Table 13. Site Hydrology at Southwestern Willow Flycatcher Survey Sites, 1996 –1999

SITE NAME (Acres)	% SITE WITH SURFACE WATER	AVERAGE DEPTH OF SURFACE WATER	DISTANCE FROM SURFACE WATER	% OF SITE WITH SATURATED SOIL** (excluding area with surface water)
	1996/1997/1998/1999	1996/1997/1998/1999	1996/1997/1998/1999	1996/1997/1998/1999
Big Hole Slough- Blythe (46.2 ac)*	na/na/60/50	na/na/1m/1m	na/na /20m/30m	na / na / 50 / 50
Ehrenberg (21.5 ac)	30/50/20/10	2cm/2cm/5cm/1cm	5m /5m / 5m / 5m	50/ 100 / 80 / 50
Headgate Rock (48 ac)	10/10/10/20	5cm/5cm/10cm/10cm	30m/30m/30m/30m	30 / 50 / 20 / 20
Imperial NWR (39.3 ac)	50/ 30/ 10/ 20	1cm/1cm/1cm/1cm	60m/60m/60m/60m	25/25/25/25
Lower Walker Lake (334 ac)	30/ 30/ 30/ 30	30cm/20cm/20cm/5cm	10m/10m/10m/10m	100/100/100/100
Cibola Lake (61 ac)	70/ 70/ 50/ 50	10cm/20cm/20cm/5cm	5m/5m/5m/5m	25/25/25/25
Adobe Lake (185.6)	10/ 10/10/ 10	5cm/5cm/10cm/10cm	10m/10m/10m/10m	50/50/50/50
Paradise Valley (104.4)	20/ 20/ 30/ 30	1cm/1cm/1cm/1cm	25m/25m/25m/25m	100/100/100/100
The Alley (244 ac)	70/ 70/ 50/ 50	30cm/20cm/20cm/5cm	5m/5m/5m/5m	100/100/100/100
Camp Store (44.1 ac)	50/ 50/ 30/ 30	5cm/5cm/10cm/10cm	10m/10m/10m/10m	100/100/100/100
Draper Lake (248 ac)	20/20/30/30	30cm/20cm/20cm/5cm	25m/25m/25m/25m	100/100/100/100
Ferguson Lake (130.6 ac)	70/70/50/50	5cm/10cm/10cm/10cm	5m/5m/5m/5m	100/100/100/100

* Site Deleted from analysis, water depth > 1.55'
** Saturated soil criteria is based on rankings of substrate samples taken within the SWWF survey area.
Observers sample multiple areas (n=30) of each surveyed site at 0 to 3cm soil depth every two weeks between 15 May and 15 August.

B. Impacts on aquatic and backwater habitat

1. Interim Surplus Criteria

The primary lake habitats identified for potential effect due to surplus criteria include Lake Powell and Lake Mead. Other reservoirs downstream of Lake Mead (Lake Mohave and Lake Havasu) are expected to be largely unaffected by the proposed ISC because operation of the project typically keeps lake levels at specified target elevations to facilitate power generation and water deliveries.

Native Colorado River fishes have not fared well in reservoir environment dominated by non-native predators. While some native species may spawn within the reservoir and others have young that drift into the lakes, predation is believed to eliminate young native fish from the reservoirs and precludes their survival and recruitment. Non-native species, however, have become well-established.

There are no specific threshold lake levels that are definitive for evaluation of potential impacts to lake habitat in Lake Powell or Lake Mead. Modeling results indicate a trend toward decreasing pool elevations with varying degrees of probability over time under baseline conditions and for each of the alternatives.

Modeling results indicate increased probabilities for Lake Powell and Lake Mead surface elevation declines over the 50-year period of analysis under baseline conditions and the ISC. These modeling projections indicate future habitat conditions at Lake Powell and Lake Mead will continue to be subjected to varying inflows and fluctuating lake elevations primarily based on hydrologic conditions present in the watershed and water diversions in the Upper Basin. Historically, these conditions have resulted in lake habitat that is favorable to nonnative species and unfavorable to native species. Projections of increased potential for future reservoir surface declines in both Lake Powell and Lake Mead are similar when comparing baseline conditions to each of the alternatives and are not likely to result in substantial changes to lake habitat.

Effects of the ISC on riverine habitat are expected to be minimal. The major effects may occur on the reach of the Colorado River between Glen Canyon Dam and Lake Mead. However, expected changes, if any, would be covered within the range of operations covered by the Adaptive Management Plan for the Grand Canyon. Implementation of the ISC may produce slightly higher mean monthly flows within the Grand Canyon during the 15 year interim surplus period as a result of more frequent equalizations.

