycatcher's range. Reclamation shall immediately initiate a rangewide evaluation to identify suitable lands requiring protection for the recovery of the southwestern willow flycatcher (to be done in conjunction with the plan called for in the long-term flycatcher alternative compensation habitat provision, number 11, below). (Part of the lands protected may, if suitable, overlap with lands protected in the bonytail chub and razorback

sucker impoundment projects under short term provision number 3, above.)

6. **Review and evaluation. In cooperation with the Service, Reclamation shall review and evaluate all fish and wildlife mitigation or enhancement programs involving riparian restoration in the action area to determine how the programs may be modified to maximize the conservation of the southwestern willow flycatcher.**

   The review and evaluation shall be completed for use in the next breeding season following the date of completion of this BO.

7. **Protective management. Reclamation shall implement protective management for existing flycatcher breeding groups and suitable habitat on the LCR .**

   Reclamation shall by March 15 of each year complete the following: (1) for each site occupied during previous years, evaluate and document existing and potential threats (inundation, desiccation, livestock, fire, recreation, habitat quality, parasitism, predation, etc.); (2) assess the potential to resolve the threats at each site; (3) with emphasis on larger breeding groups and larger habitat patches, develop management strategies including agreements, cowbird management programs, fire prevention, public education, fencing, etc.; and (4) implement the management strategies (see related Southwestern Willow Flycatcher Reasonable and Prudent Measure Number 1, below, on Habitat Protection).

8. **Study funding. Reclamation shall fund a five-year survey, monitoring, and research program for the southwestern willow flycatcher along the LCR and confluent drainages in adjacent states.**

   This program will include surveys and monitoring, dispersal/recolonization studies, monitoring productivity and survivorship, monitoring predation and parasitism, determining flycatcher habitat relationships, determining ecological conditions that promote habitat on the LCR, GIS-integrated studies, and any additional appropriate elements Reclamation determines to be important for conservation efforts for the flycatcher. (Reclamation will discuss other research details with the Service.)

b. Long-term Provisions:

Full achievement of the RPA requirement of eliminating the jeopardy and the adverse critical habitat modification caused by the proposed action to the bonytail chub and the razorback sucker, as well as the jeopardy to the southwestern willow flycatcher, will relate directly to how the short-term requirements of this RPA complement the anticipated development and implementation of the 50-year MSCP. In order to comply with the long-term component of this RPA, Reclamation must, either independently or as part of a cooperative effort such as the MSCP, actually be involved in initiating implementation of each of these provisions by May 15, 2001, which is one-year before the projected end of the consultation period. Alternative approaches that are developed through the

MSCP, that will achieve the same goals, will satisfy these provisions. The long-term requirements of this RPA are:

BONYTAIL CHUB AND RAZORBACK SUCKER

9. **Reintroduction. Reclamation will support reintroduction of protected populations of bonytail chub to the lower river and Lake Mead.**

   Reintroduction of additional populations of bonytail chub is in the LCRBMP. All populations of bonytail chub reintroduced under this item will be protected populations. In order for these populations to contribute to the recovery goals for the species, they must be protected under sections 7 and 9 of the ESA.

10. **Recruitment. Reclamation will determine what conditions in Lake Mead or the Grand Canyon allowed for the successful recruitment of razorback suckers to that population. Based on this research, Reclamation will present a plan, in cooperation with appropriate State fish and wildlife agencies, to the Service by which it will attempt to duplicate those conditions, if feasible and within Reclamation's discretion. Then, Reclamation will initiate implementation of the plan, by May 15, 2001. Reclamation also will explore ways to manage Lake Mohave water levels to provide the same type of conditions that allowed for successful recruitment of razorback suckers in the 1950's.**

    It is very important to understand how razorback sucker recruitment occurred in Lake Mead because, at least in one season, predators did not get all the eggs and larvae. On Lake Mohave, reservoir management may provide some opportunities to maintain the newly augmented populations in those areas. Water management requirements need special examination to assess flexibility.

SOUTHWESTERN WILLOW FLYCATCHER

11. **Alternative compensation habitat. Reclamation shall take part in a long-term program of on- and off-site compensation for historical southwestern willow flycatcher habitat that is lost and is not restorable on the LCR because of the effects of Reclamation's continuing operations and maintenance activities. This shall be coordinated with the rangewide evaluation called for in flycatcher short-term provision number 5, above, and with the Southwestern Willow Flycatcher Recovery Plan (in progress) and other efforts of the Southwestern Willow Flycatcher Recovery Team. The on-site compensation is additive to the requirements of provision number 5, above, and may be done in conjunction with provision number 14, below, on ecological restoration. The off-site compensation habitat, if not already used by southwestern willow flycatchers, will be managed to eliminate or sufficiently reduce the factors limiting to the species. By January 1, 1999, Reclamation shall present a plan to the MSCP for funding and implementation of the long-term program, e.g., through acquisition, easements, partnerships, ecological restoration, etc., with the goal**

of initiating implementation by May 15, 2001. Alternative off-site compensation approaches that may be developed through the MSCP, that are aimed at achieving the same goals, could satisfy this provision.

