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HCP APPENDIX A

Species Covered by the HCP

APPENDIX A

Species Covered by the HCP

Invertebrates

Cheeseweed Moth Lacewing (*Oliarces clara*)

Range and Distribution

The cheeseweed moth lacewing has been documented from Yuma County in western Arizona; Imperial, Riverside, and San Bernardino Counties in Southern California; and Clark County, Nevada. Collections of the moth lacewing have been made from sea level in Imperial County to 100 meters (328 feet) elevation in Riverside County (Faulkner 1990; Faulkner personal communication). The range of the species may be much more extensive than its documented range, correlating to some extent with the range of its larval host plant, the creosote bush (*Larrea tridentata*) (Faulkner personal communication).

Population Status and Threats

This species is rarely observed in the field. However, in 1964, a massive emergence occurred near Palm Springs, with hundreds of individuals present (Faulkner 1990). The cheeseweed moth lacewing is a federal species of concern (former category 2 candidate for federal listing). Although infrequently observed, the moth lacewing may exist at many undocumented sites throughout the arid southwest region of the United States. The fleeting, localized nature of adult emergence complicates efforts to assess the population status of this species. Current threats to this species' survival are unknown.

Habitat Requirements

The larval stage is associated with the creosote bush, a desert shrub found throughout much of the southwestern United States and northwestern Mexico (Faulkner 1990). All collections of mature larvae and egg cases have produced specimens that were found inhabiting the root mass of this plant (U.S. Bureau of Reclamation [Reclamation] 1996). Adult emergence from soils near creosote bushes often follows winters of high precipitation and is fleeting and localized, lasting no longer than 4 days (Faulkner personal communication). On the first day, adult males emerge early in the morning and form large aggregations at the highest natural or artificial landmark. This landmark may be a cliff, rock outcropping, or telephone pole. Flight is weak, and many individuals are observed walking to the landmark rather than flying. Adult male activity on the first day ceases at noon with individuals taking shelter in the cracks of cliff walls, under rocks, and under vegetation. Females emerge on day two and mating occurs. Activity decreases throughout the third day with the increased occurrence of mortality, and ceases by the fourth day with nearly complete mortality (Faulkner 1990).

Habitat in the Proposed Project Area

The creosote bush scrub community is widespread throughout the unirrigated areas of the Sonoran Desert. This habitat type surrounds the Salton Sea between the higher rock hillsides and the more saline desert saltbrush community. In the Habitat Conservation Plan (HCP) area, creosote scrub also occurs with the right-of-way of the Imperial Irrigation District (IID) along the All American Canal (AAC).

Proposed Project Area Occurrence

The occurrence and distribution of the cheeseweed moth lacewing in the proposed project area are unknown. Suitable habitat likely exists in the HCP area in desert habitats adjacent to the AAC. A single moth lacewing was attracted to a light near Parker, California, in 1949 (Belkin 1954); however, no emergence sites have been documented for this area (Reclamation 1996).

Andrew's Dune Scarab Beetle (*Pseudocatalpa andrewsi*)

Range and Distribution

The Andrew's dune scarab beetle is endemic to the creosote bush scrub habitats of the Algodones Dunes in Imperial County, California, and may occur in portions of the sand dune system in Baja California Norte, Mexico.

Population Status and Threats

Detailed population information is not available for this species. However, its limited distributional range and endemism to the area make this beetle a federal species of concern. No current threats have been identified; however, off-road vehicle traffic on the dunes could potentially impact this species.

Habitat Requirements

Andrew's dune scarab beetle primarily occurs at elevations between 98 and 492 feet (30 and 150 meters) in desert dune and Sonoran desert scrub habitats. This species inhabits both surface and subsurface sand, using the wet sand interface as protection from heat of the day. This beetle specifically inhabits troughs of loose drifting sand between the dunes. They have been observed buried 12 inches deep in the sand.

Habitat in the Proposed Project Area

Suitable habitat for Andrew's dune scarab beetle in the proposed project area occurs where the AAC traverses the Algodones Dunes.

Proposed Project Area Occurrence

Andrew's dune scarab beetle is endemic to the Algodones Dunes in Imperial County. Distribution of this species is apparently widespread across the main dune mass, and it could potentially occur within the right-of-way of IID along the AAC. There is no evidence that the beetle inhabits desert areas other than the main dunes (Hardy and Andrews 1980).

Fish

Razorback Sucker (*Xyrauchen texanus*)

Range and Distribution

Historically, the razorback sucker inhabited the Colorado River and its tributaries from Wyoming to the Gulf of California. Razorback suckers were found in the Gila, Salt, and Verde Rivers, which are all tributaries of the Lower Colorado River (LCR). Upper basin tributaries containing historic populations of razorback suckers included the Gunnison River upstream to Delta, Colorado; the Green River from its confluence with the Colorado River upstream to Green River, Wyoming (Vanicek et al. 1970); the Duchesne River (Tyus 1987); the lower White River near Ouray, Utah (Sigler and Miller 1963); the Little Snake River and lower Yampa River, Colorado (McAda and Wydoski 1980); and the San Juan River, New Mexico. Most razorback suckers in the LCR basin are currently restricted to Lake Mohave, with smaller populations occurring in the Colorado River below Davis Dam, Lake Mead, and Senator Wash Reservoir (Bradford and Vlach 1995). Razorback suckers have also been captured sporadically from the mainstream Colorado River, impoundments, and canals (Marsh and Minckley 1989). Valdez and Carothers (1998) indicate that a small population also exists in the Grand Canyon section of the Colorado River. The current distribution of razorback suckers in the Upper Colorado River basin is confined to small groups of fish in several widely distributed locations. Most fish occur in an area including the lower 6.4 kilometers (4 miles) of the Yampa River and the Green River from the mouth of the Yampa River downstream to the confluence with the Duchesne River (USFWS 1997a). Small populations may also occur in the Colorado River at Grand Valley and in the San Juan River upstream from Lake Powell.

Population Status and Threats

The largest extant population of razorback suckers in the LCR basin occurs in Lake Mohave; however, this population is declining rapidly. The Lake Mohave population was estimated to contain 60,000 individuals in 1988 (Minckley et al. 1991) but by 1995, only 25,000 razorback suckers were thought to exist there (Marsh 1995). Although razorback sucker spawning has been successful and larval fish have been observed (more than 20,000 wild razorback sucker larvae were collected in 1995 from Lake Mohave [Reclamation unpublished data]), virtually no recruitment has been detected. Combined data from 1990 to 1997 suggest that the total population of razorback suckers in Lake Mead during 1997 was between 400 and 450 individuals (Holden et al. 1997). Recent population estimates from 1998 indicate that this population may have decreased to less than 300 fish (Holden et al. 1999). Successful spawning has been identified at two locations in Lake Mead. Thousands of larvae were collected during the spring of 1997, but no juveniles were found during May and June of the same year (Holden et al. 1997). The occurrence of some relatively young razorback suckers in recent surveys indicates there may be some recruitment in Lake Mead.

In the upper basin, razorback sucker populations are smaller and more widely distributed. The largest concentration occurs in the middle Green River, but Modde et al. (1996) report that the mean razorback sucker population from 1980 to 1992 in the middle Green River was only 524 individuals.

During the past few decades, the population dynamics of razorback suckers at different locations in the LCR basin have exhibited similar trends. Adult fish were observed in each population; however, juveniles were rare. Although wild populations of razorback suckers had been observed spawning in various locations in the lower basin, recruitment was never successful enough to replenish the adult populations. Eventually, the adult fish die of old age, and populations become reduced or extirpated. The lack of recruitment in these populations is thought to be primarily a result of predation by non-native fish on early life stages of razorback suckers.

Water resource development and interactions with non-native fish species currently threaten razorback suckers (Pacey and Marsh 1998). The limiting factors resulting from these two major threats include altered temperature and flow regimes, habitat loss, habitat fragmentation, predation, competition, and an increased risk of disease and parasitism. The primary limiting factor for razorback suckers in the lower basin is probably the direct effect of predation by non-native fish on early life stages of razorback suckers (Johnson 1997; Pacey and Marsh 1998).

The presence of impoundments in the LCR represents another major threat to razorback suckers. The unnatural temperature and flow regimes created by impoundments may inhibit spawning and reduce growth of razorback suckers. Daily fluctuations in the river may result in mortality from fish stranded in flooded areas. Another limiting factor that is directly related to the flow regime is loss of habitat. The comparatively stable flows that occur downstream of impoundments during the spring and early summer do not allow the river to flood and maintain low-lying areas. Historically, high spring and summer flows created large backwater areas and off-channel habitat that may have been important habitat for early life-stages of razorback suckers. The dams and impoundments also act as barriers to larval drift, species expansion, and migration.

Habitat Requirements

Adult razorback sucker habitat use can vary depending on season and location. Adult razorback suckers are adapted for swimming in swift currents, but they may also be found in eddies and backwaters away from the main current (Allan and Roden 1978). Ryden and Pfeifer (1995) observe that subadult razorback suckers use eddies, pools, backwaters, and other slow water habitats during spring runoff, and move into swifter habitats associated with the main channel during summer. Tyus and Karp (1990) report that during spring runoff, adults also use flooded lowlands and areas of low velocity. Tyus (1987) indicates that mid-channel sandbars represent a common summer habitat. Bradford et al. (1998) conclude that adult razorback suckers in the lower Imperial Division area of the Colorado River actively selected backwater habitats for use; however, many of these habitats had become unavailable to fish due to the effects of regulated flows. In clear reservoirs, adults of this species are considered pelagic, and can be found at various depths, except during the spawning period when they use more shallow shoreline areas. Little is known about juvenile habitat requirements because very few juveniles have been captured in the wild. Larval razorback suckers have been observed using nearshore areas in Lake Mohave (Marsh and Langhorst 1988). In riverine environments, young razorback suckers use shorelines, embayments, and tributary mouths (Minckley et al. 1991).

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During the spawning season, adult razorback sucker migrations have been documented in Lake Mohave (Marsh and Minckley 1989), the Green River, and the lower Yampa River (Tyus 1987). Razorback sucker adults have demonstrated fidelity to spawning locations (Tyus and Karp 1990). Spawning in lakes and streams takes place over loosely packed gravel or cobble substrate, and always at velocities less than 1.5 meters/second (4.9 feet/second) (Bradford and Vlach 1995). In the lower basin reservoirs, spawning occurs from January through April/May (Langhorst and Marsh 1986). In Lake Mead, spawning has been observed from mid-February until early May (Holden et al. 1997). In the upper basin, spawning occurs later in the year; but the temperature range is similar to lower basin spawning times (USFWS 1997a). The final thermal preferendum for the adult razorback sucker is estimated to lie between 22.9^{o} and 24.8^{o} Celcius (C) (73.2^{o} and 76.6^{o} Fahrenheit [F]) (Bulkley and Pimental 1983).

The razorback sucker is an omnivorous bottom feeder. Its diet is dependent on location and life stage (Bradford and Vlach 1995; Valdez and Carothers 1998). Larval razorback suckers were reported to feed on diatoms, rotifers, algae, and detritus (Wydoski and Wick 1998). Stomach contents of adult individuals collected in riverine habitat consist of algae and dipteran larvae, while adults examined from Lake Mohave were found to feed primarily on planktonic crustaceans (Minckley 1973).

Habitat in the Proposed Project Area

Razorback suckers are associated with large river systems and, within those systems, prefer low-velocity backwater areas. The high-water velocities and sparse vegetation associated with the irrigation canals in Imperial Valley do not provide these conditions, and habitat quality is low for razorback suckers. While it is possible that adult razorback suckers entrained in the canal system persist for some time, they are not likely to establish a self-sustaining population.

Proposed Project Area Occurrence

Razorback suckers are known to occur in the All American and East Highline canal systems. The species has also been found in an IID reservoir near Niland. The population in Imperial County is believed to be composed of old members of a dwindling, nonreproductive, remnant stock (Tyus 1991; Minckley et al. 1991). No recruitment of wild-spawned fish occurs, probably because of predation by introduced fishes and poor habitat conditions (Tyus 1991).

Desert Pupfish *(Cyprinodon macularius)*

Range and Distribution

Desert pupfish historically occupied the Gila River basin below approximately 1,500 meters elevation in Arizona and Sonora, including the Gila, Santa Cruz, San Pedro, and Salt Rivers; the LCR in Arizona and California downstream from the vicinity of Needles to the Gulf of California and onto its delta in Sonora and Baja California; the Rio Sonoyta of Arizona and Sonora; Puerto Penasco, Sonora; and the Laguna Salada basin of Baja California. (Marsh and Sada 1993). Suitable habitat was available, and the species probably occurred in the Agua Fria, Hassayampa, and Verde Rivers of Arizona as well. Distribution of desert pupfish was widespread but probably not continuous within its historic range.

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There are currently two recognized subspecies of the desert pupfish, *Cyprinodon macularius macularius* and *C. m. eremus*. Both subspecies are included in the federal listing of the desert pupfish as endangered. Only the *macularius* subspecies occurs in the proposed project area. Historically, *C. m. macularius* occurred in the Gila River basin, mainstream Colorado River from Needles to the Gulf of California, Rio Sonoyta, Puerto Peñasco, and Laguna Salada (Minckley 1973 and 1980; Miller and Fuiman 1987). Currently, in California, the *macularius* subspecies is restricted to San Felipe Creek and the adjacent wetland, San Sebastian Marsh, upper Salt Creek, and a small portion of the Salton Sea (Miller and Fuiman 1987). In California, the San Felipe Creek system, including San Sebastian Marsh and Salt Creek, provides natural habitat for the desert pupfish populations. *C. m. eremus* was historically found only in Quitobaquito Spring, Arizona. This species still contains a natural population. Reintroductions of *C. m. macularius* (15 populations) and *C. m. eremus* (6 populations) have occurred at many different locales in Arizona. Pupfish are also thought to inhabit the Rio Sonoyta and Santa Clara Slough in Sonora, Mexico (*Federal Register 19*86).

Population Status and Threats

Although remarkably tolerant of extreme environmental conditions, the desert pupfish is threatened throughout its native range primarily because of habitat loss or modification, pollution, and introductions of exotic fishes (USFWS 1986). The introduction of non-native species is the greatest future threat and current limiting factor affecting the desert pupfish. Introduced species, such as the mosquitofish (*Gambusia affinis*) and largemouth bass, supplant pupfish as a result of predation and aggression, while cichlids (*Tilapia* spp.) and mollies interfere with reproductive behavior (USFWS 1993a). The non-native bullfrog (*Rana catesbiana*) is also a predator of the desert pupfish (USFWS 1993a).

Although desert pupfish have very high tolerances for adverse environmental conditions, severe conditions can reduce this species' ability to survive. Improper grazing can increase turbidity by increasing erosion and reducing riparian vegetation. Water pollution from the application of pesticides in proximity to desert pupfish habitat is also an important factor, contributing to the decline of the Quitobaquito subspecies (Miller and Fuiman 1987).

Desert pupfish habitat quality can be a limiting factor. Droughts can cause the springs and headwaters that this species inhabits to dry up. Water development proposed projects can degrade desert pupfish habitat by removing water through groundwater pumping, diversion, and irrigation. The reduction of the amount of water in these habitats can create situations where the desert pupfish are at a competitive disadvantage with exotic fish species.

Habitat Requirements

Desert pupfish use a variety of different habitats, including cienagas, springs, headwater streams, and margins of large rivers. They prefer shallow, clear water, with either rooted or unattached aquatic plants, restricted surface flow, and sand-silt substrates (Black 1980; Marsh and Sada 1993; and Schoenherr 1990). They have the ability to withstand extreme water temperatures up to 45°C (113°F), dissolved oxygen concentrations down to 0.1 to 0.4 parts per million (ppm) (USFWS 1986), and salinity twice that of seawater (68 parts per thousand [ppt], Lowe et al. 1967). Barlow (1958) reported that adult desert pupfish survived salinity as high as 98,100 milligrams per liter (mg/L) in the laboratory. They can also survive 10 to 15 ppt changes in salinity as well as daily temperature fluctuations of 22° to 26°C (Kinne 1960; Lowe and Heath 1969). In less harsh environments where a greater diversity of fishes are found, pupfish tend to occupy water shallower than that inhabited by adults of most other species (Marsh and Sada 1993).