2. Secretarial Implementation Agreements

Impacts on the aquatic and backwater habitat are the result of a change in point of diversion of 400 kaf from Imperial Dam to Parker Dam. The area has over 4,000 acres of backwater habitat plus over 10,000 acres of riverine habitat. Months selected for impact analysis were April, August and December. These months were selected as April represents the highest flows in the system, and backwater areas are important for nursery areas for larval fish. April also represents new growth and dormancy break for cattail and is within the Yuma clapper rail breeding season. Backwaters in August are necessary for juvenile fish cover, and December represents the lowest water elevations throughout the year.

Table 14 shows the impacts expected for 200, 300, and 400 kaf change in point of diversion. In summary, April shows the greatest impact with a reduction of 24 acres of open water associated with backwaters, 38 acres of emergent vegetation associated with backwaters, and 47 acres of open water associated with river channel. August and December show a lesser reduction.

Table 14. Open Water and Emergent Vegetation Reductions*

April Acreage Reduction				
Acre Feet (1000s)	Backwater Open Water	Backwater Emergent	River Channel Open Water	Total Open Water
200	12	19	24	36
300	18	29	35	53
400	24 17	38 28	47 35	71 52
August Acreage Reduction				
Acre Feet (1000s)	Backwater Open Water		River Channel Open Water	Total Open Water
200	5		7	12
300	7		11	18
400	10		14	24
December Acreage Reduction				
Acre Feet (1000s)	Backwater Open Water		River Channel Open Water	Total Open Water
200	4		6	10
300	6		9	15
400	8		12	20

* Proportional to 1.574 maf reduction

Marsh species which may be affected by the acreage reduction of backwaters include the Yuma Clapper Rail and the California Black Rail. Yuma Clapper Rail and California Black Rail are found in the type of habitat provided by the backwaters along the lower Colorado River. A reduction in this habitat would be expected to affect these species.

Razorback sucker and bonytail chub likewise may be affected by the reduction in open water in the river and backwaters. The river reach below Parker Dam is designated critical habitat for the razorback sucker. While there would be some modification of the habitat, it would not be expected to be adversely affected to any great degree. As stated before, that impact would be from a slight lowering of water levels in the mainstem. While bonytail chub do not presently inhabit the reach of the river below Parker Dam, they may likely be introduced in the future. Bonytail occur in Lake Havasu immediately upstream. Bonytail are one of the four big river fishes which are the subject of intensive recovery efforts. Both of these fish species require spawning gravels in the river, and the reduction in depth from reduced flows would be expected to affect those species.

VII. SPECIES DESCRIPTIONS

A. Terrestrial

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)
Federally Endangered

Description and Life Requisites

Willow flycatchers are found throughout North America and are further divided taxonomically into four subspecies, *E.t. brewseri*, *E.t. adastus*, *E. t. traillii*, and *E.t. extimus*. The latter, *E.t. extimus*, the southwestern willow flycatcher, breeds on the Lower Colorado River and its tributaries (McKernan, 1997, McKernan and Braden, 1998 & 1999). In January 1992, The U. S. Fish and Wildlife Service (FWS) was petitioned to list the southwestern willow flycatcher, *Empidonax trailllii extimus* as an endangered species. In July 1993, the species was proposed as endangered with critical habitat (58FR39495). On February 27, 1995, FWS listed the southwestern willow flycatcher as an endangered species (60FR10694). There is no recovery plans in place as of this writing and the designated critical habitat does not include the lower Colorado River (60FR10694).

As a member of the genus *Empidonax*, willow flycatchers are known for the difficulty in identifying individuals to species in the field (Phillips et al., 1964; Peterson, 1990; Sogge et al., 1997). The southwestern willow flycatcher is a small bird, approximately 5.75 inches in length, with a grayish-green back and wings, whitish throat, light grey-olive breast, and pale yellowish body. Two white wing bars are visible. The upper mandible is dark, the lower light. The most distinguishable taxonomic characteristic of the southwestern willow flycatcher is the absent or faintly visible eye ring. The southwestern willow flycatcher can only be positively differentiated in the field from other species of its genus by its distinctive "fitz-bew" song.