This compensation represents the amount of historical southwestern willow flycatcher habitat lost or precluded from developing into suitable flycatcher habitat due to inundation, lack of flooding, widely fluctuating water levels, exotic species encroachment, water quality, soil salinity, or permanent structures because of the continuing effects of Reclamation's facilities and operations. Criteria for suitable or potential flycatcher habitat are found in the Status of the Species--Habitat Use section of this BO. Reclamation, in conjunction with flycatcher short-term provision number 5, above, on immediate habitat protection, shall immediately initiate a rangewide evaluation to identify suitable lands requiring protection for the recovery of the flycatcher; this shall be coordinated with other flycatcher recovery efforts undertaken in the future by the Service, as well as with any flycatcher conservation efforts undertaken through the MSCP. As in provision number 5, protection can occur through acquisition, easements, partnerships, ecological restoration, etc., that result in long-term preservation of the habitat from destruction and from alteration in ways that would decrease its value as flycatcher habitat.

PROVISIONS THAT APPLY TO BONYTAIL CHUB, RAZORBACK SUCKER, AND SOUTHWESTERN WILLOW FLYCATCHER

The following provisions apply to the bonytail chub, razorback sucker, and southwestern willow flycatcher, and include a mix of short and long-term elements:

12. **MSCP participation. Reclamation will continue to be an active participant in the MSCP process and will encourage involvement from all Federal and non-Federal parties involved in the operation of the LCR to achieve the stated conservation goal of the MSCP.**

    This is intended to encourage the continuation of the MSCP process and the inclusion of as many parties as possible so the solutions can be as complete as possible.

13. **Discretion. Reclamation will provide the Service:**

    a) A detailed account of the type and extent of the discretionary action flexibility available to it for all elements of the proposed action, under existing legal and contractual obligations, further clarifying any limits on such flexibility that were outlined in Table 1 in the Proposed Action section, above. This shall include, but not be limited to, all aspects of managing the water levels of all portions of the LCR. This account will be provided as soon as possible but no later than 120 days after the date of completion of the final BO.

    b) Reclamation will identify any opportunities to increase that discretionary

action flexibility in cooperation with the other parties. The specific parties will be named in each case. This account will be provided within 18 months after the date of completion of the final BO.

This component is intended to determine the legal, regulatory, and contractual limits on Reclamation's ability to manage the river. It will also assist in identifying other parties with action flexibility, determining the need for section 7 or section 10 discussions with those parties, and determining their involvement in the MSCP Steering Committee. Reclamation will then present a public forum for discussion of the limits on its discretion and on how additional water may be found for fish and wildlife; this may be done in conjunction with the annual public meetings called for in provision number 16, below, on progress evaluation.

14. **Ecological restoration. Reclamation shall collect, review, and synthesize available information on channelization modification or removal projects undertaken or planned for other comparable river systems. This information will be used to evaluate the potential modification or removal of channelization works from certain areas of the LCR, that is, on modifying channel configuration and stabilization, relocating levees to restore the old floodplain (acquiring land if necessary), and letting the river meander within the floodplain, with the goal of restoring large expanses of diverse habitat for self-sustaining populations of the bonytail chub, razorback sucker, and southwestern willow flycatcher. This study shall include information on the hydrological and ecological conditions necessary to maintain significant, continuous stands of native riparian habitat, e.g., stands > 500 ha (1,235 ac), with adequate surface water and other necessary conditions. This information shall be synthesized in a report by January 1, 1999.**

The study may include examining LCR areas currently without channelization and areas with channelization, and comparing the two. This study will assess the potential to restore natural-functioning cottonwood-willow areas and native fish habitat, to let the river meander within the floodplain, and to create "floods" to foster natural processes; it will also include analysis of the necessary management to sustain restored habitats and any related legal constraints that need addressing. This study shall be followed by an adequate number of demonstration or pilot projects to evaluate effectiveness of the techniques, to be completed by May 15, 2001. Also, Reclamation shall take advantage on an opportunistic basis of any natural flood events that may provide the conditions necessary to accomplish ecological restoration, and shall incorporate the findings from analysis of any such events into the evaluation called for under this provision.

Reclamation shall then determine which techniques are the most effective for restoration of native cottonwood-willow riparian habitat and more natural floodplains and aquatic habitats for razorback sucker and bonytail chub habitat on certain portions of the LCR; this shall include analysis of the expected

response of the river to use of the techniques, as far as impacts on existing habitats. Reclamation shall then present to the MSCP, no later than September 15, 2001, the results of the efforts called for under this provision and a plan for funding and implementation of a long-term, large-scale, ecological restoration program for the LCR. Alternative ecological restoration approaches that may be developed through the MSCP, that are aimed at achieving the same goals, could satisfy this provision.