Spawning at the Salton Sea takes place between late March and late September, when water temperatures exceed 20°C (Moyle 1976; UCLA 1983). Pupfish can spawn several times during this period. Adult male desert pupfish are very territorial during the spawning season such that schools consist either entirely of adult females or entirely of juveniles. Desert pupfish usually set up territories in water less than 1 meter (3 feet) deep and associated with structure (Barlow 1961). Territoriality is highest in locations with large amounts of habitat, high productivity, high population densities, and limited spawning substrate (USFWS 1993a). Desert pupfish prefer water 18 to 22 centimeters deep for egg deposition (Courtois and Hino 1979). Depending on size, a female pupfish may lay 50 to 800 eggs or more during a season (Crear and Haydock 1971). The eggs hatch in 10 days at 20°C, and the larvae start feeding on small invertebrates within a day after hatching (Crear and Haydock 1971). Larvae are frequently found in shallow water where environmental conditions are severe.

Desert pupfish are omnivorous and consume a variety of algae, plants, insects, and crustaceans (USFWS 1993a; Cox,1972; and Naiman 1979). Walters and Legner (1980) found that pupfish foraged mostly on the bottom, consuming midge larvae, detritus, aquatic vegetation, and snails. Desert pupfish are opportunistic feeders whose diet varies seasonally with food availability (Naiman 1979). In general, when invertebrates are available, they are the preferred food of foraging pupfish. In the Salton Sea, ostracods, copepods, and occasionally insects and pile worms are taken (Moyle 1976). As invertebrates become less available, pupfish adjust their feeding behavior, and their gut usually contains large amounts of algae and detritus, as well as invertebrates (Cox 1972). The desert pupfish is not considered an important food for wading birds and other fish because of its low numbers (Walker et al. 1961; Barlow 1961).

Habitat in the Proposed Project Area

Desert pupfish prefer backwater areas, springs, streams, and pools along the shoreline of the Salton Sea. Desert pupfish habitat occurs in pools formed by barnacle bars located in near-shore and shoreline areas of the Salton Sea and in Salt Creek. Barnacle bars are deposits of barnacle shells on beaches, near-shore, and at the mouths of drains that discharge into the Salton Sea. The bars form pools that provide habitat for desert pupfish (IID 1994). Habitat for desert pupfish also occurs in the mouths of drains discharging directly into the Salton Sea and in the desert washes at San Felipe Creek and Salt Creek.

Proposed Project Area Occurrence

Desert pupfish were abundant along the shore of the Salton Sea through the 1950s (Barlow 1961). During the 1960s, the numbers declined; by 1978, they were noted as scarce and sporadic (Black 1980). Declines are thought to have resulted from the introduction and establishment of several exotic tropical species into the Salton Sea (Bolster 1990; Black 1980). These introduced species prey on or compete with desert pupfish for food and space. The sailfin molly (*Poecilia latipinna*) was discovered in irrigation drains in the late 1950s (Black

1980) and has become established in the Salton Sea (Moyle 1976). The Mozambique mouthbrooder (*Tilapia mossambicus*) and Zill's cichlid (*T. zillii*) were introduced into the Salton Sea in the late 1960s and early 1970s to control aquatic weed growth in the irrigation canals and drains (Black 1980). Interactions with the introduced mosquitofish (*Gambusia affinis*) have contributed to the decline of pupfish (Evermann 1930; Jennings 1985). Other factors responsible for declines in desert pupfish populations around the Salton Sea include habitat modification due to water diversions and groundwater pumping for agriculture (Pister 1974; Black 1980). There is also concern that introduced saltceder (tamarisk) near pupfish habitat may cause a lack of water at critical times due to evapotranspiration (Marsh and Sada 1993). Aerial pesticide application is a common practice around the Salton Sea that may also affect pupfish populations (Marsh and Sada 1993).

Historical accounts indicate that desert pupfish were once widespread and abundant around the Salton Sea. Surveys conducted by the USFWS to determine their distribution around the Salton Sea indicated that desert pupfish were present in more than 50 localities in canals and shoreline pools on the southern and eastern margins of the Salton Sea (Lau and Boehm 1991) and in small pools in San Felipe Creek, Carrizo Wash, and Fish Creek Wash near the Salton Sea. Localities also include agricultural drains in the Imperial and Coachella Valleys, shoreline pools around the Salton Sea, the mouth of Salt Creek in Riverside County, lower San Felipe Creek and its associated wetlands in Imperial County, and eight artificial refuge ponds (Bolster 1990; USFWS 1999). Designated critical habitat for desert pupfish includes San Felipe Creek, Carrizo Wash, and Fish Creek in Imperial County, California (USFWS 1986). The distribution of pupfish around the Salton Sea and designated critical habitat are shown on Figure A-1.

In surveys conducted by the California Department of Fish and Game (CDFG) in 1978-1979, desert pupfish accounted for 3 percent of the total catch in irrigation drains, 5 percent of the catch in shoreline pools, and less than 1 percent of the catch from three natural permanent tributaries and the Salton Sea proper (Black 1980). However, desert pupfish accounted for 70 percent of the total catch from San Felipe Creek.

Dunham and Minckley (1998) reported a rebound of pupfish populations in the Salton Sea paralleling recent declines in non-native fishes, presumably in response to increasing salinity. However, surveys in the various habitats around the Salton Sea indicate a general decline in desert pupfish abundance and distribution since 1991 (Table A-1). In 1991, 41 irrigation drains contained pupfish; this number was reduced to 33 in 1993 (Remington and Hess 1993). Only 11 irrigation drains contained pupfish in 1998, and the numbers of desert pupfish also declined from the earlier surveys (Sutton 1999).

Extreme annual variability in catch has occurred at individual sample sites (e.g., Trifolium 12 and County Line drains) (Table A-1). Variability in catch also occurs within a season, and some drains that did not yield pupfish during one trap set often produced pupfish in subsequent trappings (Nicol et al. 1991). This suggests that desert pupfish may move among habitats for various reasons. A variety of other factors may also influence trapping results, including numbers of traps, trap location, bait types, timing, water level fluctuations, and vegetation removal (Nicol et al. 1991).

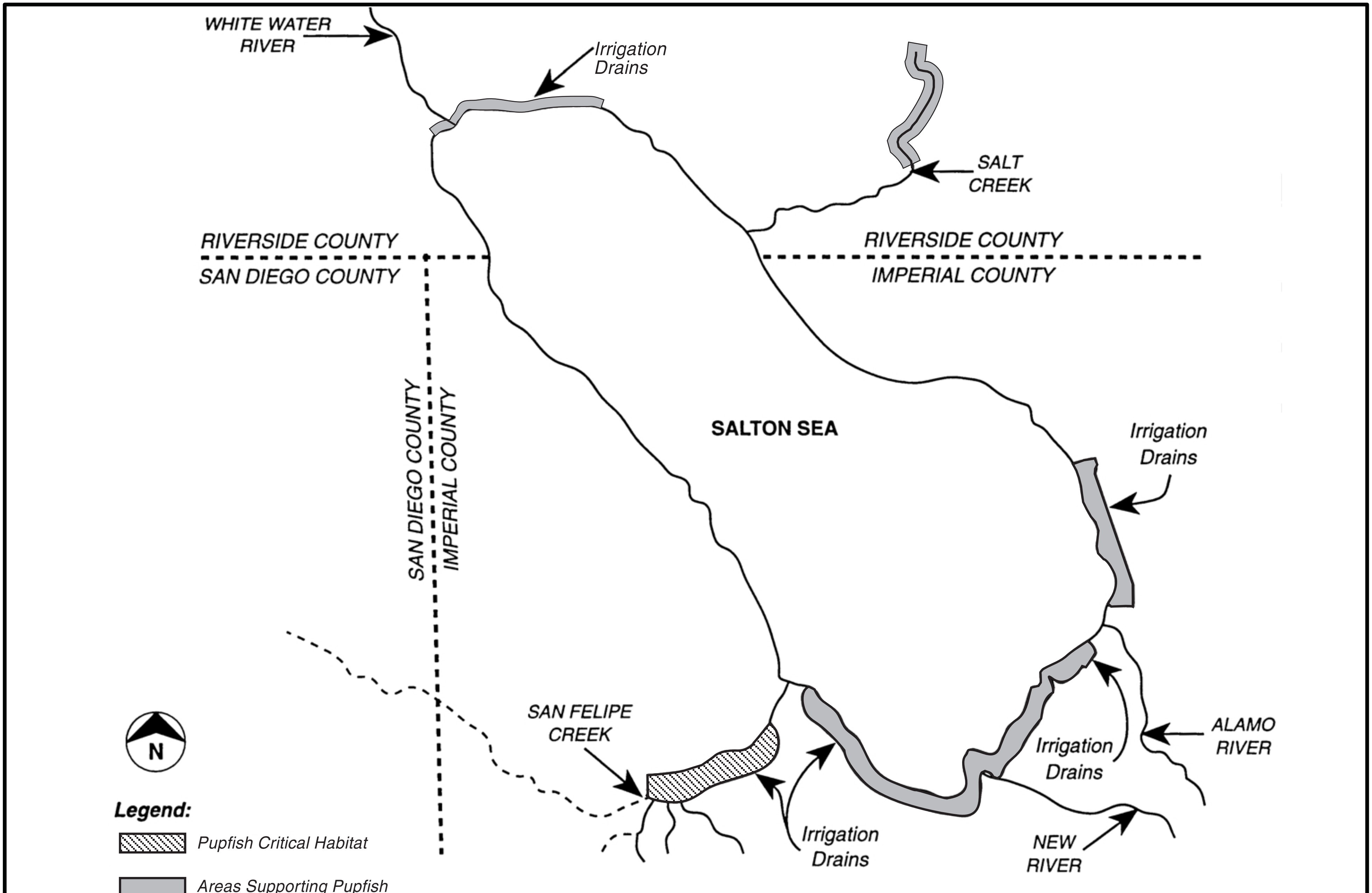

Figure A-1
Areas Sampled During 1993
CDFG/IID Desert Pupfish Survey
IID Water Conservation and Transfer Project Draft HCP

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TABLE A-1
Numbers of Desert Pupfish Collected During Various Surveys at the Salton Sea

	Year						
Drains	**1991[1]**	**1993[2]**	**1994[3,4]**	**1995[1]**	**1996[4]**	**1997[4,5]**	**1998[4]**
North End							
County Line	*				490	6	4
Oasis Grant	7						
Ave 84	38	27			*		1
Ave 83	5	1			27		1
Ave 82	*	4			*		1
Ave 81	3	5			6	6	8
Ave 80	80						
Ave 79	22	35	7				
Ave 78	155	84	1				
Ave 76	1	8	16		1		
Ave 74			1		3		
Ave 73			6				
Ave 68			2				
King Street	67		12		8	14	3
McKinley 0.5	*						
McKinley	17	51					
Cleveland 0.5	10	12					
Cleveland	18	29					
Arthur 0.5	18	6					
Arthur 4	4	8					
Garfield 0.5	2						
Garfield	*	1			1		
Hayes 0.5	9						
Hayes	2	79					
Grant 0.5	7						
Grant	92	5					
Johnson 0.5	37	17			1		
Lincoln		1					
Buchanan			*				

TABLE A-1
Numbers of Desert Pupfish Collected During Various Surveys at the Salton Sea

	Year						
Drains	**1991[1]**	**1993[2]**	**1994[3,4]**	**1995[1]**	**1996[4]**	**1997[4,5]**	**1998[4]**
South End							
Niland 4	19						
Niland 3		1					
Niland 2	2						
Niland 1		1	2				
Z		1	3				
W		11	356				1
T			2				
S		4	1				1
R		2	1			1	
Q			10				
P			10				
O			1				
Vail 4A	1						
Vail 56	44		53				
Vail 5A	26						
Vail 6	1						
Vail cutoff		1	2				
Vail 7		4	3				
Trifolium 12		261	3		1		
Trifolium 13		38	1				1
Trifolium 14A			1				1
Trifolium 1	9		1		1		
Tri Storm	1	2	3		16		2
Trifolium 18	2		2				
Poe	13	1	3		1		
Lone Tree Wash	8						
3W of Lone Tree	6						
Trifolium 19	8		3		1		
Trifolium 20		50	7				1
Trifolium 20A					13		

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TABLE A-1
Numbers of Desert Pupfish Collected During Various Surveys at the Salton Sea

	Year						
Drains	**1991[1]**	**1993[2]**	**1994[3,4]**	**1995[1]**	**1996[4]**	**1997[4,5]**	**1998[4]**
Trifolium 22		34	47				
Trifolium 23	13	64	22		1		
Trifolium 23N	2						
WP-10 SS-11	1						
S. Felipe Wash	5	3	1		31		
Pools							
S. of Bombay	23						
N. of Niland 4	30						
N. of Niland 3	9						
N. of Niland 1	4						
“U” drain pool							1
W. of New River	7						
S. of New River	1						
E. of Tri 22	6						
By Tri 23	4						
By Tri 23N	*						
N. of Tri 20A							70
N. of Grant 0.5							2
N. of Hayes 0.5					2		
S. of Salt Creek				3			
Tributaries							
S. Felipe Creek	*	224	195	115	*	388	*
Upper Salt Creek		9	15	45	18	102	
Lower Salt Creek	1			12			
* - observed							

Source: Sutton (1999)
[1] Nicol et al. (1991)
[2] Remington and Hess (1993)
[3] Schoenherr (1994) – Only surveyed north end drains
[4] CDFG, unpublished data
[5] No drain surveys in 1995; only north end drains surveyed in 1997

In a study of pupfish distribution and movement, Sutton (1999) found that physical habitat conditions appeared to influence the distribution and abundance of desert pupfish. While most irrigation drains were characterized by high densities of non-native fishes and low

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numbers of pupfish, one drain (Drain C) was unique because of a large, healthy population of desert pupfish coexisting with a high density of young tilapia. The habitat in Drain C was different from the other drains in having a high density of emergent vegetation (e.g., cattails) along both banks combined with a large portion of open, slow-moving water. The rooted aquatics acted to reduce the flow of water and provided cover and shelter for the pupfish (Sutton 1999).

Sutton (1999) observed desert pupfish movement between the Salton Sea and nearby drains. Pupfish were observed moving from both irrigation drains and Salt Creek downstream into shoreline pools. The reverse movement from shoreline pools upstream into both drains and Salt Creek was also observed. The best evidence of movements was observed in the southwestern area between Drain C and a connected shoreline pool. Decreases in the size of shoreline pools during seasonal fluctuations in water levels may affect fish health and/or force pupfish to seek other habitat. Thus, the connectivity between habitat types may be necessary to prevent pupfish from becoming stranded in habitats that cannot sustain them for prolonged periods (Sutton 1999). These observations indicate the importance of agricultural drains as pupfish habitat and the potential for pupfish to use shoreline aquatic habitats as corridors. This potential movement may be important in providing genetic mixing between various populations.

Based on the trapping studies conducted to date, desert pupfish populations are known from or expected in drains directly discharging to the Salton Sea, in shoreline pools of the Salton Sea, and in desert washes at San Felipe Wash and Salt Creek. Desert pupfish are not known to occur nor are they expected to occur in the New or Alamo Rivers because of the high sediment loads, excessive velocities, and presence of predators. Drains in the HCP area where pupfish have been found are shown on Figure A-2.