Southwestern willow flycatchers nest in riparian habitat characterized by dense stands of intermediate sized shrubs or trees. Most southwestern willow flycatcher nests are located in the fork of a shrub or tree from 4 to 25 feet above the ground (Unitt, 1987; Sogge, 1997). The nest site almost always contains or is adjacent to water or saturated soil (Phillips et al., 1964; Muiznieks et al., 1994, McKernan and Braden, 1998). The southwestern willow flycatcher is an insectivore, foraging within and above dense riparian habitat, catching insects in the air or gleaning them from the surrounding foliage. It also forages along water edges, backwaters, and sandbars adjacent to nest sites. Details on specific prey items can be found in Drost et al. (1998). On the lower Colorado River, southwestern willow flycatchers begin arriving on breeding territories in early-May and continue to be present until August, with some records into early September (McKernan and Braden, 1998). Recent studies have documented nest building as early as May 1 (McKernan, 1997) and fledging dates as late as September 9 (McKernan and Braden, 1998).

A long-distance migrant, the southwestern willow flycatcher winters in Mexico from Nayarit and southwestern Oaxaca south to Panama and possibly extreme northwestern Columbia and migrates widely through the southern U.S., occurring as a regular migrant south to the limits of the wintering range (Peterson, 1990; Sogge, 1997, AOU, 1998). Recent field studies in Costa Rica by Koronkiewicz and Whitfield (1999) and studies of museum specimens by Phil Unitt (1999) collaborate previous information on the species' range. One specimen of willow flycatcher captured in Costa Rica during the winter of 1999 was banded at the Ash Meadows National Wildlife Refuge (NWR) in southern Nevada in July 1998 (Koronkiewicz and Whitfield, 1999). The Ash Meadows NWR is within the identified breeding range of this southwestern subspecies and thus the capture in Costa Rica is the most recent confirmed wintering site of *E.t. extimus*. Breeding range for the species as a whole extends as far south as northern Sonora, and northern Baja California (AOU, 1998) and north into Canada. Breeding range for the southwestern subspecies of the willow flycatcher, *E. t. extimus*, extends from extreme southern Utah and Nevada, through Arizona, New Mexico, and southern California, but records from west Texas and extreme northern Baja California and Sonora, Mexico remain lacking to date (Unitt, 1987). The species has been documented at El Doctor wetlands, Colorado River delta, Sonora, Mexico June 7 and 8, 1999 (Huerta, University of Arizona, pers. comm.). This sighting confirms the area is used for migration, but does not confirm breeding. The presence of the subspecies after June 15 is required to confirm breeding (Sogge et al., 1997; Braden and McKernan, 1998).

The majority of southwestern willow flycatchers found during the past five years of surveys on the lower Colorado River have been found in saltcedar, *Tamarix ramosissima*, or a mixture of saltcedar and native cottonwood and willow, especially Gooddings willow, *Salix gooddingii*, coyote willow, *S. exigua* and Fremont cottonwood, *Populus fremontii*. Based on available information at the time of this writing, aside from the presence of water and dense structure of vegetation, no clear distinctions can be made based on perennial species composition, as to what constitutes appropriate southwestern willow flycatcher habitat. Due to the difficulty in determining the presence of this species in dense habitat, its presence should not be ruled out until surveys have been conducted if habitat meeting the general description given above is present.

Distribution and Abundance

Historically, the southwestern willow flycatcher was widely distributed and fairly common throughout its range, especially in southern California and Arizona (Unitt, 1987; Schlorff, 1990). Nest and egg collections by Herbert Brown suggest that the southwestern willow flycatcher was a common breeder along the lower Colorado River near Yuma in 1902 (Unitt, 1987).

Grinnell (1914) also believed that the southwestern willow flycatcher bred along the lower Colorado River due to the similarities in habitat between the lower Colorado River and other known breeding sites. He noted the abundance and possible breeding behavior of southwestern willow flycatchers observed in the willow association. However, the date of his expedition corresponds more to the migration season of the southwestern willow flycatcher, with only a small overlap with the beginning of the breeding season.

In 1993, FWS estimated that only 230 to 500 nesting pairs existed throughout its entire range (58FR39495). However, since extensive surveying has been implemented, this number has increased, especially on the lower Colorado River where the species was thought to have been extirpated (Hunter et al., 1987; Rosenberg et al., 1991; McKernan and Braden, 1999). Sixty four nesting attempts were documented on the lower Colorado River from southern Nevada to Needles, California in 1998 (McKernan and Braden, 1999).