In order to restore habitats to reflect historical rather than present conditions, information on restoration techniques available is an important component. Management to reduce conflicts detrimental to native fish caused by the presence of non-native fish, and to support southwestern willow flycatchers, will also require information on habitat restoration. Reclamation may use un-modified areas of the river as part of a pilot project, provided such areas are scientifically suitable for a comparative evaluation and are not restricted to one end of the river. The requirement to take advantage of natural flood events for ecological restoration purposes represents a form of adaptive management. Information regarding compliance with this provision shall be made available to the Service's Upper Colorado River Basin Floodplain Restoration Program Coordinator and to the parties to the MSCP, and demonstration and pilot projects carried out shall be coordinated to the extent feasible with those programs.

15. **Agreements. Reclamation shall use the full scope of its discretion to develop agreements with all MSCP parties and others, as necessary, including, but not limited to, acquiring property and other resources, to enable implementation of all of these RPA provisions.**

Again, participation by the MSCP parties is vital to achieving the requirements set forth in this BO.

16. **Progress evaluation. Reclamation shall meet on an annual basis during the consultation period with the Service, other agencies, and the public to review and evaluate progress on the RPA.**

This review, to evaluate progress and effectiveness of the RPA, shall include a written progress report and public presentations on: data collected; preliminary results of studies, demonstration and pilot projects underway; and implementation of each of the RPA provisions, as well as implementation of the Reasonable and Prudent Measures and Terms and Conditions, below.

17. **If implementation failure occurs: If Reclamation has not fully implemented the RPA requirements, or the MSCP process fails, then Reclamation must reinitiate formal section 7 consultation (see Reinitiation - Closing Statement, below).**

Because all LCR interrelated and interdependent actions would have to be part of the re-initiated consultation, any changes in such actions would be part of the proposed

action and not handled separately. The complete action, over a meaningful time frame, must be the subject of a future consultation, in the absence of the MSCP. Implementation of the MSCP is very important to the present consultation.

Because this BO has found jeopardy and destruction or adverse modification of critical habitat, Reclamation is required to notify the Service of its final decision on the implementation of the RPA.

INCIDENTAL TAKE STATEMENT

The Service has developed the following incidental take statement based on the premise that the RPA herein will be implemented. Sections 4(d) and 9 of ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of ESA sections 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

For the bonytail chub, razorback sucker, southwestern willow flycatcher and Yuma clapper rail; and in the event the flat-tailed horned lizard is subsequently listed as threatened or endangered, the measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order 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 adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

Listed species:

Bonytail Chub and Razorback Sucker

The Service anticipates that incidental take of bonytail chub and razorback sucker will be difficult to detect. There are two classes of take occurring as a result of the proposed action: (1) take related to maintaining conditions that preclude successful recruitment to bonytail chub and razorback sucker populations; and, (2) take that directly impacts individual fish through mortality.

(1) Take that precludes recruitment. This take occurs in any area containing populations of either bonytail chub or razorback sucker. The lack of sufficient recruitment by bonytail chub and razorback sucker to allow maintenance and expansion of their populations is a measurement of take.

(2) Take that relates to individual bonytail chub or razorback sucker mortality. Determination of the level of responsibility for this category of incidental take attributable to Reclamation is a complex undertaking. The actual probability of detecting individuals of either species that have been stranded (as eggs, larvae or adults), have passed through one of the dams, or have become entrained passing into a canal is unlikely. In addition, both species have small population sizes which contribute to the probability that take of individual fish through mortality will be limited. As augmentations continue, population sizes will increase and the possibility of detecting occurrences and the occurrences themselves may increase. Because currently the probabilities of both detecting occurrences and the actual occurrences of take for bonytail chub and razorback sucker are low, a surrogate measure to estimate the extent of take must be defined. Other fish species are affected by stranding, passage through dams, and entrainment to canals in the LCR. Using a measure of numbers from other species, one could begin to assess the probability of similar occurrences that could take place proportionately in bonytail chub and razorback sucker populations. Take of bonytail chub and razorback suckers presently occurs at some level, and will increase as implementation of the proposed action and other ongoing actions are carried out; but the amount of increase is unknown.

In order to determine when the level of incidental take has been exceeded, the Service applies the following standards:

(a) **Stranding.** For take due to stranding in riverine sections, the incidental take would be considered to be exceeded if Reclamation does not implement the reasonable and prudent measures and terms and conditions for the bonytail chub and razorback sucker, herein.

(b) **Dams.** For take due to passage through dams, there does not appear to be an adequate direct measure, since fish that "pass through" a turbine are no longer detectable. Reclamation shall determine an indirect way to assess the potential for fish passage through any particular LCR dam, that is, a "risk factor". Reclamation shall make this determination through modeling of the potential for fish to pass through the turbines of the hydroelectric dams (large and small), and through other appropriate risk analyses. That determined potential will then be compared with documented fish passage figures for other similar dams. Incidental take would be considered exceeded if the potential numbers of fish impacted are greater than the average of documented fish passage figures at the other similar dams, at a point in time one year after completion of the risk determination called for under the terms and conditions related to the bonytail chub and razorback sucker (numbers 1 and 2 under "To implement RPM 2 (Dams)", below). However, incidental take would not be considered exceeded if the Service concurs in a possible future determination by Reclamation that the management alternatives necessary to sufficiently reduce the risk of fish passage are not economically, technologically, and environmentally feasible, (the determination called for under term and condition number 2 under "To implement RPM 2 (Dams)", below).