Amphibians

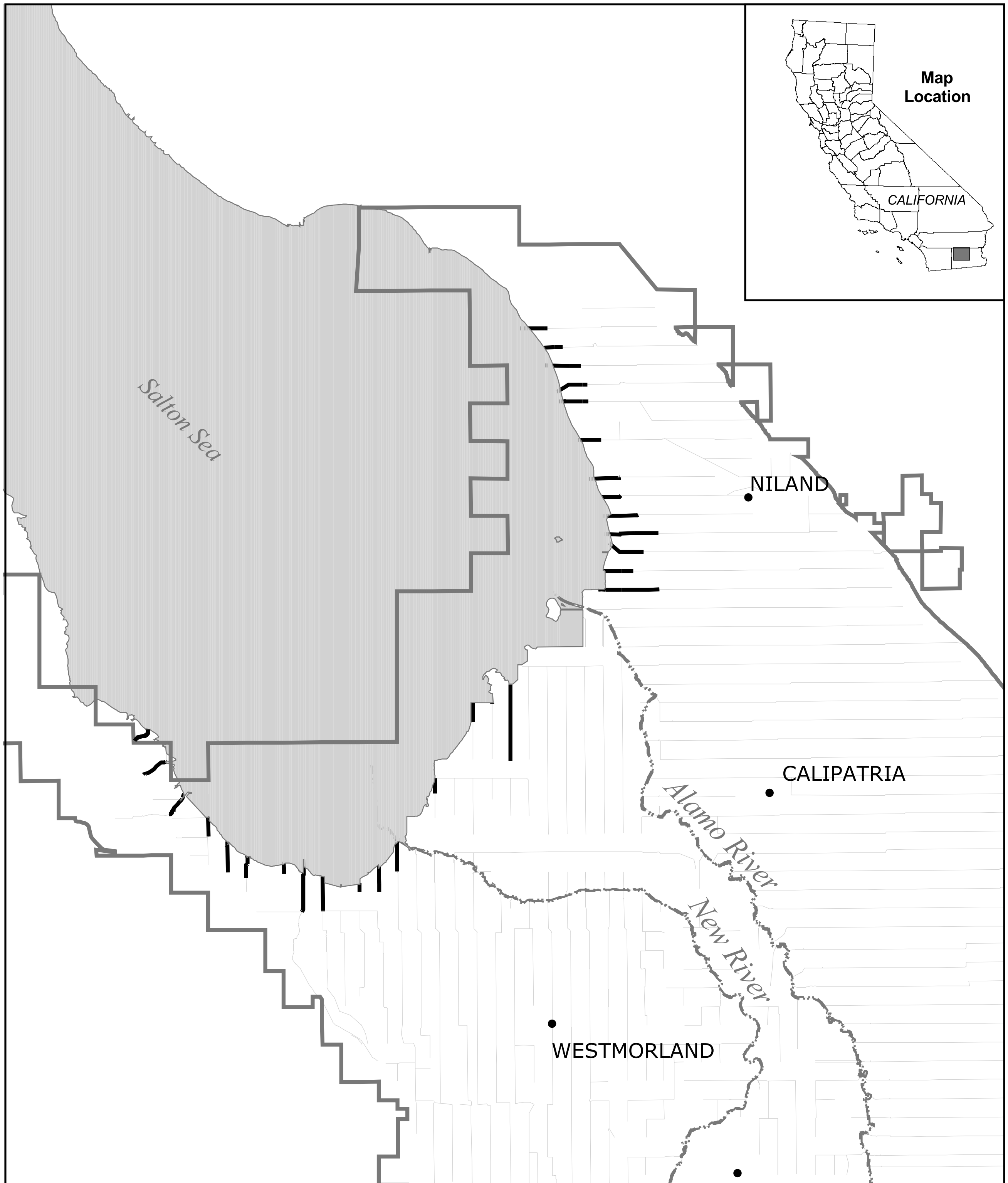
Couch's Spadefoot Toad (*Scaphiopus couchii*)

Range and Distribution

The Couch's spadefoot toad occurs from southeastern California eastward through Arizona, New Mexico, Texas, and Oklahoma, and southward into San Luis Potosí, Nayarit, and the southern tip of Baja California, Mexico. An isolated population of the species also occurs near the Petrified Forest National Monument in Colorado (Jennings et al. 1994).

Population Status and Threats

Despite an apparent tolerance for agricultural habitat modification and other disturbances, the Couch's spadefoot toad seems to be declining throughout its range (Jennings et al. 1994). Factors responsible for the decline of this species are not well known, but threats to this species may include noise disturbances from off-road vehicles and disturbances that alter the percolation characteristics of temporary rain pools used as breeding sites (Jennings et al. 1994).



PUPFISH SITES
DRAINS
COUNTY LINE
RIVER
IID WATER SERVICE AREA
CITIES

N

Source:
University of Redlands, 1999; DOI, 1999

2 0 2 Miles

SCALE IS APPROXIMATE

Figure A-2
Drains Supporting Desert Pupfish
IID Water Conservation and Transfer Project HCP

HABITAT REQUIREMENTS

Couch's spadefoot toad frequents arid and semiarid habitats of the southwest, occurring along desert washes, in desert riparian, palm oasis, desert succulent shrub, and desert scrub habitats. It is also found in cultivated cropland areas. This toad requires friable soil for burrowing. Burrowing sites are often selected beneath desert plants to reduce exposure to lethal maximum temperatures during the hottest part of the summer (Dimmitt and Ruibal 1980). Logs and other debris are also used as shelter from the heat.

Temporary pools and potholes with water lasting longer than 10 to 12 days are required as breeding sites. Runoff basins at the base of sand dunes are also sites of reproduction (Mayhew 1965). The water temperature of these potential breeding sites must be above 17°C (63°F) for normal embryonic development to occur (Hubbs and Armstrong 1961). Soil temperatures above 20°C (68°F) are also required to initiate breeding. Standing, still water is required for reproduction.

Habitat in the Proposed Project Area

In the proposed project area, native desert habitats are restricted to along the AAC. Spadefoot toads could use these desert areas, particularly in areas near the seepage communities where they may be able to breed. As spadefoot toads are also known to use agricultural areas, they may occur throughout the proposed project area in association with agricultural drains.

Proposed Project Area Occurrence

The proposed project area occurs within the range of this species; however, no populations have been reported from the Imperial Valley. The nearest known populations have been reported from the neighboring Conchise County in Arizona (AGFD 1995), and Sonora, Mexico (Flores-Villela 1993).

Colorado River Toad (*Bufo alvariu*)

Range and Distribution

The Colorado River toad ranges from southeast California across lowland Arizona to southwestern New Mexico, and southward through most of Sonora to northern Sinaloa, Mexico (Fouquette 1970). Historically, the species likely extended northward along the bottomlands of the Colorado River to extreme southern Nevada near Fort Mohave (Jennings et al. 1994). In the main part of its range, it can be found from sea level to 1,600 meters (5,300 feet).

Population Status and Threats

The overall status of the Colorado River toad is uncertain. The New Mexico Department of Game and Fish (NMDGF 1997) describes the status of this species as probably fairly secure, while other investigators have suggested the species is imperiled throughout much of its range (Jennings et al. 1994). In California, the species is probably extirpated over most of its range due to habitat destruction and use of pesticides (Jennings et al. 1994). Although habitat alteration along the LCR has adversely affected this species, the specific factors responsible for declines in this region are uncertain. Isolation of small, vulnerable populations caused by channelization and damming of the Colorado River, and the

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introduction of the spiny softshell turtle and bullfrog in the early 1900s may also be partly responsible for the species' decline along the LCR (King and Robbins 1991). Habitat destruction/alteration, pesticide use, and predation by exotics may continue to threaten the survival of this species.

Habitat Requirements

Colorado River toads are found in a variety of desert and semiarid habitats including brushy desert with creosote bush and mesquite washes, semiarid grasslands, and woodlands. The toad is semiaquatic and usually associated with large, permanent, or semipermanent streams. It is occasionally found near small springs, temporary rain pools, constructed canals, and irrigation ditches. When not on the surface, this species uses the burrows of other animals as refugia. Colorado River toads have also been found underneath watering troughs (Wright and Wright 1949; Stebbins 1985). Primary breeding habitat for the Colorado River toad is moderately large streams, but it is also known to breed in temporary rain pools and constructed watering holes and irrigation ditches (Blair and Pettus 1954; Stebbins 1954 and 1985; Savage and Schuierer 1961). This species needs permanent or semipermanent water sources for breeding.

Habitat in the Proposed Project Area

In the proposed project area, native desert habitats are restricted to along the AAC. The toad could use these desert areas, particularly in areas near the seepage communities where they may be able to breed. Agricultural drains have the potential to be used by the toad, and the toad could use areas adjacent to the New and Alamo Rivers, although its use of tamarisk has not been determined.

Proposed Project Area Occurrence

The known extant populations in the U.S. have been reported from southeastern Arizona and southwestern New Mexico (Rosen et al. 1996). While populations have been reported to occur in Sonora, Mexico (Flores-Villela 1998), this species is presumably extinct in California (Jennings et al. 1994). No populations have been reported from the HCP area.

Lowland Leopard Frog (*Rana yavapaiensis*)

Range and Distribution

The historic range of the lowland leopard frog included the lower Colorado River and its tributaries in Nevada, California, Arizona, New Mexico, northern Sonora and extreme northeast Baja California, Mexico. This frog occurred in the Colorado River near Yuma in extreme southwestern Arizona, in west, central, and southeastern Arizona south of the Mogollon Rim, and the Virgin River drainage in extreme northwestern Arizona (AGFD 1997; Platz and Frost 1984; NMDGF 1997). It now occurs mostly in central Arizona, below 1,676 meters (5,500 feet), south and west of the Mogollon Rim (NMDGF 1997).

Population Status and Threats

The lowland leopard frog has been extirpated from southeastern California. It is also believed to have been extirpated from southwestern Arizona and New Mexico (AGFD 1997). The species has not been found in surveys in California since 1965 (Clarkson and

Rorabaugh 1989; USFWS 1999). The species is considered stable in central Arizona, but declining in southeast Arizona (AGFD 1997).

Potential reasons for regional declines include water manipulations; water pollution (including human use of aquatic habitat); introduced species (e.g., fish, bullfrogs, and crayfish); heavy grazing; and habitat fragmentation (Clarkson and Rorabaugh 1989; AGFD 1996 and 1997). These factors continue to threaten the survival of this species. In addition, in Arizona where the species still occurs, it may face future threats from competition with the Rio Grande leopard frog, an introduced species that is expanding into the range of the lowland leopard frog (AGFD 1996).

Habitat Requirements

The lowland leopard frog is generally restricted to permanent waters associated with small streams and rivers, springs, marshes, and shallow ponds. It is normally found at elevations below 1,500 meters (4,921 feet) and is often concentrated near deep pools in association with the root masses of large riparian trees (NMDGF 1997). In New Mexico, lowland leopard frogs were associated with vegetation that includes Arizona sycamore (*Platanus wrightii*), seepwillow (*Baccharis glutinosa*), other trees and shrubs, and various forbs and graminoid plants. In Arizona, populations typically occur in aquatic systems with surrounding Sonoran desert scrub, semidesert grassland, or Madrean evergreen woodland upland vegetation communities at elevations from 244 to 1,678 meters (800 to 5,500 feet) (AGFD 1997). In Arizona, lowland leopard frogs show a strong preference for lotic habitats, with 82 percent of known localities being natural lotic systems and 18 percent lentic habitats, primarily stock tanks (Sredl 1997).

Historic accounts from the Imperial Valley reported the species occurring in slack water habitats, such as canals and roadside ditches with abundant aquatic vegetation (Storer 1925; Klauber 1934). Emergent or submergent vegetation, such as bulrushes or cattails, is probably necessary for cover and as substrate for oviposition (Jennings et al. 1994). Both aquatic habitat and adjacent moist upland or wetland soils with a dense cover of grasses or forbs and a canopy of cottonwoods or willows are important components of leopard frog habitat. Large pools may be essential for adult survival and reproductive efforts, while smaller pools and marshy habitats probably enhance juvenile survival (NMDGF 1997). Studies of microhabitat use by differing age classes of lowland leopard frogs suggest that management practices that create or maintain a variety of aquatic habitats may be important to this species. The primary food source for adults is small invertebrates, while larvae eat algae, plant tissue, organic debris, and probably small invertebrates (AGFD 1997).

Leopard frogs may be especially vulnerable to catastrophic events, such as floods and drought. Tadpoles are susceptible to predation by introduced predators, such as catfish and bullfrogs. Removal of vegetation may result in increased predation by both aquatic and terrestrial predators (NMDGF 1997). Because local populations of leopard frogs are prone to extinction, it is also important to facilitate recolonization through the maintenance of adequate dispersal corridors (Sredl 1997).

Habitat in the Proposed Project Area

Lowland leopard frogs are generally associated with small streams and marshes that support emergent vegetation. In the HCP area, suitable habitat could occur in the wetlands on the state and federal refuges and wetlands adjacent to the Salton Sea. The New and Alamo Rivers probably do not provide suitable habitat conditions due to their large size. However, portions of the agricultural drainage system that support cattails could provide suitable conditions.

Proposed Project Area Occurrence

Lowland leopard frogs are not known to inhabit the proposed project area currently. Lowland leopard frogs have the potential to occur in the proposed project area in the future as a result of additional introductions or migration from reintroduced populations.

Reptiles

Desert Tortoise (*Gopherus agassizi*)

Range and Distribution

The desert tortoise is found in many Mojave and Sonoran Desert habitats in a range that covers southeastern California, southern Nevada, and northern Mexico. Suitable tortoise habitat includes sandy washes, canyons, and gravel beds dominated by creosote bush scrub with ocotillo, cactus, and yucca, usually between elevations from 500 to 2,700 feet (Reclamation 1993). In the Salton Trough, desert tortoise occur near San Gorgonio Pass and on the alluvial fans of Coachella Valley.

The Colorado River has been an effective geographic barrier, separating the Mojave and the Sonoran populations of desert tortoise for millions of years. The Mojave population is found to the west and north of the Colorado River, and the Sonoran population is found to the east and south. The Mojave population may be further divided into two subpopulations, western and eastern. A low sink that generally runs from Death Valley to the south may be used to separate the western and eastern subpopulations.

Population Status and Threats

Analysis of study plot data from sites in the western Mojave Desert indicates that subpopulations (both adults and especially juveniles) have declined over the last decade. Populations are threatened by a combination of human activities (i.e., urbanization, agricultural development, off-highway vehicle use, grazing, and mining) and from direct vandalism, collections, and raven predation of young. Luckenbach (1982) concluded that human activity is the most significant cause of desert tortoise mortality. In addition, a virus is spreading through the natural population.

Data recently collected on the Mojave population of the desert tortoise indicate that many local desert tortoise subpopulations have declined precipitously. The apparent distribution of Upper Respiratory Disease Syndrome, not identified before 1987 in wild desert tortoises, has suggested the possibility of an epizootic condition and thus may be a significant contributing factor to the current high level of desert tortoise losses documented for certain localities.

Habitat Requirements

The species inhabits desert scrub, desert wash habitats, and Joshua tree woodland (Zeiner et al. 1988). Optimal habitat has been characterized as creosote bush scrub in which precipitation ranges from 5 to 20 centimeters (2 to 8 inches), the diversity of perennial plants is relatively high, and production of ephemerals is prominent (Luckenback 1982; Turner 1982, Turner and Brown 1982; Schamberger and Turner 1986). Tortoises feed primarily on spring annual grasses and forbs, as well as perennial grasses. They are most active in the spring and fall months, and escape extreme temperatures of summer and winter by remaining in underground burrows, hibernating in the winter months. Soil conditions must be firm, but soft sandy loams are suitable for burrow construction. Desert tortoise burrows have been found in a variety of locations, such as along the banks of washes, at the base of shrubs, in the open on flat ground, under rocks, on steep hill sides, in caleche caves, and in berms along rail lines.

Habitat in the Proposed Project Area

In the HCP area, creosote bush scrub only occurs in the right-of-way of IID along the AAC. Outside the HCP area, creosote bush scrub surrounds the Salton Sea between the higher rock hillsides and the more saline desert saltbrush community. It also occurs adjacent to the irrigated portions of the valley.

Proposed Project Area Occurrence

Desert tortoise populations are known from areas northeast of the Imperial Valley, particularly in the Chocolate Mountains and the Chuckwalla Valley where high densities have been recorded. Areas adjacent to the Coachella Canal were surveyed in 1981, but no animals were found; the area was considered poor habitat because of rocky soils and sparse vegetation (Reclamation 1993). Populations have also been reported from the Pinto Drainage in the far southwestern part of Imperial County. It is unlikely that desert tortoise would be found in most of the HCP area because most of the HCP area is at or below sea level (IID 1994).

Flat-Tailed Horned Lizard (*Phrynosoma mcalli*)

Range and Distribution

The flat-tailed horned lizard occurs only in sparsely vegetated, sandy areas of the deserts of extreme southwestern Arizona; southeastern California; northeastern Baja California; and extreme northwestern Sonora, Mexico. In Arizona, the species occurs in the Yuma Desert west of the Tinaja Altas and Gila Mountains, and south of the Gila River. In California, it is found in the Coachella Valley, then south toward the head of the Gulf of California (AGFD 1997c). The original range of the species has diminished in recent years due to human activities (Turner et al. 1980).