Several factors have caused the decline in southwestern willow flycatcher populations. Extensive areas of suitable riparian habitat have been lost due to river regulation and channelization, agricultural and urban development, mining, road construction, and overgrazing (Phillips et al., 1964; Johnson and Haight, 1984; Unitt, 1987; Rosenberg et al., 1991; Sogge et al., 1997). The total acreage of riparian vegetation has changed little in the last 25 years (see Table 8 and CH2MHill, 1999), although there is less native vegetation and more non-native present (Rosenberg, 1991). A description of historical southwestern willow flycatcher habitat can be found in Long term restoration program for the historical Southwestern Willow Flycatcher (*Empidonax traillii extimus*) habitat along the Lower Colorado River, (USBR, 1999).

Effects Analysis

At Lake Mead, declining Lake elevations may increase riparian habitat for willow flycatchers, although the habitat may be ephemeral due to possible high inflows in the future that could inundate the area. Differences in impacts to willow flycatcher habitat between the No Action Alternative and the California Alternative for the ISC between Hoover Dam and

Imperial Dam are negligible. The probability of flood control releases from Parker Dam greater than or equal to 19,500 cfs are 13.9% under the No Action Alternative and 13.0% under the California Alternative between 2001 and 2015. The probabilities increase slightly after the interim period ends in 2015 to 19.7% for the No Action Alternative and 17.9% for the California Alternative (USBR, 2000).

On the lower Colorado River, willow flycatchers utilize dense stands of vegetation adjacent to standing water or moist soil. A change in point of diversion of 400 kaf under the SIAs may affect willow flycatcher habitat by lowering river and groundwater elevations. For a more complete description of effects to willow flycatcher habitat see Section V.A.2.

Bald Eagle (Haliaeetus leucocephalus)
Federally Threatened

Description and Life Requisites

The bald eagle is a large, powerful brown raptor with a white head and tail. Bald eagles do not reach full adult plumage until they are 4 to 6 years of age. Immature birds younger than 4 years old are primarily brown with some white mottling. The bald eagle is the only member of the sea eagle family regularly occurring on the North American continent.

A bird of aquatic ecosystems, it frequents estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. In winter, bald eagles often congregate at specific wintering sites that are generally close to open water and that offer good perch trees and night roosts (59FR35584, 1994). They prey mainly on fish but also eat birds, mammals and carrion fish.

Distribution and Abundance

The bald eagle historically ranged throughout North America except extreme northern Alaska and Canada and central and southern Mexico. Bald eagles nest on both coasts from Florida to Baja California, in the south, and from Labrador to the western Aleutian Islands, Alaska, in the north. World population estimates range as high as 80,000 bald eagles (Stalmaster, 1987), with up to 20,000 eagles wintering in the contiguous United States (Gerrard, 1983).

In 1978, in response to lowering population and reproductive success, FWS listed the bald eagle throughout the lower 48 states as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened (43FR6233, February 14, 1978). In the 18 years since it was listed, the bald eagle population has clearly increased in number and expanded its range. This improvement is a direct result of the banning of DDT and other persistent organochlorines, habitat protection, and from other recovery efforts (60FR36001, July 12, 1995). On August 11, 1995, FWS reclassified the bald eagle from endangered to threatened in the lower 48 states. This reclassification also included the southwestern population (including Arizona) which was determined not to be reproductively isolated as previously believed (60FR133, pg 3600, August 12, 1995).

Little was known about the bald eagle in Arizona (and the project area) prior to 1972 when the FWS began monitoring the population (Rubink and Podborny, 1976). For many years, the unique desert nesting birds of Arizona were thought to be reproductively isolated. In 1982, a recovery plan was developed specifically for the southwestern bald eagle. The geographic boundaries of this population as defined by the recovery plan includes Arizona, New Mexico, portions of Texas and Oklahoma west of the 100th meridian, and southeast California within 10 miles of the Colorado River or its reservoirs.

In 1987-1990, Biosystems Analysis, Inc., investigated the ecology of Arizona's nesting population of bald eagles. The study was funded by Reclamation for the purpose of determining what factors limit the Arizona eagles, and particularly whether the reservoirs and regulated flows produced by construction and operation of water projects have been harmful or beneficial. Hunt et al. (1992) was an extremely comprehensive look into the biology and ecology of this raptor which will likely be used and cited by resource managers and researchers for decades to come.