(c) **Entrainment.** For take that involves canals, a direct measure of the live and dead fish taken

can be used. Because population numbers of bonytail chub in Lake Havasu and razorback sucker in Lake Havasu and below Parker Dam are, at present, extremely low, and the likelihood of finding dead individuals is not high, it is prudent to use a low number of fish found dead to determine when incidental take would be exceeded. The actual number of dead fish will certainly be higher than the number of dead fish found, because many will go undetected. However, the RPA short-term provision number 1, above, requires Reclamation to significantly augment the fish populations. After the first two years of the proposed action, the implementation of this provision should result in a greater number of fish entrained than would otherwise be the case. The incidental take will be considered exceeded if a total of two (2) or more bonytail chub and razorback sucker (in any combination of the two species) are found dead, over the first two years of the five year period covered by this incidental take statement. For years three through five, if the augmentation programs that are part of the proposed action and the RPA herein are implemented at the appropriate rate over the five year period for the specific receiving water (Mohave, Havasu, Parker-Imperial), then the level of take that can occur before incidental take is considered exceeded will be increased proportionally to the increase in the fish populations each year. This increase will be one (1) fish added to the level of incidental take for each 1,000 fish stocked into the specific receiving water. This increase would be added to the base of two (2) fish from the first two years. Depending on the number of either bonytail chub or razorback suckers stocked overall, the level at which incidental take would be exceeded may not be the same for both species. Fish that are found alive in the canals will not be counted as take under this provision. Live fish found will be handled according to a Service-developed protocol to be developed.

Southwestern Willow Flycatcher

With full implementation of the RPA, the Service still anticipates that incidental take of southwestern willow flycatchers will occur due to project-related activities in the form of riparian habitat degradation and loss, reduced productivity of adults, and reduced survivorship of adults and young. Nest loss/abandonment is anticipated to result from treefall, fire, cowbird parasitism, and recreational activities. Habitat loss and degradation caused by fire, desiccation, encroachment by saltcedar, and the operation of dams, diversions, levees, and banklines is anticipated to result in displacement of adults, reduced productivity, and reduced survivorship of adults and young.

Throughout the LCR, the rate of nest loss due to predation is anticipated to be up to 50% (i.e., up to 50% of all nesting attempts may fail as a result of depredation of nests). The rate of cowbird parasitism is also anticipated to be up to 50% (i.e., up to 50% of all nests will have at least one cowbird egg in them). Inadequate information is available to quantify actual take in the form of nest loss and habitat loss that results from fire, desiccation, encroachment by saltcedar, recreational activities, and the operations of dams, diversions, levees and banklines. However, when habitat is destroyed or habitat regeneration is impeded, 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. For the unquantifiable take, incidental take will be considered exceeded if the following reasonable and prudent measures and terms and conditions are not implemented.

Yuma Clapper Rail

The Service anticipates some incidental take of the Yuma clapper rail will occur due to project-related activities in the form of habitat loss and disturbance, disturbance and possible injury to adults and occasional inundation of active nests. Incidental take will be difficult to estimate or detect and quantify. Observing flushed birds or finding a dead or impaired specimen or an inundated nest is unlikely due to the dense habitat used by this secretive species. Therefore, although we are unable to quantify it, we are assuming some incidental take will occur and that it will be minimized or avoided by implementing the following reasonable and prudent measures and terms and conditions.

Proposed species:

Flat-tailed Horned Lizard

This conference opinion anticipates that eight (8) flat-tailed horned lizards per year could be taken as a result of animals moving onto travel routes or project sites from adjacent habitats and being crushed or injured by moving vehicles or equipment that would not be present but for the proposed action.

If this conference opinion is adopted as a biological opinion, the Service will only authorize forms of take of listed species that are incidental to operation, and maintenance of the existing 242 well field, Yuma Desalting Plant sludge disposal site, and ancillary facilities. Incidental take will be authorized only if such activities are consistent with the terms and conditions of this conference opinion.

EFFECT OF THE TAKE

Listed species:

Bonytail Chub and Razorback Sucker

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 when the RPA is fully implemented.

Southwestern Willow Flycatcher

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 proposed critical habitat when the RPA is fully implemented.

Yuma Clapper Rail

In the accompanying BO, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species.

Proposed species:

Flat-tailed Horned Lizard

In the accompanying conference opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the flat-tailed horned lizard.

REASONABLE AND PRUDENT MEASURES

The definition of an RPM is an action consistent with a proposed action's basic design, location, scope, duration, and timing. An RPM cannot cause more than a minor change to the project. Determining appropriate RPMs for this incidental take statement are complicated by the limits of Reclamation's discretion on the LCR activities. Many of the activities on the river that cause take are controlled by parties other than Reclamation. As a result, it is difficult to define RPMs that can actually be accomplished by Reclamation alone. Reclamation is strongly encouraged to seek the help of MSCP parties in implementing the terms and conditions of these RPMs.