Population Status and Threats

The flat-tailed horned lizard was proposed as threatened in November 1993 (Federal Register [FR] 58 [227]: 62624-62629). The species was withdrawn from proposed status on July 15 1997. Habitat loss and other impacts have fragmented this species' distribution. Agricultural and urban development in the Imperial Valley have isolated populations in

East Mesa from those west of the Salton Sea, in the Yuma desert, and in the Superstition Mountain area. Flat-tailed horned lizards in the Coachella Valley may be geographically isolated from flat-tailed horned lizards in the Imperial Valley by the Salton Sea and conversion of habitat to croplands. The All American and Coachella Canals are likely barriers to movement, and major highways, such as Interstate 8 in Imperial County and Interstate 10 in Riverside County, further fragment populations. Habitat loss to development and recreation, such as off-highway vehicle use, are the principal threats to species persistence (Zeiner et al. 1988).

Human impacts have resulted in the loss of roughly 34 percent of the historic flat-tailed horned lizard's habitat. In the Imperial and Coachella valleys, a large portion of the flat-tailed horned lizard's habitat has been converted to urban or agricultural use or was flooded by the filling of the Salton Sea from 1905 to 1907. The precise extent of this species' historic habitat cannot be quantified because filling of the Salton Sea and much of the agricultural development predates most collections of flat-tailed horned lizards.

Habitat Requirements

Flat-tailed horned lizard habitat is characterized by areas of low relief with surface soils of fine, packed sand, or pavement overlain with loose, fine, windblown sand (Turner et al. 1980). This species requires fine sand substrates that allow subsurface burrowing to avoid extreme temperatures. Shrubs and clumps of grass are also used for thermal cover when soil surface temperature is very high. Within its range, the flat-tailed horned lizard typically occupies sandy, desert flatlands with sparse vegetation and low plant species diversity, but is occasionally found in low hills or areas covered with small pebbles or desert pavement. Optimal habitat is found in the desert scrub community; however, the species is also known to occur at the edges of vegetated sand dunes, on barren clay soil, and in sparse saltbush communities. Flat-tailed horned lizards are occasionally found on blacktop roads. The flat-tailed horned lizard shares habitat with the fringe-toed lizard.

Habitat in the Proposed Project Area

Suitable habitat for flat-tailed horned lizards in the proposed project area occurs along the AAC and along the western side of the Westside Main Canal in the West Mesa. Extensive habitat for this lizard also occurs to the east of the East Highline Canal (BLM 1990).

Proposed Project Area Occurrence

Flat-tailed horned lizards are known to occur in the HCP area. Lizards have been observed near Gorden Wells where the Coachella Canal branches off the AAC. Field surveys have detected lizards in the East Mesa south of Highway 78 east of the East Highline Canal (BLM 1990). Surveys for the flat-tailed horned lizard were conducted in May 1984 and again in June 1993 (Reclamation and IID 1994). Results of the two surveys were similar. Flat-tailed horned lizards were observed along the AAC between Drops 1 and 3; however, scat was also observed east of the eastern Interstate 8 crossing of the Algodones Dunes. USFWS (1996b) surmised that the species is probably absent from the high dunes between Drop 1 to around the eastern Interstate 8 crossing. Although this species is well distributed along the AAC, this area has not been identified as a key area for the species (Turner and Medica 1982). The area is isolated from other flat-tailed horned lizard habitat by the AAC, Interstate 8 on the north, and agricultural development in the Mexicali Valley to the south.

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Western Chuckwalla *(Sauromalus obesus obesus)*

Range and Distribution

The chuckwalla is found throughout the deserts of the southwestern U.S. and northern Mexico (Stebbins 1985). Chuckwallas are found in a variety of desert scrub and woodland habitats from sea level to 3,750 feet in the Mojave and Colorado deserts.

Population Status and Threats

The chuckwalla is a widespread species but is regionally limited by its requirement for rock outcrops. Under ideal conditions, it can be quite common locally. Urban expansion (e.g., construction of roads and utilities, inundation by reservoirs, and agriculture) has reduced the available habitat for this species and is the primary threat to this species. Overcollection by collectors or shooters can also cause local declines in this long-lived species. Collection also leads to habitat destruction when collectors use tools to pry open crevices and break up rockpiles resulting in further declines in chuckwalla populations (NMDGF 1997).

Habitat Requirements

Western chuckwallas are most abundant in the Sonoran Creosote Bush Scrub plant community, but only occur in areas with large rocks, boulders, or rocky outcrops, usually on slopes. Warm rock surfaces are used for basking and as lookout positions for predators. Typical habitat includes rocky hillsides and talus slopes, boulder piles, lava beds, or other clusters of rock, usually in association with desert scrub habitat. Burrows are dug between rocks for dwelling and breeding (NMDGF 1997). Chuckwallas feed entirely on plant material, especially the flowers, leaves, and fruits of the creosote bush. Nests are dug in sandy, well-drained soils. Chuckwallas are generally active only from mid-spring to mid-summer and occasionally in fall, though they can be active year-round in warm areas.

Habitat in the Proposed Project Area

The creosote bush scrub community is widespread throughout the nonirrigated areas of the Sonoran Desert. This habitat type surrounds the Salton Sea between the higher rock hillsides and the more saline desert saltbrush community. In the HCP area, creosote scrub only occurs within the right-of-way of IID along the AAC. However, most of the habitat along the AAC consists of sandy soils, lacking significant amounts of rocky habitat. IID operates two quarries adjacent to the Salton Sea. These quarries could provide suitable habitat conditions for chuckwallas, but chuckwallas are unlikely to inhabit these quarries because they are surrounded by agriculture and wetlands and are isolated from desert habitats.

Proposed Project Area Occurrence

This species is known to occur on lava flows and craters of the LCR Valley, but has not been observed in the HCP area. Lack of suitable habitat makes the occurrence of this species unlikely. The right-of-way of IID along the AAC is the only location where chuckwallas might occur.

Colorado Desert Fringe-Toed Lizard (*Uma notata notata*)

Range and Distribution

This species ranges from the extreme southeastern California west, to the extreme eastern part of San Diego County, and into northeastern Baja California. In California, this species is found south of the Salton Sea in the Colorado Desert Region in northeast San Diego County and the majority of Imperial County. It is restricted to areas containing fine, loose sand.

Population Status and Threats

While the distribution of this species is limited, populations in areas without disturbance appear healthy and stable. The current primary threat to this species is off-road vehicle use.

Habitat Requirements

The Colorado desert fringe-toed lizard is highly adapted to living in areas of windblown sand and is not known to occur elsewhere (Smith 1971). Distribution is restricted to fine, loose, windblown sand of dunes, flats, riverbanks, and washes (Stebbins 1985). It is most abundant on well-developed dunes, but does occur on level or undulating sand with very low vegetation. The species is a habitat specialist and is restricted to the distribution of sand particles no coarser than 0.375 millimeters.

Colorado desert fringe-toed lizards often seek cover under shrubs at the foot of dunes. They burrow in sand during hot or cold weather and go into torpor in winter. The lizards usually hibernate on the lee side of the dunes and can tolerate being buried by up to 12 feet of wind-deposited sand. Fringe-toed lizards often burrow 5 to 6 centimeters below the sand surface, using rodent burrows or the bases of shrubs for cover and thermoregulation.

Habitat in the Proposed Project Area

Suitable habitat for the Colorado desert fringe-toed lizard occurs in the proposed project area, specifically, where the AAC traverses the Algodones Dunes.

Proposed Project Area Occurrence

The Colorado desert fringe-toed lizard is found in areas with fine, loose, windblown sand in habitats such as desert wash or sparse desert scrub south of the Salton Sea in San Diego and Imperial Counties. It could potentially occur throughout the study area wherever aeolian sand is found (Norris 1958). During Reclamation surveys for the flat-tailed horned lizard, approximately 100 Colorado desert fringe-toed lizards were sighted in the Algodones Dunes along a 600-foot-wide transect immediately adjacent to the north side of the AAC.

Banded Gila Monster *(Heloderma sespectum cinctum)*

Range and Distribution

The Gila monster is distributed from southwestern Utah and Southern Nevada south to Southern Sonora, Mexico, and from the Colorado River east to extreme southwestern New Mexico (AGFD 1998b). The banded Gila monster, which is the subspecies potentially occurring in the study area, ranges from the Vermilion Cliffs, Utah, south through the LCR basin, including extreme Southern Nevada, southeastern California, and Arizona west of the Central Plateau to Yuma (Jennings et al. 1994).

Population Status and Threats

The Gila monster has declined in heavily urbanized and agricultural areas throughout its range, but remains locally common elsewhere. Overcollection by collectors is the principal threat to this species. Because the Gila monster is only one of two poisonous lizards in the entire world, the species is highly prized as a pet. Demand as a collectors item may have created a black market for this species and contributed to its decline (Jennings et al. 1994; Zeiner et al. 1988).

Habitat Requirements

The banded Gila monster is uncommon in a variety of desert woodland and scrub habitats, principally in desert mountain ranges. This lizard prefers the lower slopes of rocky canyons and arroyos but is also found on desert flats among scrub and succulents. It seems to prefer slightly moist habitats in canyons, arroyos, and washes. The Gila monster uses the burrows of other animals and may construct its own. Rock crevices and boulder piles are also used for shelter (Shaw 1950; Stebbins 1954; Bogert and Del Campo 1956). Little is known about reproductive requirements. Eggs are laid in the soil in excavated nests, so the soil must be sandy or friable. Gila monsters may also require areas with exposure to the sun and moisture (Stebbins 1954; Bogert and Del Campo 1956). This species seems to occur in areas that are moister than surrounding areas.

Habitat in the Proposed Project Area

Most of the proposed project area is agricultural land or urban area and offers no habitat for the banded Gila monster. Desert scrub occurs along the AAC. However, this area is near major highways and areas heavily used for off-highway recreation and is unlikely to support this species. There are no desert mountain ranges in the proposed project area. The nearest suitable habitat likely occurs in the Chocolate Mountains to the northeast of the proposed project site and in the rocky areas along the LCR.

Proposed Project Area Occurrence

The banded Gila monster is not known to occur in the proposed project area, and lack of suitable habitat makes the presence of this species unlikely.

Birds

American White Pelican (*Pelecanus erythrorhynchos*)

Range and Distribution

American white pelicans once nested throughout inland North America on isolated islands in rivers, lakes, and bays that were free of mammalian predators. Breeding colonies were distributed from British Columbia and the prairie provinces of Canada south across the southern U.S. from California to Florida. This species now breeds in scattered locations in the prairie provinces and in the western U.S. (Washington to Texas). Most white pelicans winter in central California, along the Pacific coastal lowlands south to Guatemala and Nicaragua, along the Gulf Coast, and throughout most of Florida (Terres 1980; Ehrlich et al. 1988).

Population Status and Threats

The American white pelican has declined in numbers since presettlement times due primarily to the loss and degradation of breeding and foraging habitats and to human persecution, especially by fishermen who mistakenly believed that the pelican competed for game fishes. Eggshell thinning caused by the use of insecticides may also have played a significant role in the decline of this species (Terres 1980).

Nesting American white pelicans have declined in California in the last century because of degradation and loss of nesting habitat; the only remaining nesting colonies are at large lakes in the Klamath Basin. The white pelican population is vulnerable to decline because of its low annual reproductive output, colonial nesting, and dependence on isolated nesting sites. Drought, water diversion proposed projects, and disruptive human activities at nesting colonies continue to threaten this species. Lowering water levels in lakes allows predators to destroy nesting colonies as nesting islands become connected to mainland shorelines. American white pelicans also are susceptible to persistent pesticides that pollute the watershed. An estimated 10 percent of the white pelican western population died from avian botulism in 1996 (Rocke 1999).

Habitat Requirements

White pelicans are usually associated with large freshwater marshes and shallow lakes at lower elevations 853 to 1,676 meters [2,800 to 5,500 feet]) that support a rich supply of fish. They are also frequently found in coastal estuaries (Garrett and Dunn 1981; Terres 1980). Large expanses of open water appear to be a major stimulus in attracting these birds to an area, with the nearby vegetation seemingly an unimportant factor (NMDGF 1997). Fish are the primary diet of the white pelican, but salamanders, frogs, crayfish, and a variety of aquatic invertebrates are also consumed. This species can catch prey only in shallow water or within about 1 meter (3 feet) of the surface of the water. The white pelican has the ability to disperse widely and locate new food supplies.

The white pelican is a colonial species that is often found nesting and foraging in association with several species of waterbirds, particularly the double-crested cormorant. White pelicans breed synchronously and due to brood reduction (i.e., starvation of smaller chicks because of harassment by the larger sibling), only one juvenile is usually raised per successful nesting attempt. Sexual maturity is reached at age three (NMDGF 1997).

Habitat in the Proposed Project Area

Suitable habitat for white pelicans in the proposed project area occurs mainly at the Salton Sea. Pelicans congregate at the mouths of the New and Alamo Rivers, where prey items are generally abundant (IID 1994). Lakes in the valley (e.g., Fig, Lagoon, and Finney Lakes) also provide suitable habitat for white pelicans.

Proposed Project Area Occurrence

The Salton Sea is an important migratory stopover for American white pelicans. The pelicans appear to use the Salton Sea for a few weeks to a few months before continuing on their migration to Mexico (Shuford et al. 1999). As many as 33,000 American white pelicans have been counted at the Salton Sea during migration and during the winter (USFWS 1999). From the early 1900s to the late 1950s, this species also nested at the Salton Sea. Currently, it is unlikely that there is sufficient undisturbed habitat at the Salton Sea to support nesting colonies of American white pelicans.

In radio-telemetry studies during 1991, individual pelicans migrating south from northern California (e.g., Clear Lake National Wildlife Refuge) were documented as using the Salton Sea (Anderson 1993). The large populations of white pelicans at the Salton Sea in the early- to mid-1980s were likely associated initially with extensive flooding in the LCR Delta area from the late 1970s through the mid-1980s, when many white pelicans came to reside in the region for a substantial portion of the wintering period, using Salton Sea/Laguna Salada/Rio Hardy wetlands as wintering habitat. Most recent censuses of the Salton Sea white pelicans (Anderson 1993) indicate that use may be declining in recent years, but that the area still supports several thousand white pelicans for significant periods during the winter (Anderson 1993; Setmire et al. 1993). Although accurate data are not available to compare relative numbers of white pelicans at the Salton Sea with those found at other typical habitats in the region, the population at the sea is probably much larger than at the other areas (Anderson 1993). Data collected by the USFWS (USFWS 1993d) also indicate that smaller numbers of white pelicans have used the Salton Sea and adjacent wetlands in recent years as compared to the peak numbers reported in 1985. Overall, the USFWS counts in combination with data summarized above indicate that 2,000 to 17,000 white pelicans use the Salton Sea as overwintering habitat for up to 6 months.

California Brown Pelican *(Pelecanus occidentalis californicus)*

Range and Distribution

Brown pelicans occur in marine habitats along the Pacific, Atlantic, and Gulf Coasts in North America and range southward through the Gulf and Caribbean areas to Central and South America. The California subspecies nests on islands off the coast of Southern California, south along the coast of Baja California and the Gulf of California, to Guerrero, Mexico (CDFG 1992). After the breeding season, California brown pelicans disperse from breeding areas and can be found as far north as British Columbia, Canada, and as far south as South America.

Population Status and Threats

Brown pelican populations declined greatly in the mid-20th century because of human persecution, disturbance of nesting colonies, and reproductive failure caused by eggshell thinning and the adverse behavioral effects of pesticides (Palmer 1962; Terres 1980). Most North American populations of this species were extirpated by 1970. Since the banning of dichlorodiphenyl-trichloroethane (DDT) and other organochlorine use in the early 1970s, brown pelicans have made a strong recovery and are now fairly common and perhaps still increasing on the southeast and west coasts (Kaufmann 1996). The endangered Southern California Bight population of the brown pelican grew to 7,200 breeding pairs by 1987, but has experienced considerable population fluctuations in recent years and has not, as yet, been considered sufficiently stable for delisting (CDFG 1992). In 1992, there were an estimated 6,000 pairs in Southern California and approximately 45,000 pairs on Mexico's west coast (Ehrlich et al. 1992). Transient brown pelicans are threatened by physical injury or direct mortality resulting from human persecution, fish hooks, or accidental entanglement in fishing lines. Pesticides, poisons, and other environmental contaminants as well as human disturbance and disease may also threaten brown pelicans (CDFG 1992).