Most of those who studied bald eagles previously in Arizona believed that reservoirs were relatively unimportant as foraging habitat. Rubink and Podborny (1976) speculated that, "Large reservoirs may be unsuitable as foraging habitat. Several reasons are possible: inadequate perches and shallow water areas, the absence of fish near the surface, turbidity of the water or human disturbance by boating." However, Hunt et al. (1992) concluded that bald eagles on the Salt and Verde River systems of Arizona often perched and foraged at reservoirs. Not only did nesting eagles frequently perch at reservoirs, they foraged on them extensively. Of 841 forage attempts recorded at the 7 studied territories by Hunt et al (1992), 435 (51.7%) occurred on rivers and 406 (48.3%) on reservoirs. Overall, reservoirs, dams, or regulated river reaches did not appear to have a negative effect on bald eagle reproduction. In habitats altered by dam construction, 134 young fledged from 12 sites in 122 occupied nest years for a mean of 1.1 young per year. In "natural" habitats, the eagles produced 93 young at 9 sites in 92 nest-years, for a mean of 1.0 young. The difference in productivity between altered and unaltered habitat was not significant (Hunt et al., 1992).

On reservoirs, most observed eagles foraged for fish in deep water and most were taken as carrion or as they floated moribund on the surface. Hunt et al. (1992) documented eagles foraging on a number of non-native species on reservoirs including carp, black crappie, yellow bass, largemouth bass, and catfish. Two factors which appear to strongly increase habitat quality included "reservoirs supporting warm water fisheries" and "reservoir inflow areas" (Hunt et al., 1992).

Busch (1988) commented that "Although potential cliff nest sites appear to be abundant in Arizona and New Mexico, the bald eagle's proclivity toward tree nests throughout its range may indicate that cliff nests are only marginally suitable." Hunt et al. (1992), however, found that bald eagles nested on cliffs and in trees. Of the 11 known nests within the 28 breeding areas known at the time of the study, 36 were on cliffs, 17 on pinnacles, 46 in trees, 11 in snags, and 1 was built on an artificial nesting platform. Of the 11 cumulative years of data on active nests, Biosystems, Inc. also found that at breeding areas where both cliff and nest trees were available, eagles selected cliff nests 73 percent of the time and tree nests 27 percent. More significantly, Hunt et al. (1992) found no significant difference in the nesting success between cliff nests (65% successful) and tree nests (57% successful).

No data exists to indicate that the lower Colorado River was a significant breeding area for bald eagles. Historical records of breeding are rare. In 1975 a nest was built in a cottonwood tree on Havasu National Wildlife Refuge (Hunt et al., 1992). No eggs were laid in 3 years of monitoring, and the breeding area was not included as a known breeding area by Hunt et al. (1992) or Driscoll (1994). The site was checked by the AGFD in 1994 and 1995. While the Havasu tree nest still exists, no eagles were observed in either year (Greg Beatty, AGFD, pers. comm.). An unverified report of a cliff nest 15 miles upstream of Davis Dam also exists (Hunt et al., 1992). On April 18, 1996, a large eagle-sized cliff nest was found at Gene Wash Reservoir in California approximately 1 mile west of Parker Dam. Sightings of bald eagles at Gene Wash and the Copper Basin Reservoir to the west strongly suggest that this is a new bald eagle breeding area (AGFD letter, May 15, 1996).

Two nesting pairs inhabit the Bill Williams River near Alamo Dam, and it is possible the dispersing young or wide-ranging foraging adults may be seen during spring and summer along the Colorado River. At least some of the wintering birds are known to be from the Arizona breeding population. In 1988, a radio-tracked fledgling from the Verde River, Arizona, was followed to British Columbia and then reappeared at Martinez Lake in December of the same year (Rosenberg et al., 1991).

Current river operations and maintenance may preclude the establishment of newly regenerated cottonwood/willow stands that could provide future nesting and perching substrate for eagles. However, as documented in Hunt et al. (1992) and by the potential Gene

Wash Reservoir nesting territory, bald eagles can successfully nest on other substrates (cliffs, pinnacles).

Still, Reclamation's ongoing native riparian plant restoration program has the potential to increase available tree nesting and perching habitat along the river. No evidence exists to suggest that the food resources available in the reservoirs and river are limiting nesting within the project area.

Human disturbance is a cumulative effect associated with recreational use of shorelines and waterways that has the potential to degrade bald eagle habitat. However, steps to reduce such human-induced disturbances are underway by all levels of government and numerous private conservation organizations nationwide.