Listed species:

Bonytail Chub and Razorback Sucker

The Service believes the following RPMs are necessary and appropriate to minimize take of bonytail chub and razorback sucker:

1. Reclamation will assess and reduce the potential stranding of eggs, larvae or individual fish; if needed, Reclamation will seek agreements from necessary parties to implement this measure.

2. Reclamation will assess and reduce the potential of bonytail chub and razorback suckers passing through the hydroelectric dams.

3. Reclamation will assess and reduce the potential of bonytail chub and razorback suckers being lost to the system because of entrainment.

Southwestern Willow Flycatcher

The Service believes the following RPMs are necessary and appropriate to minimize take of southwestern willow flycatchers:

1. Reclamation will protect southwestern willow flycatcher habitat on the LCR.

2. Reclamation will conduct additional surveying and monitoring of southwestern willow flycatcher habitat on the LCR.

Yuma Clapper Rail

The Service believes the following RPMs are necessary and appropriate to minimize take of the Yuma clapper rail:

1. Operations and maintenance actions by Reclamation must result in no net loss of Yuma clapper rail habitat, otherwise rails will be taken due to loss of nesting habitat. Disturbance of rails and rail habitat must be minimized. If areas are affected, they must be restored or replaced.

2. Subject to the limitations of the RPA for the bonytail chub, razorback sucker, and the southwestern willow flycatcher (which take precedence over this provision), dredging to maintain wetland and backwaters to offset succession and to benefit clapper rails must be continued (see **Table 15**, above) as part of Reclamation's annual maintenance program on the Colorado River.

Proposed species:

The prohibitions against taking a species found in section 9 of ESA do not apply until the species is listed. However, the Service advises Reclamation to consider implementing the following reasonable and prudent measures. If this conference opinion is adopted as a biological opinion following a listing or designation, these measures, with their implementing terms and conditions, will be nondiscretionary.

Flat-tailed Horned Lizard

The Service believes that the following RPMs are necessary and appropriate to minimize the incidental taking authorized by this conference opinion. If the species is listed, then the incidental take statement in this opinion, including its protection against a section 9 violation, will apply only to the proposed action.

1. Worker education programs and procedures shall be implemented to avoid or minimize the take of flat-tailed horned lizards resulting from operation and maintenance of the project facilities.

2. Reclamation shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

Listed species:

Bonytail Chub and Razorback Sucker

In order to be exempt from the prohibitions of section 9 of the ESA, Reclamation must comply with the following terms and conditions, which implement the RPMs described above. These terms and

conditions are non-discretionary.

To implement RPM 1 (Stranding):

1. Reclamation will evaluate the amount of spawning and nursery habitat that would be exposed by water level fluctuations in riverine areas in the January through May period. The amount of such habitat available to fish depends upon the actual total amount of water released and the daily fluctuations in the release. The amount of potential spawning and nursery habitat (i.e., habitat that would be under water at the highest daily flow), will vary over the five month period and the Service and Reclamation will have to evaluate this variance. Once the evaluation is completed, the possibilities to reduce such exposures will be examined. The evaluation, based over the first January through May period following issuance of the final BO, must include, at a minimum, a delineation of affected areas, an estimate of population size for the endangered fish species in affected areas, the extent of discretion in water releases available to each area, and the potential benefits to non-native fish species from either maintaining or altering the current system.

2. The evaluation in term number 1, above, will be completed by October 1 following the first January to May evaluation period after the date of the final BO and shall be provided to the Service and the MSCP Steering Committee. Reclamation will have until the next January to put in place alternatives that are reasonable, prudent, and environmentally feasible that will minimize effects to bonytail chub and razorback suckers; if needed, Reclamation will seek agreements from necessary parties to implement this term.

To implement RPM 2 (Dams):

1. Reclamation will determine, using surrogate measures or species, modeling, and other appropriate risk analyses, the current potential for bonytail chub and razorback sucker to pass through turbines at each of the LCR hydroelectric generating dams. Once the risk determination is complete, Reclamation will evaluate potential changes to existing management that would reduce passage of fish through each dam's turbines. The assessment will be completed within one year of the date of the final BO and the evaluation of management alternatives will be completed within another 120 days. These assessments and evaluations will be discussed with interested parties involved in the MSCP process, and both the assessments and evaluations will be provided to the MSCP Steering Committee and the Service.

2. Reclamation will implement those alternatives, if any, that reduce the risk of fish passage and are economically, technologically, and environmentally feasible, within one year of the date of the completed risk determination.

3. Reclamation will provide reports documenting determinations and decisions made in terms number 1 and 2, above, to the Service and the MSCP Steering Committee.

4. In the event that incidental take is exceeded, within seven (7) days Reclamation will provide the Service with a report on where, why and how this excess occurred. At the time of the

report, Reclamation and the Service will convene a meeting to address a method(s) for avoiding further take expected to occur during the remaining period covered by this consultation. Such determination(s) shall be implemented as appropriate. Should an individual of either species be found showing signs of having passed through a dam, Reclamation will contact the Service within 48 hours.