Habitat Requirements

Brown pelicans are found primarily in warm estuarine, marine subtidal, and marine pelagic waters (Zeiner et al. 1990; NMDGF 1997). They occur mostly over shallow waters along the immediate coast, especially near beaches and on salt bays (Kaufmann 1996). Brown pelicans roost on water, rocks, rocky cliffs, jetties, piers, sandy beaches, and mudflats, and forage in open water. Brown pelicans are plunge divers, often locating fish from the air and diving into the water to catch them. They feed almost exclusively on fish. The brown pelican is a colonial nester. It nests on islands in trees, bushes, and on the ground. This species first breeds at 2 or 3 years of age with only one brood raised per year (Kaufmann 1996; Terres 1980; Zeiner et al. 1990). For roosting, brown pelicans congregate at selected roosting locations that are isolated from human activity.

Habitat in the Proposed Project Area

Because brown pelicans are associated with large open bodies of water, habitat for brown pelicans in the proposed project area principally occurs at the Salton Sea where abundant fish populations provide foraging opportunities for brown pelicans. Nesting habitat is present at the Alamo River Delta, where brown pelicans have nested since 1996 (Shuford et al. 1999). In addition to the Salton Sea, brown pelicans are known to use Finney Lake in the Imperial Wildlife Area (U.S. Army Corps of Engineers [Corps] 1996).

Proposed Project Area Occurrence

Brown pelicans probably had little historical use of the Salton Sea (Anderson 1993). Some visiting postbreeding pelicans were documented at the Salton Sea in the late 1970s, but overwintering was not confirmed until 1987. Use of the Salton Sea by brown pelicans subsequently increased. The Salton Sea currently supports a year-round population of California brown pelicans, sometimes reaching 5,000 birds, although more typically numbering 1,000 to 2,000 birds. In 1996, the brown pelican was first found to nest successfully at the Salton Sea, and several pairs have attempted to nest annually since then (Shuford et al. 1999).

Other than the small number of breeding birds at the Salton Sea, the closest breeding colonies of brown pelicans are located in the Gulf of California on San Luis Island (about 220 miles southeast of the Salton Sea). On San Luis Island, breeding populations vary between 4,000 and 12,000 pairs. The Puerto Refugio area contains about 1,000 to 4,000 breeding pairs, and the Salsipuedes/Animas/San Lorenco area supports 3,000 to 18,000 pairs. Birds from these breeding areas may visit the Salton Sea after the breeding period.

Double-crested Cormorant (*Phalacrocorax auritus*)

Range and Distribution

The double-crested cormorant is a year-round resident along the Pacific Coast of Canada and the U.S. During the summer, it may occur in the north-central U.S. and central provinces of Canada. Wintering birds are found in coastal states along the Gulf of Mexico

(Kaufman 1996). Double-crested cormorants are found year-round along the California coast. Approximately 7,500 individuals nest in Northern California, with lesser numbers in Southern California, Oregon, and Washington (Tyler et al. 1993).

Population Status and Threats

The population of double-crested cormorants declined considerably during the 1960s and early 1970s. This decline was attributed to pesticide residues in the marine food chain, principally DDT (Small 1994). The population began recovering in the late 1970s and 1980s, but has not yet achieved historic levels. Kaufman (1996) reports that the population is currently increasing and expanding its range. In some locations, cormorant populations have increased to such levels that some consider them a competition with recreational fishing. The USFWS is considering implementing control measures in some locations. This species may be threatened by persistent pesticides in water, habitat destruction, and human disturbance. Many nesting colonies in California have been abandoned after human disturbance and habitat destruction (Remsen 1978). Predation on eggs and young by gulls and crows may also be an important factor reducing nesting success (Ellison and Cleary 1978; Siegel-Causey and Hunt 1981).

Habitat Requirements

The double-crested cormorant is a year-round resident along the entire coast of California and on inland lakes and rivers of fresh, salt, or brackish quality (Zeiner et al. 1990). It feeds mainly by diving for fish in water less than 30 feet deep, but will also prey on crustaceans and amphibians. The species requires undisturbed nest sites beside water on islands or on the mainland, including offshore rocks, cliffs, rugged slopes, and live and dead trees. In the midwest, it typically nests in flooded dead timber (snags) and on rocky islands, often in mixed colonies with great blue herons and black-crowned night herons (Meier 1981).

Habitat in the Proposed Project Area

Suitable habitat for double-crested cormorants in the proposed project area occurs at the Salton Sea and at lakes in the valley, such as Finney and Ramer Lakes on the Imperial Wildlife Area. At the Salton Sea, cormorants nest on rocky ledges such as occur on Mullet Island or on accumulations of dead vegetation that occur at the deltas of the New and Alamo Rivers. Snags in the Salton Sea are important for providing protected roost sites for double-crested cormorants. Cormorants regularly move between the Salton Sea and the lakes at the Finney-Ramer Unit of the Imperial Wildlife Area where they forage. In addition to suitable habitat found at the Salton Sea and on the refuges, double-crested cormorants occasionally forage in open water areas of the New and Alamo Rivers. They may also use larger agricultural drains for foraging on occasion.

Proposed Project Area Occurrence

Double-crested cormorants occur as a common year-round resident at the Salton Sea, with counts of up to 10,000 individuals (IID 1994). Small numbers of cormorants have nested at the Salton Sea in the past, and small nesting colonies were documented at the north end of the Salton Sea in 1995 (USFWS 1996a), the first time since 1989 (USFWS 1993d). More than 7,000 double-crested cormorants and 4,500 nests were counted on Mullet Island in 1999.

This represents the largest breeding colony on the West Coast (Point Reyes Bird Observatory 1999).

Least Bittern *(Ixobrychus exilis hesperis)*

Range and Distribution

Least bitterns nest throughout much of the U.S. and southeast Canada south to most of tropical and subtropical South America east of the Andes. The northern populations of this species winter in California, south Texas, and central Florida (Terres 1980). Most of the California population winters in Mexico and migrates in the spring and the summer to scattered locations in the western U.S., including the Colorado River, Salton Sea, Central Valley, and coastal lowlands of Southern California.

Population Status and Threats

This species is believed to have declined in many locales, but it is still abundant in parts of North America (Kaufman 1996). Although no trend data are available for western populations of the least bittern, population trends probably reflect the availability of suitable freshwater marsh habitats (Sauer et al. 1997). Marsh habitats have been declining throughout the 20th century due to channelization, dredging, flood control, grazing, stream diversion, recreational activities, and wildfires (NMDGF 1997). Habitat loss remains the primary threat to this species. Pesticides are also considered a threat to least bitterns (Zeiner et al. 1990a).

Habitat Requirements

The least bittern inhabits fresh and brackish water marshes, and desert riparian habitats (Zeiner et al. 1990a). It is a secretive bird usually found in densely vegetated marshes. This long-distance migrant can also inhabit saltwater and brackish marshes near the coast in the southern portion of its range (Kaufmann 1996; Terres 1980). In the LCR Valley, the largest breeding populations of least bitterns are found in extensive cattail and bulrush marshes like those found near Topock and Imperial Dam. Smaller populations of least bitterns are found throughout the LCR Valley at a variety of marshy areas, including ponds and agricultural canals (Rosenberg et al. 1991). Rosenberg et al. (1991) estimated the breeding density of this species to be 40 birds per 40 hectares (100 acres) in some marshy areas along the LCR. The least bittern builds its nest in tall marsh vegetation, usually cattails. It occasionally nests in loose colonies, but nests are generally scattered throughout the appropriate marsh vegetation.

The least bittern is a carnivorous species that primarily eats small fish, such as catfish, minnows, eels, sunfish, killifish, and perch. Other food items consumed by this species include frogs, tadpoles, salamanders, leeches, slugs, crayfish, small snakes, aquatic insects, and, occasionally, shrews and mice (Terres 1980; Kaufmann 1996).

Habitat in the Proposed Project Area

Least bitterns nest in wetlands adjacent to the Salton Sea that provide dense emergent vegetation, such as cattails or tules. They forage for fish, aquatic and terrestrial invertebrates, and small vertebrates in shallow waters and mudflats along the Salton Sea shoreline or in adjacent freshwater marshes. Dense salt cedar stands adjacent to marshes are often used as roost sites (Garrett and Dunn 1981). Agricultural drains with emergent vegetation and areas of the New and Alamo Rivers are also likely to provide foraging habitat for least bitterns. Portions of the drains support cattail stands that could be used by least bitterns for nesting. Whether least bitterns nest in the drain vegetation is unknown. In addition, marsh communities supported by seepage from the AAC and the main canals in Imperial Valley are also expected to provide suitable habitat.

Proposed Project Area Occurrence

Least bitterns occur in the proposed project area throughout the year, although they are more common in the summer. At the Salton Sea, the least bittern population has been estimated at about 550 individuals (IID 1994).

Reddish Egret *(Egretta rufescens)*

Range and Distribution

In the U.S., reddish egrets breed along the Gulf Coast and Florida coast. Outside the U.S., breeding occurs in Baja California and along the Pacific and Atlantic coasts of Mexico and south to Guatemala. The species also breeds in the Caribbean. It overwinters from southern Florida to Colombia and Venezuela (DeGraaf and Rappole 1995).

Population Status and Threats

The population of reddish egrets was substantially reduced in the late 1800s by feather collectors. Since then, the population has increased. Currently, the U.S. population is estimated at approximately 2,000 pairs (Kaufman 1996). Nesting colonies are susceptible to disturbance; habitat loss and human disturbance may threaten this species.

Habitat Requirements

Reddish egrets are associated with coastal tidal flats, salt marshes, ocean shores, and lagoons. For foraging, they prefer calm shallow waters close to shore such as in marshes or protected bays and lagoons. Small fish comprise most of the reddish egret's diet; but frogs, tadpoles, and crustaceans are also taken. Occasionally, reddish egrets will feed on aquatic invertebrates (Kaufman 1996).

Habitat in the Proposed Project Area

In the proposed project area, reddish egrets are mainly expected to occur at the Salton Sea where suitable foraging habitat exists along the margins of the Salton Sea. Mudflats and marsh habitats adjacent to the Salton Sea may provide suitable foraging conditions for this species. Reddish egrets could also find suitable foraging conditions at the wetlands and lakes of the state and federal refuges and duck clubs. Reddish egrets could forage in agricultural drains like other wading birds (e.g., great blue herons) in the proposed project area.

Proposed Project Area Occurrence

The reddish egret is a rare visitor to the proposed project area in the summer and fall. Only seven records of this species exist at the Salton Sea National Wildlife Reserve (NWR) (USFWS 1997b). It is not known to breed in the area.

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White-faced Ibis (*Plegadis chihi*)

Range and Distribution

The white-faced ibis formerly nested from Minnesota west to Oregon and south into California, Utah, and Colorado, and locally down to the Gulf Coast and Mexico (Terres 1980). Breeding colonies are now isolated, with the greatest abundance of breeding birds occurring in Utah, Texas, and Louisiana. The winter range extends from California and along the Gulf Coast south into Mexico, Central America, and Costa Rica.

Population Status and Threats

Breeding white-faced ibis populations declined in distribution and abundance during the 1960s and 1970s, especially in the western U.S. (Ryder and Manry 1994; Shuford et al. 1996). Since the 1980s, however, there has been an increase in western white-faced ibis populations due to improved nesting habitat management, increased planting of alfalfa, and a ban on DDT and other pesticide use in the early 1970s. Unlike some other western states, however, the breeding population in California has decreased substantially, and the species is no longer a regular breeder in the state (Remsen 1978; Zeiner et al. 1990).

The winter population in California appears to have increased especially since the 1970s (Shuford et al. 1996). This may be due to changes in agricultural practices that provide more ibis winter habitat or because the species was overlooked and not surveyed adequately in the early part of the century. During the winter of 1994 to 1995, the California population of the white-faced ibis was estimated at 27,800 to 28,800 individuals.

The primary reason for the decline of the white-faced ibis as a nesting species in California is the loss of extensive marsh habitats (Remsen 1978; Shuford et al. 1996). Habitat loss remains the primary threat to this species. Allowing wetlands to dry up in the spring and summer for mosquito and cattail control adversely impacts this species (Remsen 1978). White-faced ibis populations also declined dramatically during the 1960s and 1970s because of the impacts of pesticides on reproductive success, and loss of habitat from drought and proposed flood-control projects (Ryder and Manry 1994). Pesticides (e.g., dieldrin) were documented in the 1970s as causing large-scale nesting failures at breeding colonies in Utah, Texas, and Nevada and may be an additional cause of the decline of this species in California (Remsen 1978; Terres 1980). Decreasing reproductive success of ibis nesting at Carson Lake, Nevada, in the mid-1980s (Henny and Herron 1989) and at Colusa, California, from 1989 to 1991 (Dileanis et al. 1992) was attributed to DDT. These birds appear to have been exposed to pesticides on their wintering grounds (Henny and Herron 1989). However, limited testing for persistent organochlorine pesticides in ibises from several locations in Mexico indicated that concentrations of 1,1-dichloro-2,2-bis(chlorophenyl)ethylene (DDE), a metabolite of DDT, are the same for Mexican birds as for those in the southwestern U.S. (Mora 1997). Although there are some areas in Mexico from which birds that have the potential for higher DDT accumulation were not tested, there is also the possibility that ibises are acquiring DDE during migration stopovers and winter residency in the southwestern U.S.

Habitat Requirements

The white-faced ibis is gregarious throughout the year, foraging in flocks in perennial marshes, wet fields and croplands, and shallow open water (Grinnell and Miller 1944; Palmer 1962; Cogswell 1977; Burger and Miller 1977). Most wintering ibises in the Salton Sea/Imperial Valley area foraged in irrigated agricultural lands, especially alfalfa and wheat (Shuford et al. 1996). Along the Colorado River, the ibis also forages primarily in alfalfa fields, but uses other flooded agricultural fields, marshes, and lake shores (Rosenberg et al. 1991; Shuford et al. 1996). White-faced ibis probe for invertebrates and small vertebrates in freshwater marshes, in shallow waters along lakeshores, in wet agricultural fields and meadows, and occasionally in salt marshes.

The white-faced ibis nests near the ground or over water in colonies located in extensive, undisturbed marshes with large stands of tall marsh plants such as bulrushes (Palmer 1962; Burger and Miller 1977; Terres 1980). Egg laying is from April to July, with incubation lasting 3 weeks and young remaining at the nest for about 5 weeks after hatching (Cogswell 1977; Terres 1980). The species can establish new colonies in areas with extensive marshes and other conditions that are suitable for breeding. Several factors may affect establishment of new breeding colonies, including population age structure and breeding site fidelity. In addition, the white-faced ibis is able to shift nesting areas in response to changing availability of marsh habitat (Ryder 1967). However, this species may need other ibises and other waders, such as herons, gulls, and ducks, present to initiate a new colony (Palmer 1962; Burger and Miller 1977).

Habitat in the Proposed Project Area

For nesting, white-faced ibis typically use areas of extensive marsh. However, in the proposed project area, they nest predominantly in tamarisk and mesquite snags that are over water. In the proposed project area, the state and federal wildlife refuges and naturally occurring marshes along the Salton Sea are the only areas known to support nesting white-faced ibis. Agricultural drains support limited amounts of cattails and bulrushes in small patches within the confines of the drain. These patches are not likely to provide suitable nesting habitat for white-faced ibis.

Nighttime roosts in the Imperial Valley are found in managed wetlands, such as Ramer Lake and local duck club wetlands, where birds roost in open ponds or in marsh vegetation. The Salton Sea also supports roosting birds (Salton Sea Authority and Reclamation 2000).

Agricultural fields are used extensively by white-faced ibis for foraging. Alfala is one of the primary crops of the Imperial Valley, and white-faced ibis typically congregate in these fields foraging on insects displaced as the field is flood irrigated. Wheat fields are also commonly used for foraging.

Proposed Project Area Occurrence

White-faced ibis occur year-round in the proposed project area, although the greatest numbers occur during winter. The Salton Sea provides habitat for the second largest wintering population of this species in California (USFWS 1999), and more than 24,000 were recorded at the Salton Sea in 1999 (Point Reyes Bird Observatory 1999). These numbers represent more than 50 percent of the white-faced ibis in California (Shuford et al. 1999).

Small numbers of white-faced ibis nest at the Salton Sea (USFWS 1996a). At Finney Lake on the Imperial Wildlife Area, recent breeding estimates indicate 370 breeding pairs using this lake (Shuford et al. 1999).

Wood Stork *(Mycteria americana)*

Range and Distribution

Wood storks have a limited distribution in the U.S. They occur as year-round residents in Florida, Mexico, and parts of South America where they breed (Kaufman 1996; DeGraaf and Rappole 1995). They also breed at scattered locations elsewhere in the southeastern U.S. (DeGraaf and Rappole 1995). After the breeding season, wood storks occur throughout their breeding range as postbreeding visitors but also wander outside their breeding range. Post-breeding birds from western Mexico use the Salton Sea and other locations in the southwestern United States (Kaufman 1996).