The Arizona Nest Watch Program, established in 1978, has been a positive force in preserving bald eagles in Arizona. It is well known that the presence and activities of the nest watchers has resulted in a substantial increase in breeding success (Hunt et al., 1992). Efforts to coordinate inter-agency programs to monitor, protect, and educate the public on the bald eagle are actively overseen by the Southwest Bald Eagle Management Committee. Federal agencies often implement closures around bald eagle nests to manage human disturbance, and the committee provides recommendations on closure programs when requested.

Effects Analysis

The proposed action is not likely to adversely affect the food resources, foraging opportunities, or the nesting habitat of the bald eagle within the project area. Wintering birds are expected to continue using the river and most likely will congregate where food resources are plentiful and excessive disturbance from recreation can be avoided. Reclamation, and most likely other Federal and State resource management agencies, will continue to coordinate with the Southwestern Bald Eagle Management Committee and the Arizona Bald Eagle Nestwatch Program to ensure that nesting territories are protected to the greatest extent possible. The diversion of river flows and the ISC over the next 15 years will not affect the bald eagle.

Desert Tortoise (Gopherus agassizii) (Mojave population)
Federally Threatened

Description and Life Requisites

The desert tortoise occupies a variety of habitats throughout its range. In the Sonoran Desert of Arizona, the tortoise typically occurs in the palo verde-cacti-mixed scrub series (Barrett and Johnson, 1990). Range-wide, desert tortoises are typically found at elevations of 6,000 to 3,500 feet. In Arizona, they have been found as low as 500 feet (Mohave Valley, Mohave County) and as high as 5,200 feet (east slope of the Santa Catalina Mountains, Pima County). Sonoran tortoise shelter sites (dens, pallets, etc.) most often occur on rocky bajadas and slopes or in washes that dissect the desert scrub and include cavities in sides of washes, crevices beneath rocks and depressions under shrubs. Sonoran tortoises often use more than one den (Holm, 1989; Barrett and Johnson, 1990) and re-use previously occupied dens. They appear to avoid the deep, fine soiled valley situations favored by western Mojave tortoises. Nest sites are nearly always associated with soil at the mouth of shelter sites.

The Mojave population of desert tortoise occurs primarily on flats and bajadas with soils ranging from sand to sandy-gravel, characterized by scattered shrubs and abundant inter-space for growth of herbaceous plants. They occur in creosote bush, alkali sink, and tree yucca habitats in valleys, on alluvial fans, and in low rolling hills at elevations ranging from sea level to 4,000 feet. They appear to prefer bajadas and desert washes where soils range from sandy-loam to light gravel-clay which are optimal for burrow construction. Shelter sites often occur on lower bajadas and basins in burrows dug in soil, cavities in sides of washes and depressions under shrubs. Important food items of the Sonoran tortoise are similar to those of the Mojave tortoise and include various species of forbs, grasses, succulents, and shrubs.

In general, downward trends in desert tortoise numbers and habitats result from urban development, long-term livestock grazing, mining, off-highway vehicle use, and collecting. Mortimore and Schneider (1983) suggested a Nevada die-off in the early 1980s was due in part to drought conditions and that habitat had been adversely impacted by long-term grazing intensities. D'Antonio and Vitouseki (1992) indicate that the increasing incidence and severity of fires combined with changes in vegetative community types, primarily towards exotic ephemerals, have adversely effected desert tortoises. Habitat fragmentation is another major contributor to population declines (Berry, 1992). Populations have been fragmented and isolated by urban development, highway construction, and development within powerline corridors.

The most serious problem facing the Mojave population of the desert tortoise is the "cumulative effects of human and disease-related mortality accompanied by habitat destruction, degradation, and fragmentation" (FWS, 1994a).

Human contact includes a number of threats. Among the most common are collection for food, pets, commercial trade, and medicinal uses, as well as being struck and killed by on-and-off road vehicles. Still another is by gunshot. Berry (1990) found that between 1981-1987, 40 percent of the tortoises found dead on a study plot in Freemont Valley, California, had been killed by gunshot or by off-road vehicles (FWS, 1994a).

Predation is another factor. Hatchlings and juveniles are preyed upon by several native species of reptiles, birds, and mammals, as well as by domestic and feral dogs. Predation by ravens is intense, as their population has grown over the last few decades due to increased food supplies provided by human development. Berry (1990) believes that predation pressure by ravens in some portions of the Mojave is so great that recruitment of juveniles into the adult population has been halted.