To implement RPM 3 (Entrainment):

1. Reclamation will evaluate all diversions (to canals or pipelines) for their potential to remove fish from the system. Diversions that allow for access into and out of the system will be evaluated for the potential of such movements of fish. This will be completed and a report provided to the Service within one year of the date of the final BO.

2. Management programs for all accessible canals will be examined by Reclamation in consultation with the affected water rights or contract holders to determine if present management encourages or discourages fish residency in the canal system. Reclamation will work with canal owners to develop monitoring programs to locate listed fish. This task will be completed and a report provided to the Service within 18 months of the date of the final BO.

3. Reclamation will work with appropriate Federal and non-Federal parties to research appropriate technologies to prevent fish entrainment into canals or pipelines from which return to the system is unlikely. If economically, technologically, and environmentally sound methods exist to reduce the potential for fish to access these canals or pipelines, Reclamation will work with the owners of the facilities to incorporate such methods into each facility within five years of the date of the final BO. A report detailing each decision herein will be provided to the Service and the MSCP Steering Committee before the end of the five year consultation period.

Because of the need for Reclamation to obtain cooperation and assistance from outside parties who own or operate facilities or have water or power contracts on the LCR (and therefore additional discretion) in meeting the terms and conditions of these RPMs, the Service believes that there is no guarantee that the level of incidental take will be reduced in the short-term as a result of these terms and conditions. However, Reclamation is required to use all of its appropriate discretionary authority alone if cooperation is not forthcoming. Cooperation with Reclamation by water and power users could address a portion of the take of these species that can be attributed to those users. Cooperation with Reclamation on the terms and conditions in this incidental take statement does not address the entire issue for these parties, but could provide some assurances as far as incidental take by them. In order to document the progress of these terms and conditions and cooperative or non-cooperative activities of outside parties, the Service will require Reclamation to provide informal briefings to the Service at least twice annually during the five year period covered by this consultation.

Southwestern Willow Flycatcher

In order to be exempt from the prohibitions of section 9 of the ESA, Reclamation must comply with

the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary. Implementation of the following terms and conditions may reveal additional information that will help to better define the extent of take and additional measures to reduce it. If that occurs, Reclamation may need to request a modification of this BO from the Service to address this new information.

To implement RPM 1 (Habitat Protection):

1. Reclamation will protect occupied flycatcher habitat regardless of plant species composition, and unoccupied, but potential flycatcher habitat, including stands of willow, cottonwood-willow, and mixtures of saltcedar and cottonwood-willow in all portions of the LCR under Reclamation management; provided that this term shall not be interpreted to require protection of saltcedar when its removal would actually result in improved flycatcher habitat, but saltcedar removal should not occur in an extant or recently-extant flycatcher location. Protection actions will include but not be limited to cowbird trapping in and near occupied habitat, fire breaks, and measures such as levee road closures to limit recreational disturbance of occupied sites.

2. In areas not under Reclamation management:

    a. Reclamation will immediately develop agreements with appropriate land management agencies along the LCR to implement a cowbird trapping program in the specific area(s) where cowbird parasitism rates have been monitored for one year from the date of the final BO and parasitism rates exceed 10% at any LCR site. Reclamation will continue trapping at the specific area(s) during the five year consultation period or until alternative means of reducing take have been negotiated with the Service.

    b. Reclamation will develop agreements with appropriate land management agencies along the LCR to put in and maintain fire breaks to protect occupied or potential southwestern willow flycatcher habitat from wildfire within one year of the date of the final BO.

    c. Reclamation will develop agreements with appropriate land management agencies along the LCR to close levee roads and put in place and enforce other public closures necessary to minimize impacts to southwestern willow flycatcher habitat from fire and disturbance within one year of the date of the final BO.

3. Reclamation will initiate a public information program within one year of the date of the final BO to alert resource users about the dangers of wildfire to riparian habitat.

To implement RPM 2 (Surveys and Monitoring):

1. Reclamation will conduct additional status surveys of all occupied and potential southwestern willow flycatcher habitat on the LCR over the next five years and a representative sample each year after that, or until alternative means of reducing take have

been negotiated with the Service to determine the number of flycatcher territories, the number of breeding pairs, the breeding status of pairs, cowbird parasitism rates, predation rates, nest success, biotic and abiotic habitat relationships of occupied sites, and the genetic relationships of flycatchers throughout the LCR for comparison with genetic data obtained from flycatchers breeding at Roosevelt Lake and the San Pedro River, Arizona. Reclamation will deliver a report of the findings to the Service annually, by December 1.

2. Reclamation will determine the effectiveness of the fire break and recreational access measures by monitoring location, size, and timing of fires on the LCR. Such monitoring will include acquisition of both ground and aerial color transparencies of all occupied or potential southwestern willow flycatcher habitat areas that are burned, partially or completely by fire. A yearly report, due September 30 each year, will be provided to the Service and will include photographs described above, a summary of the fire activity over that period, the amount of southwestern willow flycatcher habitat affected, effectiveness of closures and fire breaks, and recommendations for the coming year that can be transmitted to other agencies..