Population Status and Threats

The population of wood storks in the southeastern U.S. was reportedly greater than 150,000 at one time. By the early 1990s, the population declined to about 10,000 (Kaufman 1996). Numbers in California appear to have declined since the 1950s (CDFG 1999a). The decline of the breeding population of this species in the United Sates is attributed to loss of breeding and foraging habitat in Florida. Habitat loss remains the primary threat to this species. Outside of this United States, it remains common throughout its range (DeGraaf and Rappole 1995).

Habitat Requirements

Wood storks are associated with marshes, lagoons, and ponds. The species primarily feeds on fish, small vertebrates, and aquatic invertebrates. The storks forage while wading by moving their open bill in the water until contacting a prey item, and then quickly snapping the bill closed (CDFG 1999a). Thus, foraging is restricted to shallow water areas. Wood storks appear in California as early as May after the breeding season and remain as late as October (Small 1994).

Habitat in the Proposed Project Area

Suitable habitat for wood storks in the proposed project area principally occurs at the Salton Sea and adjacent wetland areas. Shallow shoreline areas and pools formed by barnacle bars provide appropriate foraging conditions for wood storks. Most wood storks at the Salton Sea occur at the southern end (CDFG 1999a).

Proposed Project Area Occurrence

The wood stork is a common postbreeding visitor to the Salton Sea, generally occurring at the Salton Sea between July and September (IID 1994). It is also known to occur at the Salton Sea during the spring, fall, and winter although less frequently and in fewer numbers (USFWS 1997b). In the 1950s, as many as 1,500 wood storks occurred at the Salton Sea (Shuford et al. 1999). In recent years, up to 275 individuals have been counted at the Salton Sea (IID 1994).

Aleutian Canada Goose *(Branta canadensis leucopareia)*

Range and Distribution

Aleutian Canada geese once nested in the outer two-thirds of the Aleutian Islands in Alaska and in the Commander and Kuril Islands of the former Soviet Union. Currently, they nest on six islands of the Aleutian archipelago and on one island of the Semidi Island group, southward of the Alaska peninsula. Most Aleutian Canada geese migrate from breeding grounds in Alaska during September, arriving at wintering grounds in California in mid-October. Most Aleutian Canada geese winter in the Central Valley from Los Banos to just north of Sacramento.

Population Status and Threats

Predation by arctic foxes introduced during 1920 to 1936 to many of the Aleutian Islands was primarily responsible for reducing the population to about 800 birds. Aleutian Canada geese were also hunted recreationally and for food until 1975. Chronic outbreaks of avian cholera and avian botulism are present threats to wintering Aleutian Canada geese. The Aleutian Canada goose population has increased in recent years to more than 5,000 (Small 1994), and the USFWS delisted this species.

Habitat Requirements

In winter, Aleutian Canada geese are associated with lakes, fresh emergent wetlands, moist grasslands, croplands, pastures, and meadows (CDFG 1990). Geese feed on a wide variety of marsh vegetation, including algae, seeds of grasses and sedges, grain (especially in winter), and berries.

Habitat in the Proposed Project Area

Aleutian Canada geese do not breed in the proposed project area, and their use of the proposed project area is restricted to overwintering. Habitat for Aleutian Canada geese consists of wetlands adjacent to the Salton Sea, managed wetlands on the state and federal refuges, and wetlands on private duck clubs. In addition, Aleutian Canada geese often forage in agricultural fields during the winter.

Proposed Project Area Occurrence

Aleutian Canada geese occur only as rare fall migrants and winter residents in the proposed project area, where they forage in the wetland areas around the Salton Sea in the agricultural fields throughout the Imperial Valley (Small 1994; USFWS 1997b). The 1998 Christmas Bird Count reported two Canada Geese (small races) in the south Salton Sea area.

Fulvous Whistling-Duck (*Dendrocygna bicolor*)

Range and Distribution

The fulvous whistling-duck is a tropical/subtropical species that breeds in widely separated populations in all hemispheres. This goose-like duck is found in the southern U.S. and Mexico, northeast and southeast South America, east Africa, and India. In the Western Hemisphere, it ranges from Mexico north into the Gulf States and California and along the

Atlantic and Pacific Coasts to New Brunswick and British Colombia, respectively (Terres 1980). Breeding birds in the southern U.S. winter in southern Mexico (Ehrlich et al. 1988).

Population Status and Threats

In recent decades, the fulvous whistling-duck has declined in the southwestern U.S. while increasing in numbers in the Southeast. At the Lake Okeechobee area in southern Florida the population was estimated at 6,000 ducks in the late 1980s (Turnbull et al. 1989). The decline of this species in the Southwest has been primarily attributed to the draining of permanent marshes for agricultural use and the diversion of lakes and rivers for irrigation. Habitat loss remains the primary threat to this species. The destruction of nests by farmers in other parts of North America, susceptibility to hunting due to its unwary behavior, and poisoning by crop pesticides have also contributed to this species' decline (Kaufmann 1996; Ehrlich et al. 1988; Zeiner et al. 1990).

Fulvous whistling-ducks historically occurred as a regular summer visitor in small numbers along the Southern California coast north to Los Angeles and in greater numbers in the Central Valley (Garrett and Dunn 1981). In California, the range and population size of fulvous whistling-ducks have declined, particularly on the coastal slope and in the San Joaquin Valley. By the 1970s, the fulvous whistling-duck was thought to breed only in the Imperial Valley (Shuford et al. 1999). It also has declined along the Colorado River and at the Salton Sea and is now considered a rare summer visitor that may sporadically breed at the Salton Sea (USFWS 1997b). Reasons for decline of the fulvous whistling-duck are draining and development of marsh habitats and hunting. Pesticides have been shown to cause declines in fulvous whistling-duck populations in other states and may also have adversely affected the California population (Zwank et al. 1988).

Habitat Requirements

The fulvous whistling-duck inhabits shallow wetlands, preferring freshwater and brackish marshes on the coastal plain. Although marshy shallows are preferred, roving flocks of whistling-ducks wander widely and occasionally occur at most wetland habitats. Ponds, lakes, and irrigated agricultural fields, particularly flooded rice fields, are commonly used by this species (Terres 1980; Kaufmann 1996; and Ehrlich et al. 1988). The fulvous whistling-duck usually builds its nest in freshwater marshes among dense stands of cattails or bulrushes. The nest is frequently built on a marsh hummock or on the ground at the water edge. Occasionally, nests are placed among tall grasses in wet meadows and rarely in tree cavities (Terres 1980; Kaufmann 1996; and Ehrlich et al. 1988). The species forms long-term pair bonds and raises one brood per year (Ehrlich et al. 1988).

The diet of the fulvous whistling-duck consists mostly of plant material, including a wide variety of greens and seeds. It often forages in agricultural fields for alfalfa, rice, and corn. A few aquatic insects are also eaten (Terres 1980; Kaufmann 1996; and Ehrlich et al. 1988).

Habitat in the Proposed Project Area

Habitat for fulvous whistling-ducks primarily occurs on the state and federal wildlife refuges at Finney and Ramer Lakes, which support dense stands of cattails and bulrushes, and the freshwater impoundments above the mouth of the Alamo River (Garrett and Dunn 1981). Freshwater marshes at the Salton Sea National Wildlife Refuge also potentially provide habitat for this species. Fulvous whistling-ducks nest in dense freshwater wetlands consisting of cattails near the south end of the Salton Sea and forage on wetland plants and submerged aquatic vegetation in freshwater habitats (Salton Sea Authority and Reclamation 2000). Agricultural drains and seepage communities along the water delivery canals may provide foraging habitat for fulvous whistling-ducks but are unlikely to be used for nesting due to their small size. Agricultural fields of alfalfa and wheat are used for foraging in addition to marsh habitats.

Proposed Project Area Occurrence

The Salton Sea has supported a population of up to approximately 200 individuals during the spring and summer (IID 1994). Most of these birds are postbreeders arriving in June and July (Small 1994). The species rarely occurs in the HCP area during the winter (USFWS 1997b). Christmas bird surveys in 1999 reported only 5 birds in the south Salton Sea area and 17 birds from the Martinez Lake area near Yuma Arizona. The 1999 breeding bird surveys for the Southern California population reported an average of less than 1, whereas in other parts of its range average counts ranged between 3 and 30.

Cooper's Hawk *(Accipter cooperii)*

Range and Distribution

The Cooper's hawk breeds from Southern Canada south throughout much of the U.S. and into northern Baja California, Mexico, and northern mainland Mexico (Johnsgard 1990). It breeds throughout most of California (Zeiner et al. 1990). Outside of the breeding season, it disperses widely from southern Canada south into Central America. Cooper's hawks are usually year-round residents in the Southwest, with some migrants from more northern areas arriving in winter (Zeiner et al. 1990).

Population Status and Threats

Cooper's hawk populations have declined historically with an estimated decrease of 13.5 percent between 1941 and 1945 and with rates as high as 25 percent a year after 1948 with the widespread use of DDT (Henny and Wright 1972). Since the late 1960s, however, there has been an increase in some populations, especially in the northeast (Evans 1982). A conservative estimate based on Christmas Bird Count data is that there were 19,400 individuals in the U.S. and Canada (Johnsgard 1990). The largest populations were in Arizona and California. An additional but unknown number of individuals that breed in the U.S. but winter south to Central America were not included in this estimate.

Historically, Cooper's hawks nested in lowland riparian woodlands in the Central Valley and coastal valleys. Cooper's hawks declined as a breeding species in California in the 1950s and 1960s (Remsen 1978). Major factors in the decline of Cooper's hawk populations include pesticide-induced reproductive failures, especially in the eastern U.S., and loss of riparian nesting habitat, especially in the Southwest (Remsen 1978). Other threats include human disturbance at the nest and illegal taking of nestlings.

Habitat Requirements

Cooper's hawks are associated with open and patchy deciduous and mixed forests, riparian woodlands, and semiarid woodlands in the Southwest (Johnsgard 1990; Zeiner et al. 1990).

The Cooper's hawk most often nests in deciduous riparian forest, oak woodland, or young- to mid-seral stage, even-aged conifer forest (30 to 70 years old), usually near streams or other open water (Reynolds 1983). Eucalyptus woodlands may also be used. These forests range from extensive wilderness to smaller forest fragments, woodlots, deciduous riparian groves, small conifer plantations, and suburban habitats (Reynolds 1983; Bosakowski et al. 1992; and Rosenfield and Bielefeldt 1993). In central California oak woodlands, Asay (1987) found the majority of nests to be in closed canopy forests, but noted two nests that occurred in lone trees. Cooper's hawks appear to be tolerant of fragmented forest conditions, and forest edge is generally included within their home range (Rosenfield and Bielefeldt 1993). Even in heavily wooded areas, Cooper's hawk nests were found significantly closer to forest openings than random sites (Bosakowski et al. 1992).

In the western U.S., Cooper's hawks' diet includes approximately 50 percent birds, with the remainder consisting of mammals, amphibians, and reptiles. They hunt from perches with short flight attacks or extended searching flights, often relying on stealth to capture their prey. These hawks prefer hunting in broken woodland and along habitat edges, catching prey on the ground, in the air, or on vegetation (Zeiner et al. 1990).

Habitat in the Proposed Project Area

Cooper's hawks primarily forage on small birds and often hunt along woodland edges. In the proposed project area, Cooper's hawks can find suitable foraging conditions in and adjacent to tamarisk stands that occur along the New and Alamo Rivers and agricultural drains. Wetlands and tamarisk scrub along the Salton Sea are known to be used by Cooper's hawks (Salton Sea Authority and Reclamation 2000). Similarly, wetland and riparian habitats on the state and federal refuges provide suitable foraging habitat, as do habitats supported by seepage from the AAC.

Proposed Project Area Occurrence

Cooper's hawks are winter visitors to the proposed project area (USFWS 1997b). About 300 migrants occur in Imperial Valley during winter (IID 1994). Several Cooper's hawks were observed along the Holtville Main Drain during surveys of selected drains in Imperial Valley (Hurlbert et al. 1997). This drain had the greatest amount of vegetation, predominantly tamarisk, of all of the drains surveyed.

Sharp-shinned Hawk (*Accipiter striatus*)

Range and Distribution

Sharp-shinned hawks nest in north-central North America and in Central and South America. Their breeding range extends from west and central Alaska south through much of Canada and into the upper Great Plains. Breeding populations also extend south along the Pacific Coast to central California and along the northern Atlantic Coast southwest to South Carolina. There is a large disjunct breeding area that includes Arizona, Utah, New Mexico, and Colorado. The winter range is south of the breeding range and includes most of the U.S. except Alaska, where they are found only along the southwest coast.

Population Status and Threats

The Canadian and U.S. wintering populations of sharp-shinned hawks were conservatively estimated to be more than 30,100 individuals (Johnsgard 1990). Highest densities were from Massachusetts to Virginia on the Atlantic Coast and in California and Arizona in the west. The size of the population that breeds in the U.S. and winters to the south is unknown, but is expected to be substantial.

Earlier declines in sharp-shinned hawk populations were likely the result of decreased reproductive success due to pesticides introduced after World War II (Johnsgard 1990). Populations increased after DDT was banned in the U.S. in the early 1970s; however, there has been a decline recently in the number of sharp-shinned hawks passing through traditional migratory paths in the eastern U.S. (Viverette et al. 1996). The continued use of pesticides in Central and South America, the wintering grounds for many sharp-shinned hawks that breed in North America and for many of their avian prey species, is also a concern (Johnsgard 1990). Forest management practices in the western U.S. that produce monoculture forest habitats may threaten this hawk species as well. This species was historically shot in large numbers during migration, which also contributed to its historic decline in abundance.

Habitat Requirements

Sharp-shinned hawks' breeding habitat is typically boreal forest, where up to 80 percent of the North American breeding population is found (Johnsgard 1990). In winter, sharp-shinned hawks use a wider variety of habitats. While it is typically associated with woodland habitats, the sharp-shinned hawk will use open or young forests with a variety of plant life supporting abundant avian prey. Along the Colorado River, sharp-shinned hawks forage in mesquite and willow groves and along the brushy borders of agricultural fields and canals. They forage by darting out from a perch or by hunting in low gliding flights to capture unwary avian prey (Zeiner et al. 1990).

Habitat in the Proposed Project Area

Sharp-shinned hawks typically use woodland habitats. In the proposed project area, woodland habitats are relatively rare and consist mainly of tamarisk scrub along the Salton Sea, the New and Alamo Rivers, and agricultural drains. Tamarisk, as well as some cottonwoods, willows, and mesquite, are supported by seepage from the AAC between Drops 3 and 4 and may provide habitat for sharp-shinned hawks. Tamarisk and eucalyptus trees bordering agricultural fields may also be used as perch sites for foraging.

Proposed Project Area Occurrence

Sharp-shinned hawks occur in the proposed project area as migrants and winter visitors (USFWS 1997b). About 250 sharp-shinned hawks occur in Imperial Valley during migration or winter (IID 1994). Ten drains were surveyed in the Imperial Valley during 1994 to 1995. Two sharp-shinned hawks were observed along the Trifolium 2 Drain, and one was observed along the Holtville Main Drain (Hurlbert et al. 1997). These two drains had the greatest vegetation coverage of the 10 drains surveyed.

Golden Eagle *(Aquila chrysaetos)*

Range and Distribution

The golden eagle is found throughout the U.S. and Canada, ranging from Southern Alaska to central Mexico. It is a widely distributed resident throughout western North America, except for the recent extirpation in the Central Valley of California (Harlow and Bloom 1989).

Population Status and Threats

Approximately 500 breeding pairs of golden eagles nest in California (CDFG 1985). Golden eagle populations declined in Southern California primarily because of the loss of large, unfragmented habitat areas as well as lead toxicosis (Harlow and Bloom 1989). Human disturbance of nest areas may have also contributed to earlier statewide declines (Thelander 1974). Habitat loss and human disturbance remain the primary threats to this species.