Disease has been noted as a factor since 1990. An upper respiratory tract disease has been discovered and is currently a major cause of mortality in the western Mojave Desert population. Predisposing factors, such as habitat degradation, poor nutrition, and drought, have only served to compound the problem (FWS, 1994a).

Habitat destruction, degradation, and fragmentation are yet some other threats. Over the last 150 years, there have been substantial decreases in perennial grasses and native annuals and an increase in exotics, which serve as fire hazards. Perennial shrubs and grasses used for cover and food have been diminished and have been replaced by inedible exotic ephemerals. Also, as the habitat becomes increasingly fragmented, desert tortoises are forced to forage over larger areas and are thus exposed to greater dangers. Finally, grazing by domesticated animals damages the soil, reduces water filtration, promotes erosion, and invites invasion by exotic vegetation (FWS, 1994a).

Distribution and Abundance

The desert tortoise has a rather extensive range in the Mojave and Sonoran Deserts of the United States and Mexico. Tortoise populations occurring in the Mojave and Sonoran deserts are for the most part isolated from each other by the Colorado River.

Sonoran Population:

Arizona's Sonoran population of the desert tortoise occurs discontinuously south and east of the Colorado River, from Lake Mead National Recreational Area through the southwest, westcentral and southcentral parts of the State. The precise range limits are generally not well known, and there are frequent occurrence information gaps within the known or suspected limits. The distribution map prepared by Johnson et al. (1990) (Figure 10). represents known areas of Sonoran tortoise occurrence within Arizona. Within this estimated 68,228 acres of occupied habitat, actual occurrence depends on local habitat parameters and other factors affecting tortoise populations. Available data indicate the range of the desert tortoise has not been reduced in Arizona in recent times (Barrett and Johnson, 1990).

Mojave Population:

The Mojave desert tortoise population, including both the western and eastern subpopulations, occurs (generally) in eastern California, southern Nevada, and the Beaver Dam Slope and the Virgin River Basin of southwestern Utah and extreme northwestern Arizona. These areas include portions of both the Mojave and Sonoran deserts. Within the Mojave region, the Mojave Desert is represented in parts of Inyo, Kern, Los Angeles, San Bernardino, and Riverside Counties in California; the northwestern part of Mohave County in Arizona; Clark County, and the southern parts of Esmeralda, Nye, and Lincoln Counties in Nevada; and part of Washington County, Utah. The Colorado Desert, a division of the Sonoran desert, is located south of the Mojave Desert and includes Imperial County and parts of San Bernardino and Riverside Counties, California.

Effect Analysis

Potential effects to desert tortoises from activities associated with the proposed action are not expected to occur since tortoises are not expected to occupy areas in close proximity to the river channel. Furthermore, no river maintenance activities such as bankline stabilization, levee maintenance, or dredging activities are anticipated in areas along the lower river where desert tortoises are known or expected to occur. All existing bankline and levee roads are either immediately adjacent to the river and/or within previously disturbed agricultural and/or urban areas and, hence, not within suitable tortoise habitat. The diversion of river flows and the ISC over the next 15 years will not affect the desert tortoise.

Yellow-billed Cuckoo (*Coccyzus americanus*)
Federally Proposed Endangered, State Endangered-California, State Protected-Nevada

Description and Life Requisites

Cuckoos are riparian obligates, found along the lower Colorado River in mature riparian forests characterized by a canopy and mid-story of cottonwood, willow and saltcedar, with little ground cover (Haltermann, 1998). Within the area of interest, cuckoos occur during the breeding season from interior California and the lower parts of the Grand Canyon, and Virgin River Delta in southern Nevada (McKernan and Braden, 1999) south to Southern Arizona, Baja California,. Chihuahua, Choahuila, Nuevo Leon, and Tamaulipas and have been recorded breeding as far south as Yucatan. The species winters in the southern United States, and from northern South America to Northern Argentina (AOU, 1998; Hughes, 1999). Cuckoos are largely insectivorous, with cicadas, (*Diceroprocta apache*) comprising 44.6% of their diet on the Bill Williams River National Wildlife Refuge (Halterman, 1998). The Bill Williams River is a tributary of the lower Colorado River near Parker, AZ. The lower 10 miles of this tributary is designated as the Bill Williams River National Wildlife Refuge, comprised of a large expanse of native cottonwood and willow habitat, interspersed with saltcedar. This area is believed to contain the largest cuckoo population in the lower Colorado River Valley. In February 1998, the western subspecies of the yellow-billed cuckoo, *C. a. occidentalis*, was petitioned for listing under the Endangered Species Act. The U.S. Fish and Wildlife Service made a preliminary determination that the petition presented substantial scientific or commercial information to indicate that the listing of the species may be warranted (FWS, 2000). A final determination on status listing is not yet available. Surveys for this species were conducted throughout Arizona in 1998 and 1999 (Carman and Magill, 2000), and have been conducted on the Bill Williams River NWR, beginning in 1993 (Halterman, 1994). In 2000, surveys have been expanded into southern Nevada and also include the Bill Williams River and Alamo Lake in Arizona.