Yuma Clapper Rail

In order to be exempt from the prohibitions of section 9 of the ESA, Reclamation must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

To implement RPM 1 (Habitat Protection):

1. All clapper rail habitat areas destroyed or degraded due to future project activities shall be restored by the action agency.

2. This restoration shall be implemented as part of the scheduled project activity and completed within one year of the action.

3. Reclamation will develop/update and begin to implement rail management plans for areas under its management that currently or potentially support Yuma clapper rails within one year of the date of the final BO. These plans shall include management protocol for operations and maintenance activities that need to occur within or near rail habitat. These activities can be expanded in future years as part of the MSCP.

4. Where there is discretion regarding the scheduling of activities (such as non-emergency work or activities that are not constrained seasonally) in or near rail habitat, the clapper rail nesting season (March 15-July 10) will be avoided.

To implement RPM 2 (Dredging):

1. Subject to the limitations outlined in the RPA for the bonytail chub, razorback sucker, and the southwestern willow flycatcher, Reclamation will continue to maintain all mitigation backwaters and will work with all resource agencies on a cost share basis to maintain other backwaters. These backwaters will contain areas suitable for Yuma clapper rail habitat.

Proposed species:

Flat-tailed Horned Lizard

The following terms and conditions are established to implement the RPMs described above. If the species is listed, implementation of these terms and conditions will be mandatory.

To implement RPM 1 (Worker Education):

1. All personnel who implement the proposed action shall be briefed on the biology and status of the flat-tailed horned lizard, protection measures designed to reduce potential impacts to this species, and reporting procedures to be used if flat-tailed horned lizards are encountered in the field. Personnel shall be advised that handling of flat-tailed horned lizards by anyone is prohibited by State law without a permit.

2. Reclamation shall implement standard mitigation measures for the flat-tailed horned lizard detailed in the *Flat-tailed Horned Lizard Rangewide Management Strategy* for work in flat-tailed horned lizard habitat.

3. No ground-disturbing maintenance activities shall occur within the context of this conference. Any ground-disturbing activities are outside the project description herein and will require additional site-specific section 7 compliance.

To implement RPM 2 (Monitoring):

1. At the end of each calendar year, Reclamation will submit a monitoring report to the Arizona Ecological Services Field Office. The report shall include numbers and locations of flat-tailed horned lizards encountered; and numbers of flat-tailed horned lizards killed, injured, moved, or otherwise taken as a result of activities authorized by this conference opinion. The report will also make recommendations for modifying or refining the terms and conditions stipulated herein to enhance flat-tailed horned lizard protection or to reduce needless hardship on Reclamation.

2. Reclamation will work with the Marine Corps Air Station - Yuma, the Bureau of Land Management, Arizona Game and Fish Department and other entities to support research necessary to: 1) improve our knowledge of the ecology and life history of the flat-tailed horned lizard, particularly in regards to demographic parameters needed to better understand population dynamics and viability; and, 2) determine the relationship between scat/lizard counts and lizard densities.

Review requirement: The RPMs, with their implementing terms and conditions, are designed to **minimize** incidental take that might otherwise result from the proposed action. With implementation of these measures, the Service believes that:

1) Because of the difficulty in detectability or measurement, a minimized level of take for bonytail chub and razorback sucker cannot be identified. If the RPMs are implemented, no more than the numbers identified, or the surrogate measures, determined to represent the level of incidental take under provisions (2)(a)-Stranding, (2)(b)-Dams, and (2)(c)-Entrainment, of the Amount or Extent of Take section for bonytail chub and razorback sucker, will be incidentally taken.

2) Because of the difficulty in detectability or measurement, a minimized level of take for the southwestern willow flycatcher cannot now be completely identified. The survey and monitoring requirements identified in the RPA, the RPMs, and the terms and conditions will enable monitoring of take throughout the LCR. If the RPMs are implemented, take of flycatchers due to nest predation is not to exceed 50%. Incidental take will have been exceeded if more than 50% of flycatcher nests are depredated during any one breeding season. Additionally, take of flycatchers due to cowbird parasitism is not to exceed 25%. Incidental take will have been exceeded if more than 25% of flycatcher nests contain one or more cowbird eggs during any one breeding season.

3) An unknown, but minimized, number of Yuma clapper rails will be incidentally taken and the Service will consider that the incidental take level has not been exceeded if the Yuma clapper rail RPMs are implemented.

4) No more than **four (4)** flat-tailed horned lizards per year will be incidentally taken resulting from direct mortality due to crushing of lizards on roadways, routes, or project sites.

If, during the course of the action, these minimized levels of incidental take are exceeded, such incidental take would represent new information requiring reinitiation of consultation. Reclamation must immediately provide an explanation of the causes of the taking(s) and review with the Service the need for possible modification of the RPMs along with the reinitiation request.