Habitat Requirements

Golden eagles occupy primarily mountain, desert, and canyon habitats, usually avoiding dense forested areas where hunting is difficult due to their large wingspan (Johnsgard 1990). Golden eagles construct their nests on cliff ledges and high rocky outcrops, in large trees, on top of telephone poles, and on the ground (Bruce et al. 1982; and Knight et al. 1982). Golden eagles hunt over open country for hares, marmots, rodents, snakes, birds, and sometimes newborn ungulates and carrion. In California, golden eagles forage on wintering waterfowl. Grassland, oak savannah, alpine tundra, meadows, open woodland, chaparral, and wetland habitats provide foraging habitat.

Habitat in the Proposed Project Area

Much of the proposed project area could potentially be used by golden eagles for foraging; however, golden eagles are most likely to concentrate foraging activities in areas of high prey concentrations. In the proposed project area, the Salton Sea and managed wetlands at the state and federal wildlife refuges, as well as private duck clubs, attract abundant waterfowl populations during winter. Agricultural fields also attract waterfowl. Golden eagles may exploit the seasonally abundant prey of these areas.

Proposed Project Area Occurrence

Golden eagles occur at the Salton Sea only as accidentals during the winter and spring (USFWS 1997b).

Ferruginous Hawk (*Buteo regalis*)

Range and Distribution

Ferruginous hawks breed from southeastern Washington; southern Alberta and Saskatchewan, Canada; and western North Dakota south to Texas, northern New Mexico, and Arizona (Johnsgard 1990). They winter primarily from the central part of their breeding range in Nevada, Colorado, and Kansas south to northern Mexico (Johnsgard 1990). There are no breeding records from California, but they are a fairly common winter resident in the southwestern part of the state (Zeiner et al. 1990). Important wintering locales for ferruginous hawks in California include Fish Lake Valley, Owens Valley, Carrizo Plain, Cuyama Valley, Antelope Valley, Lucerne Valley, Lakeview-Perris area (Riverside), and Lake Henshaw (Garrett and Dunn 1981).

Population Status and Threats

The ferruginous hawk has declined as a breeding resident in parts of its range, including Oregon, Arizona, and Kansas. It is now considered a sparse breeder in northern Arizona and no longer nests in southeastern Arizona (AGFD 1996). The estimated breeding population of ferruginous hawks in the U.S. and Canada in the early 1980s was 3,000 to 4,000 breeding pairs (Schmutz 1984). In 1986, the estimated wintering population of ferruginous hawks north of Mexico was approximately 5,500 individuals based on Christmas Bird Count data (Johnsgard 1990). Most wintering birds were concentrated in Arizona and Colorado. From 1973 to 1984, there was a substantial increase in the abundance of wintering ferruginous hawks in the U.S. based on Christmas Bird Count data (Warkentin and James 1988). The largest regional increases in wintering populations were in California and the eastern portion of the range.

The decline of the ferruginous hawk is attributed to the loss of large, open tracts of grasslands and desert scrub habitats used for nesting to agriculture and urban development (Schmutz 1984 and 1987; AGFD 1996). This species is also vulnerable to prairie dog control programs, illegal hunting, and human disturbance at nesting sites (Schmutz 1984; AGFD 1996). Habitat loss and illegal hunting may threaten populations of this species in the study area (Schmutz 1984; AGFD 1996).

Habitat Requirements

Ferruginous hawks are adapted to breeding and wintering in large expanses of semiarid grasslands of the Great Plains with scattered trees, rock outcrops, and tall trees along streams and rivers (Johnsgard 1990). They also use agricultural lands in winter for foraging in both California (Zeiner et al. 1990) and the LCR Valley (Rosenberg et al. 1991). Ferruginous hawks forage on rabbits, jackrabbits, and grassland rodents, such as ground squirrels and prairie dogs (Johnsgard 1990; Plumpton and Andersen 1997). They forage mostly from perches and the ground but also capture prey via long, low, overhead flights. They may steal prey from other raptors and scavenge for food.

Habitat in the Proposed Project Area

Ferruginous hawks are associated with arid open habitats. In the HCP area, they could use agricultural fields or desert habitats adjacent to the AAC.

Proposed Project Area Occurrence

Ferruginous hawks regularly occur in the Imperial Valley in small numbers during the winter. In the Colorado River Valley, most winter migrants and residents are observed from mid-October to mid-March, although they can occur in the valley from late September to early April (Rosenberg et al. 1991). Similar periods of occurrence are assumed for the Imperial Valley. Ferruginous hawks are not known to breed in the HCP area.

Swainson's Hawk (*Buteo swainsoni*)

Range and Distribution

Swainson's hawks nest in disjunct areas of central Alaska and from western Canada east as far as Minnesota and south through Texas to Baja California, Mexico, and north-central Mexico (Johnsgard 1990). This species migrates in large flocks between breeding areas in North America and wintering areas in South America (Terres 1980). In California, this formerly widespread hawk is now restricted to portions of the Central Valley and the Great Basin region of the state (CDFG 1991).

Population Status and Threats

The geographic range and abundance of the Swainson's hawk have decreased in the western U.S. (Zeiner et al. 1990). Swainson's hawks have declined in parts of their range (e.g., southeastern Oregon and California) since the 1940s, whereas in the Great Plains, there was no evidence of decline by the mid-1980s except in peripheral populations (Johnsgard 1990). As of the mid-1980s, an estimated 500,000 birds were in North America; however, more recently, there is thought to have been a nationwide decline (AGFD 1996). Detailed information is lacking on the historical and current abundance of breeding Swainson's hawks in Arizona (AGFD 1996). In California, it is estimated that the breeding population around 1900 may have exceeded 17,000 pairs (CDFG 1991). As of the early 1990s, the statewide population was estimated to be only approximately 550 pairs. The population is still declining, and the species has disappeared from Southern California, except as a spring and fall transient during migration.

The major reason for the substantial decline of this species in the western U.S. is the loss of nesting and foraging habitat due to urban expansion into rural areas (Zeiner et al. 1990; CDFG 1991). There has also been considerable foraging habitat loss due to the trend in planting agricultural crops unsuitable for foraging (e.g., vineyards, orchards, and rice); grassland losses due to grazing practices; fire control; and shrub invasion (CDFG 1991; AGFD 1996). Another major threat to Swainson's hawks has been pesticide use in South America, with an estimated 20,000 to 30,000 individuals killed in 1996 (AGFD 1996). Additional threats to Swainson's hawks include nesting habitat loss due to flood control proposed projects, shooting, pesticide poisoning of prey animals, competition with other raptors, and human disturbance at nest sites (CDFG 1991).

Habitat Requirements

Swainson's hawks nest in mature riparian forests; oak groves; or in lone trees adjacent to foraging areas, such as agricultural fields (Johnsgard 1990; Zeiner et al. 1990; and CDFG 1991). Nests are built from 1.2 to 30.5 meters(4 to 100 feet) high with an average nest tree height of nearly 18 meters(58 feet) in the Central Valley of California (Zeiner et al. 1990; CDFG 1991). Swainson's hawks nest from late March to late August. Spring migration occurs from March through May, and fall migration occurs from September through October.

Swainson's hawks are unusual among most large birds of prey in that they feed largely on insects during the nonbreeding season (e.g., dragonflies, grasshoppers, and crickets) and often congregate in large flocks to forage (Jaramillo 1993; Rudolph and Fisher 1993). Because they depend on insect prey in the winter, they are highly migratory (Johnsgard 1990). During the breeding season, they feed on small mammals and, to a lesser degree, on birds, lizards, and amphibians (Terres 1980; Johnsgard 1990). These hawks often soar in search of prey, catching insects and bats in flight, and will also walk on the ground to capture prey (Zeiner et al. 1990). Swainson's hawks forage during migration in grasslands, agricultural fields (including alfalfa and other hay crops), and lightly grazed pastures (CDFG 1991). Unsuitable foraging areas are crops in which prey is scarce or inaccessible, such as vineyards, orchards, rice, corn, and cotton.

Habitat in the Proposed Project Area

Agricultural fields provide the primary foraging habitat for Swainson's hawks in the proposed project area. Swainson's hawks often visit alfalfa fields for foraging in other parts of its range and would be expected to forage in alfalfa, wheat, and sudangrass fields in the Imperial Valley. Trees, such as tamarisk or eucalyptus that occur adjacent to agricultural fields, provide perch and roost sites.

Proposed Project Area Occurrence

Swainson's hawks are occasional visitors to the Salton Sea area during the spring and fall (USFWS 1997b). No breeding occurs in the proposed project area.

Northern Harrier (*Circus cyaneus*)

Range and Distribution

The northern harrier is a widespread species that can be found distributed from Alaska in the spring and summer as far south as South America. It is distributed across the U.S. with populations that exist year-round throughout the central states to the west coast (Kaufman 1996). In California, the harrier is a year-round resident that is commonly found throughout the state in low-lying areas of agricultural lands, estuaries, and marshes (Zeiner et al. 1990).

Population Status and Threats

Northern harriers are generally declining throughout their range, and southern breeding limits are retracting northward (Johnsgard 1990). Breeding populations have been reduced in most parts of the harrier's range due to the loss and degradation of wetland, meadow, and grassland habitats and burning and plowing of nesting areas during early stages of the breeding cycle (Remsen 1978; Johnsgard 1990). Habitat destruction and exposure to pesticides are the primary threats to northern harriers (Ehrlich et al. 1992). In addition, northern harriers nest on the ground and are vulnerable to nest destruction from agricultural and other human activities; nest predation; and heavy grazing, which reduces nesting cover and also can result in trampling of nests (Zeiner et al. 1990a).

Based on California Biodiversity Council (CBC) data, there was an estimated population of 111,500 northern harriers in North America (MacWhirter and Bildstein 1996). Highest densities in the U.S. were reported from the Chesapeake Bay Area, Texas, California, and Arizona.

Habitat Requirements

The northern harrier is an open country species, nesting at low elevations up to about 900 feet (Johnsgard 1990). It feeds mostly on voles and other small mammals; birds; frogs; reptiles; and insects that inhabit low-lying wetland marshes, swamps, bogs, fields, pastures, cropland, and meadows (Johnsgard 1990). In the LCR Valley, harriers forage primarily in alfalfa or grass fields and over sparse riparian vegetation or marshes and occasionally over open desert. The harrier usually hunts with low, coursing flights over the ground (3 to 30 feet), making quick plunges onto prey. Harriers use tall grasses and wetland forbs as cover. The harrier nests on the ground in tall grasses, sedges, reeds, rushes, cattails, willows, or shrubby vegetation, usually on marsh edges (Brown and Amadon 1968; Johnsgard 1990). Grasslands, cultivated fields, and pastures are used for nesting in addition to native habitats. Harriers breed from April to September, with most egg laying between mid-April and July (Johnsgard 1990; Zeiner et al. 1990).

Habitat in the Proposed Project Area

Throughout California, northern harriers commonly use agricultural fields. In the proposed project area, habitat for northern harriers is abundant. Alfalfa, wheat, and sudangrass are currently the principal crops in the valley, all of which provide suitable forage for harriers. Additional foraging and roosting habitat are available in the managed wetlands of the state and federal wildlife refuges and private duck clubs and wetlands in the vicinity of the Salton Sea.

Proposed Project Area Occurrence

Northern harriers are common fall and winter residents in the proposed project area, but only occasionally occur in the area during the spring and summer (USFWS 1997b). Small (1994) states that nesting of harriers has been significantly reduced in the southern part of California. No recent breeding pairs have been confirmed in Imperial Valley, but, given the occasional occurrence of northern harriers in the project area during summer, breeding is possible. Ten drains were surveyed in the Imperial Valley during 1994 to 1995 (Hurlbert et al. 1997). One to nine individuals were observed along eight of the drains. Surveys conducted in 1999 reported 33 northern harriers at the Salton Sea (Salton Sea Authority 2000).

White-Tailed Kite (*Elanus leucurus*)

Range and Distribution

The white-tailed kite's range extends from coastal zones in western Oregon south to Baja California, Mexico. The white-tailed kite is a common to uncommon, year-long resident in coastal and valley lowlands and rarely found away from agricultural areas. It inhabits herbaceous and open stages of most habitats, primarily in cismontane California.

Population Status and Threats

Population declines were noted nationwide during the 1980s and 1990s (Dunk 1995). However, Small (1994) reports a general population increase in California in recent years following declines in several portions of the state (e.g., southern and west-central areas) during the 1980s. Nests may be robbed by jays, crows, magpies, raccoons, and opossums. No other threats to this species have been identified.

Habitat Requirements

The white-tailed kite uses herbaceous lowlands with variable tree growth and dense populations of voles (Waian and Stendell 1970). The preferred foraging habitat of the white-tailed kite consists of farmlands, open grasslands, meadows, emergent wetlands, clearcuts, and lightly wooded areas (Johnsgard 1990). Lightly grazed or ungrazed fields provide the best foraging habitat (Dunk 1995). Specific associations with plant species for foraging or nesting seem unimportant; rather vegetation structure and prey base are thought to be the primary determinants of foraging and nesting habitat quality. Substantial groves of dense, broad-leafed deciduous trees are used for nesting and roosting. This species uses trees with dense canopies for cover. In Southern California, it also roosts in saltgrass and Bermudagrass.

The white-tailed kite makes a nest of loosely piled sticks and twigs and lined with grass, straw, or rootlets. Nests are placed near the top of dense oak, willow, or other tree stand; usually 6 to 20 meters(20 to 100 feet) above ground (Dixon et al. 1957). Nest trees range from 10 to 170 feet tall and can occur as single, isolated trees or in large stands greater than 250 acres. Most nests are placed near forest/grass edges in the upper one-third of the tree (Dunk 1995).

Habitat in the Proposed Project Area

Agricultural fields and managed wetlands associated with the state and federal wildlife refuges provide foraging areas for the white-tailed kite. Tamarisk and eucalyptus bordering agricultural fields provide potential roosting and nesting sites.

Proposed Project Area Occurrence

White-tailed kites may occur in the proposed project area throughout the year. Although not common, they are regularly observed (USFWS 1997b). Breeding status is uncertain. They have bred in the HCP area previously, but have not been verified to breed there recently (USFWS 1997b). White-tailed kites were observed during general avian surveys of several drains in the Imperial Valley (Hurlbert et al. 1997).

Bald Eagle *(Haliaeetus leucocephalus)*

Range and Distribution

Bald eagles occur in North America from central Alaska and Canada south to northern Mexico (USFWS 1995b). They are found primarily along coasts, inland lakes, and large rivers, but may also be found along mountain ranges during migration. Although the bald eagle is greatly reduced in abundance from historical levels, the current distribution is essentially the same (USFWS 1976). Many bald eagles withdraw in winter from northern areas, migrating north again in spring and summer to breed (Terres 1980).

Population Status and Threats

Historically, bald eagles are believed to have nested throughout North America on both coasts and along major rivers and large lakes (Gerrard and Bortolotti 1988). By the mid-1800s, bald eagle populations had declined radically throughout most of the U.S. because of widespread shooting, reductions in the species' prey base, and secondary poisoning as a result of predator control programs. The introduction of DDT for agricultural purposes in the 1940s furthered the decline of this species, resulting in widespread reproductive failure due to eggshell thinning. Efforts to save the bald eagle, including passing of the Bald Eagle Protection Act in 1940, listing the bald eagle as a federally endangered species in 1967, and banning DDT in the U.S. and Canada in the early 1970s, have resulted in a slow recovery of the species. Between 1982 and 1990, the number of occupied bald eagle territories in the lower 48 states. doubled from 1,482 to 3,014. Reintroduction programs have also contributed to the species' recovery (Hunt et al. 1992). Due to population increases, the USFWS has proposed to delist the bald eagle (FR 64 36454-36464). The main threats to bald eagles in the study area are habitat loss and degradation, including declines in prey and roost-site availability. Human disturbance, environmental contamination, electrocution, poisoning, trapping, and illegal taking also threaten this species (NMDGF 1997).

Habitat Requirements

Bald eagles are associated with aquatic ecosystems, including large rivers, major lakes, reservoirs, estuaries, and seacoasts. They require open water habitats that support an adequate food base. Bald eagles forage on fish and waterfowl from perch sites adjacent to foraging areas. Thus, perch sites near open water or marshes are an essential habitat feature. Bald eagles acquire food in a diversity of ways. They catch live prey, steal prey from other predators, and find carrion. Fish, small mammals, and waterfowl make up the majority of the eagles' diet (Terres 1980).

Habitat in the Proposed Project Area

Suitable foraging habitat occurs at the Salton Sea and adjacent wetlands where eagles may prey on fish and waterfowl. The state and federal wildlife refuges as well as private duck clubs that support abundant waterfowl populations during the winter may also attract bald eagles. In addition, some waterfowl species forage in agricultural fields of the valley, and bald eagles probably exploit this food source where trees are present to provide roost sites.

