[[[[insert table 9 landscape, pp. 1

[[table 9, p. 2]]

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

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

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 ± 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 psites 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 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.

Proposed species/critical habitat:

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.

[[[insert Table 12]]]]

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.