DISPOSITION OF DEAD, INJURED, OR SICK INDIVIDUALS OF A LISTED SPECIES

If a dead, injured, or sick individual of a listed species is found in the action area, initial notification must be made to Service Law Enforcement, Federal Building, Room 105, 26 North McDonald, Mesa, Arizona, 85201 (Telephone: 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 finding, a photograph of the animal, and any other pertinent information. The notification shall be sent to Law Enforcement with a copy to the Arizona Ecological Services Field Office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. If possible, the remains shall be placed with educational or research institutions holding appropriate State and Federal permits. If such institutions are not available, the information noted above shall be obtained and the carcass left in place. Arrangements regarding proper disposition of potential museum specimens shall be made with the institution prior to implementation of the action. Injured animals should be transported to a qualified veterinarian by an authorized biologist. Should any treated animals survive, the Service shall be contacted regarding the final disposition of the animals. Although not required, Reclamation should implement these disposition measures for the flat-tailed horned lizard,

as well as the listed species addressed herein.

Notice: To the extent that this incidental take statement concludes that take of any threatened or endangered species of migratory bird will result from the agency action for which consultation is being made, the Service will not refer the incidental take of any such migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 USC sec.s 703-712) or the Bald Eagle Protection Act of 1940, as amended (16 USC sec.s 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

CONCURRENCES

Bald Eagle

The Service concurs with Reclamation's finding that the Lower Colorado River Operations and Maintenance Program may affect, but is not likely to adversely affect, the bald eagle. Our rationale for this concurrence follows. As stated in the BA, Reclamation's ongoing native riparian plant restoration program has the potential to increase the available tree nesting and perching habitat for eagles along the river beyond the five year time frame. Current river operations may preclude establishment of newly regenerated cottonwood and willow stands that could provide future nesting and perching substrate for bald eagles. However, the likelihood that regeneration-inducing events would be precluded over the five year time frame is so low as to be discountable. The limited number of nesting attempts in this area indicates that competition for nesting and perching sites would not be increased by precluding the trees from developing over the next five years, and it is also a discountable effect. Because the above effects are either insignificant, discountable, or beneficial over the short, five year time frame, no adverse effect is likely.

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 endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Listed species/critical habitat:

Bonytail Chub and Razorback Sucker

The Service recognizes the ongoing conservation efforts of Reclamation in helping to stabilize and prevent additional loss of bonytail chub and razorback sucker populations in the LCR. Because the Service is aware of Reclamation's continuing dedication to the survival and recovery of these species, additional conservation recommendations are not necessary at this time. The Service urges Reclamation to continue its efforts and to work in cooperation with other interested parties in long-term planning efforts to recover bonytail chub and razorback suckers in the LCR.

Southwestern Willow Flycatcher

Because of its expertise, authorities, and the amount of habitat it can affect, Reclamation should become a key player in helping develop and facilitate implementation of the recovery plan for this species.

Yuma Clapper Rail

Reclamation should continue to support recovery actions including, but not limited to, those detailed in the 1983 Recovery Plan for this species, such as annual surveys, effects of contaminants, habitat creation and maintenance, investigations of relationships between rail populations in the United States and Mexico, and investigations of the relationship between river water levels, flow rates and rail habitat and nesting success. Reclamation should join the Service in pursuing agreements with appropriate land management agencies and the Republic of Mexico to protect rail habitat.

Proposed species:

Flat-tailed Horned Lizard

Reclamation should manage undeveloped parts of the 5-mile zone north and west of the proposed area service highway route with the same management prescriptions as the Yuma Desert Management Area for the flat-tailed horned lizard. This area could be managed as a unit of the Management Area until construction of the area service highway is initiated. Reclamation should work with Yuma County, the BLM, and the Border Patrol to close and rehabilitate unneeded roads along section lines within the proposed Yuma Desert Management Area.

In future planning decisions regarding sludge disposal sites, well fields, or other activities, Reclamation should consider locating such facilities outside of the Yuma Desert Management Area and west of Avenue B. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation and conference on the actions outlined in Reclamation's request. 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 that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The Service expects that above conditions (2) and (3) for reinitiation may be met if the Lower

Colorado River Multi-Species Conservation Program does not materialize as described in the description of the proposed action.

In instances where the amount or extent of incidental take (see Amount or Extent of Take section, above) is exceeded, any operations causing such take must cease pending reinitiation. To avoid this, Reclamation is encouraged to provide the Service with early notice if excess take is anticipated to occur in order to provide an explanation of the causes of the anticipated take and review with the Service the need for possible modification of the RPMs.

Proposed species/critical habitat:

Reclamation may ask the Service to adopt the conference opinion incorporated in this consultation as a biological opinion issued through formal consultation if the flat-tailed horned lizard is listed. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will adopt the conference opinion as the biological opinion on the proposed action and no further section 7 consultation will be necessary.

After listing of the flat-tailed horned lizard as threatened or endangered and any subsequent adoption of this conference opinion, Reclamation shall request reinitiation of consultation if: (1) the amount or extent of incidental take is exceeded (see Amount or Extent of Take section, above); (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The incidental take statement provided with this conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the flat-tailed horned lizard has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the flat-tailed horned lizard may occur between the listing of the species and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

Because this BO has found jeopardy and destruction or adverse modification of critical habitat, Reclamation is required to notify the Service of its final decision on the implementation of the RPA.

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