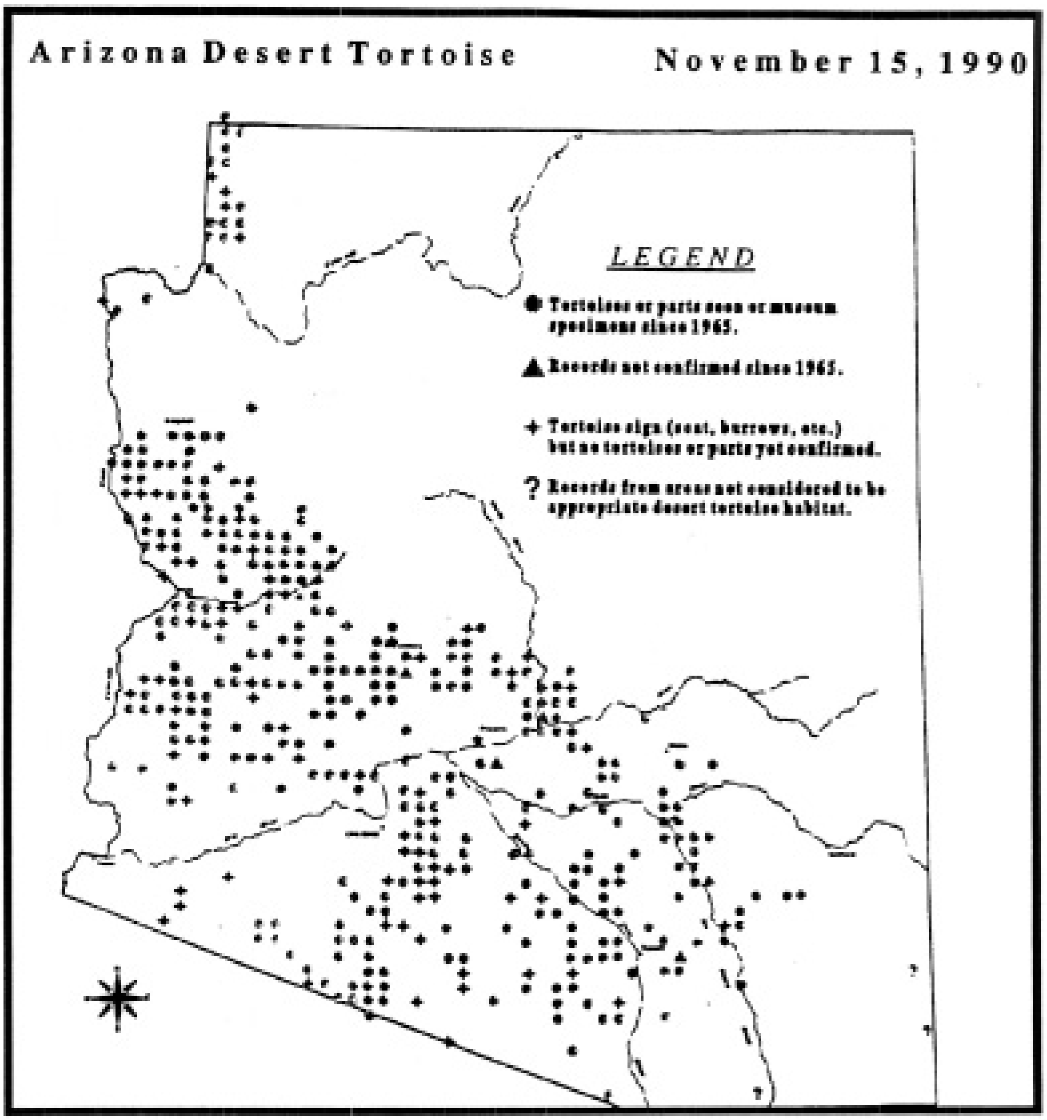

Figure 10. Known Sonoran Tortoise Sites