Proposed Project Area Occurrence

Bald eagles are a rare and occasional winter visitor to the proposed project area. A few winter migrants (one to three birds) have been regularly observed at the Salton Sea, but are rarely observed during the fall (IID 1994). They are not known to breed in the proposed project area.

Osprey *(Pandion haliaetus)*

Range and Distribution

The osprey is a cosmopolitan species, found on every continent except Antarctica (Terres 1980). In North America, ospreys breed from northwest Alaska and Canada south to Baja California, Mexico, and Florida (Johnsgard 1990). In the U.S., they occur close to coastal waters on the east and west coasts and inhabit inland areas around the Great Lakes, Utah, Arizona, and Nevada. Ospreys winter on the Gulf Coast and Southern California south into

Central and South America (Terres 1980). This species breeds throughout Northern California from the Cascade Range south to Marin County and throughout the Sierra Nevada (Zeiner et al. 1990).

Population Status and Threats

Ospreys have declined in abundance, especially since the 1960s (Terres 1980). There were an estimated 8,000 pairs in the contiguous U.S. in the early 1980s with Florida having the largest numbers, followed by Chesapeake Bay and Maine (Johnsgard 1990). Based on Christmas Bird Count data, the U.S. winter population was estimated at 7,080 individuals in 1986, with more than half in Florida. Since DDT was banned in the U.S., osprey populations have increased considerably in many parts of the country (Kaufman 1996). The North American breeding population has been estimated at 17,000 to 20,000 individuals (Poole 1989).

The decline in osprey numbers is largely attributed to the adverse effects of DDT and other pesticides on reproduction (Johnsgard 1990). Some areas still have greatly reduced osprey populations that may be due to residual effects of these now banned pesticides. The adverse effects of pesticides continue to threaten this species. More than half of the North American population may winter in Latin America and the West Indies where pesticide use is not as controlled as in the U.S. and Canada. Human encroachments on breeding areas and shooting have also adversely affected osprey populations.

Habitat Requirements

Ospreys are found only in association with lakes, reservoirs, coastal bays, or large rivers. They feed predominantly on fish, although some mammals, birds, reptiles, and amphibians are also eaten. Ospreys require open, clear water for foraging and swoop down while in flight or from a perch to catch fish at the water's surface. Large trees and snags near the water are used for roosting and nesting. During the breeding season, ospreys generally restrict their movements to activities in and around the nest site, and between the nest and foraging sites.

Habitat in the Proposed Project Area

Habitat for ospreys in the proposed project area principally occurs at the Salton Sea, where abundant fish populations provide foraging opportunities. Snags and trees along the margins of the Salton Sea provide important perch sites that ospreys use for foraging and eating captured prey. Ospreys may also forage along the New and Alamo Rivers and lakes in the Imperial Valley, such as Finney Lake and Fig Lagoon.

Proposed Project Area Occurrence

At the Salton Sea, ospreys occur in small numbers as a nonbreeding visitor throughout the year (IID 1994).

Harris' Hawk *(Parabuteo unicinctus)*

Range and Distribution

Historically, Harris' hawks were residents of semiopen habitats from northern Baja California, Mexico, east through central and southern Arizona, southern New Mexico, and southern Texas; and south through Central America and South America. This species has also occurred infrequently in Kansas, Louisiana, Colorado, Utah, and Nevada (Johnsgard 1990). Historically, Harris hawk occurred year-round in the LCR Valley from near Needles to the Imperial National Wildlife Refuge, with a small disjunct breeding population at the south end of the Salton Sea (Small 1994; Bednarz 1995).

Population Status and Threats

Although Harris' hawks are still located throughout most of their historic range, they were believed to be extirpated from southeastern California and southwestern Arizona by the early 1970s. Small numbers of Harris' hawks are once again present in California due to accidental releases and recent attempts at reestablishing a breeding population along the LCR. Attempts to reintroduce the Harris' hawk occurred in the 1980s, when nearly 200 birds were released along the LCR (Walton et al. 1988). A few nests have been found incidentally since (Bednarz 1995). Continuing habitat alteration and increasing recreational impacts are the greatest threats to this species (Johnsgard 1990). Lack of suitable habitat threatens the success of reintroduction programs. Shooting, poisoning (i.e., rodenticides), and the taking of nestlings for falconry may also threaten this species' survival (AGFD 1997c).

Habitat Requirements

Harris' hawks occur in desert scrub dominated by saguaro, paloverde (*Cercidium spp*.), and ironwood (*Olneya tesota*); cottonwood-mesquite forests; and semidesert prairies. Saguaro cacti, paloverde, mesquite, and riparian trees, especially cottonwoods, are used as nest sites. This species also occurs in some urban environments where it takes advantage of washes, vacant lots, and areas of undeveloped desert (Rosenberg et al. 1991; Johnsgard 1990). In urban situations, nests have been placed in pine trees, palm trees, and transmission towers. The diet of the Harris' hawk consists mainly of small- to medium-sized rodents, but it is also known to take birds, lizards, and mammals up to the size of rabbit.

Habitat in the Proposed Project Area

Little potential habitat for Harris' hawk exists in the HCP area. Cottonwood and mesquite trees that Harris' hawks could use for nesting occur only in a few isolated seepage areas along the AAC, principally between Drops 3 and 4. In the remainder of the HCP area, Harris' hawks could use landscape trees and trees on the state and federal refuges. Agricultural fields throughout the HCP area could be used for foraging.

Proposed Project Area Occurrence

Harris' hawks have been observed at the Imperial National Wildlife Refuge and are known to forage in mesquite and willow groves along the LCR (Bednarz and Ligon 1988). Although, historically, they apparently bred at the Salton Sea, they have not been observed recently.

Merlin *(Falco columbarius)*

Range and Distribution

Merlins breed in summer in the northern forests of Europe, Asia, and North America. In North America, their breeding range extends from northwestern Alaska and northern Canada to the southern limits of the boreal coniferous zone. In winter, most merlins migrate south of their breeding range to the western U.S., the Gulf Coast, and south to northern South America (Johnsgard 1990; Terres 1980).

Population Status and Threats

The status of this species is somewhat uncertain. Some merlin populations apparently declined significantly during the 1960s as a result of pesticide contamination and the loss of native grassland habitats. More recent analyses suggest population increases on the northern prairies of the U.S. and southern Canada, possibly resulting from banning DDT. In other areas, merlin numbers are now probably stable. Because merlins feed mostly on birds, pesticide contamination is probably the greatest threat to this species (Zeiner et al. 1990a).

Habitat Requirements

Wintering habitats of the merlin are extremely diverse, ranging from deserts to tropical forests and including prairies, open farmland, and even urban areas. Along the California coast, they often concentrate their foraging in areas supporting abundant shorebird populations. The merlin is a predator that catches and eats a wide variety of avian prey, often consuming locally abundant species like doves and house sparrows. Although birds often comprise more than 90 percent of the merlin's diet, it occasionally feeds on large insects, rodents, bats, and reptiles (Ehrlich et al. 1988; Kaufmann 1996; and Johnsgard 1990).

Habitat in the Proposed Project Area

Much of the proposed project area could be used by merlins. Along the Salton Sea, merlins may forage on shorebirds that congregate along the mudflats and shallows. Wetlands and riparian habitats on the state and federal wildlife refuges also support abundant bird populations that would be attractive to foraging merlins. In the LCR Valley, the merlin prefers open habitats, such as agricultural lands and wetlands with scattered trees or shrubs such as along canals and drains (Rosenberg et al. 1991). Similar habitats are probably used in the Imperial Valley as well.

Proposed Project Area Occurrence

Merlins are rare visitors to the Salton Sea area in the fall and winter (USFWS 1997b). They are not known to breed in the area.

Prairie Falcon (*Falco mexicanus*)

Range and Distribution

Prairie falcons breed from southeastern British Columbia, southern Alberta, and southern Saskatchewan south through the western U.S. to southern Arizona, southern New Mexico, and Baja California, Mexico. It winters from its breeding range in southern Canada south to central Mexico, expanding its range eastward after the nesting season onto the Great Plains and westward to the California coast (Johnsgard 1990; Terres 1980; and Kaufmann 1996). In California, the prairie falcon can be found year-round in the southern half of the state and in the Klamath Basin in Northern California (Zeiner et al. 1990).

Population Status and Threats

The North American population of prairie falcons has been estimated at 7,800 birds (Johnsgard 1990). The species is believed to be declining in Utah, western Canada, and agricultural areas of California. In California, local problems, such as the effects of agricultural chemicals on reproduction and the conversion of grassland to cropland, are thought to be responsible for the species' decline; these factors may continue to threaten local populations.

Habitat Requirements

Prairie falcons typically inhabit open and treeless terrain, such as arid plains, hills, mountains, and deserts. Throughout their range, they prefer habitats with nearby cliffs and escarpments that provide suitable nesting sites. Wintering prairie falcons in the desert Southwest are commonly found in low and moderate elevation habitats, including agricultural fields, lakes, and reservoirs. In summer, higher elevation communities, such as desert grassland and chaparral, are frequently occupied. Breeding prairie falcons nest on sheer cliffs overlooking vast foraging areas. Most nests are built in "potholes" on cliff ledges, but old stick nests that other raptors built are also commonly used. Less frequently, nests are placed in caves, holes, and other rocky crevices (Johnsgard 1990; Ehrlich et al. 1988).

The prairie falcon's diet consists mostly of small birds and mammals. Seasonal shifts in diet tend to reflect changes in the abundance of easily caught prey species. Mourning doves, western meadowlarks, ground squirrels, horned larks, black-tailed quail, and Gambel's quail may all be seasonally important prey animals for the prairie falcon in the study area. Other species, including various lizards and insects, are also eaten regularly (Johnsgard 1990; Kaufmann 1996).

Habitat in the Proposed Project Area

Habitat for prairie falcons in the proposed project area consists mainly of agricultural fields and the shoreline of the Salton Sea. Prairie falcons may also forage in desert areas adjacent to the irrigated portions of the valley. In addition, small areas that have not been cultivated in many years occur within the valley and support more natural vegetation. Prairie falcons may also exploit these areas for foraging.

Proposed Project Area Occurrence

Prairie falcons are rare migrants at the Salton Sea and in the Imperial Valley. About 30 migrants occur in the valley each year (IID 1994). Prairie falcons may also occur along the AAC.

Peregrine Falcon (*Falco peregrinus*)

Range and Distribution

Peregrine falcons breed throughout much of North America, as well as South America, Eurasia, Australia, Africa, and Oceania. The American peregrine falcon, which is the most southerly subspecies of peregrine falcon in North America, breeds south of the arctic tundra of Canada and Alaska to Mexico. In winter and during migration, the American peregrine falcon extends its range southward to the Caribbean and parts of South America.

Population Status and Threats

The American peregrine falcon began its decline in North America in the late 1940s, when DDT and other chlorinated hydrocarbon pesticides were being used in large quantities (Johnsgard 1990; NMDGF 1997). Approximately 600 to 800 pairs nested in the western U.S. before 1940 (NMDGF 1997). By 1965, the species was extirpated from east of the Mississippi, and fewer than 20 breeding pairs still occurred west of the Great Plains (Johnsgard 1990; NMDGF 1997). In the early 1970s, the U.S. and Canada banned DDT; subsequently, the nesting success of wild peregrine falcons began to rise. At the same time, captive breeding and reintroduction programs were being implemented, with the known number of pairs in the West estimated at nearly 200 by 1987 (NMDGF 1997). The peregrine falcon was previously listed as a federal endangered species. However, with the known number of territorial pairs at approximately 1,400 and a total population of more than 3,000 pairs, the USFWS has recently delisted the species. Factors that may continue to threaten peregrine populations include pesticide poisoning on the wintering grounds, low breeding densities, lack of gene flow between populations, and the reduced availability of foraging habitat and avian prey (NMDGF 1997).

Habitat Requirements

Peregrine falcons occur in a wide range of open country habitats from desert mountains to seacoasts (Kaufman 1996). The presence of tall cliffs is the most characteristic feature of the peregrine’s habitat and is considered a limiting factor for this species. Cliffs provide the peregrine with both nesting and perching sites and an unobstructed view of the surrounding area. Where cliffs are lacking, manmade structures, such as tall buildings and bridges, can be used as substitutes.

Nearby waterbodies or wetlands that support abundant prey of small- to medium-sized birds, particularly waterfowl, are another common feature of peregrine habitat that influences their distribution and abundance (Johnsgard 1990). Highly mobile, flocking, and colonial-nesting birds, such as pigeons, shorebirds, and waterfowl, are the peregrine falcon’s primary prey. River canyons that offer a large number of potential nest sites, abundant prey, and ideal hunting conditions are frequently inhabited by this species (Skaggs et al. 1988).

Habitat in the Proposed Project Area

No cliffs or tall buildings that could provide nesting sites for peregrine falcons occur in the proposed project area; thus, use of the proposed project area by peregrine falcons is limited to foraging. Much of the proposed project area could provide foraging opportunities for peregrine falcons, given this species’ association with open habitats. Peregrine falcons are most likely to concentrate foraging activities in areas with high concentrations of shorebirds and waterfowl. In the proposed project area, managed wetlands on the state and federal wildlife refuges as well as private duck clubs attract large numbers of wintering waterfowl and may also attract peregrine falcons. The Salton Sea also provides suitable foraging habitat as large numbers of waterfowl and shorebirds inhabit this area. In addition, some waterfowl and shorebirds forage in agricultural fields and peregrine falcons may also exploit this foraging opportunity.

Proposed Project Area Occurrence

Peregrine falcons are rare visitors to the Salton Sea area, although they may occur at any time during the year (USFWS 1997b). Small numbers of migrant peregrine falcons (one to three birds) are regularly observed over Salton Sea marsh areas, particularly at the Salton Sea National Wildlife Refuge (IID 1994). One peregrine falcon was observed during surveys of selected drains in Imperial Valley (Hurlbert et al. 1997).

California Black Rail *(Laterallus jamaicensis coturniculus)*

Range and Distribution

The California subspecies of the black rail occurs in western North America from San Francisco Bay and the Sacramento/San Joaquin Delta south along the California coast into northern Baja California, Mexico. In California, it also occurs in the San Bernardino/ Riverside area and at the Salton Sea (CDFG 1991). Along the LCR, the California black rail is a permanent resident in the vicinity of Imperial Dam and Bill Williams Delta (Snider 1969; Repking and Ohmart 1977). Black rails are also thought to breed in the Cienega de Santa Clara, one of only three breeding localities for this species in Mexico and one of the few for the subspecies anywhere (Piest and Campoy 1998).

Population Status and Threats

California black rail populations declined substantially between the 1920s and 1970s due to the loss and degradation of coastal salt marsh and inland freshwater marsh habitats (Eddleman et al. 1994; CDFG 1991). Along the LCR, black rail populations declined an estimated 30 percent between 1973 and 1989, with the majority of birds shifting from north of Imperial Dam to Mittry Lake during the same period (Eddleman et al. 1994). Currently, black rails appear to be stable along the LCR, with approximately 100 to 200 individuals estimated to occur from Imperial National Wildlife Refuge south to Mittry Lake (Rosenberg et al. 1991). This population and the small population at the Salton Sea represent the only stable inland population of this subspecies (Eddleman et al. 1994; Rosenberg et al. 1991).

The California black rail's decline throughout its range is attributed to the loss of saltwater and freshwater wetlands to urban and agricultural development (Wilbur 1974). The effect of selenium on black rails remains unknown, but toxic levels of this heavy metal may also threaten black rail populations in the study area (AGFD 1996; Eddleman et al. 1994; and Flores and Eddleman 1991). These factors continue to threaten the California black rail.

Habitat Requirements

Preferred habitat of the California black rail is characterized by minimal water fluctuations that provide moist surfaces or very shallow water, gently sloping shorelines, and dense stands of marsh vegetation (Repking and Ohmart 1977). Studies conducted along the LCR suggest that habitat structure and water depths are more important factors than plant composition in determining black rail use of wetland habitats. Unsuitable water and structural conditions appear to restrict the California black rail to only a fraction of the emergent vegetation available within an entire wetland (Flores and Eddleman 1995). In general, Flores and Eddleman (1995) found that black rails used marsh habitats with high stem densities and overhead coverage that were drier and closer to upland vegetation than randomly selected sites. Marsh edges with water less than 1 inch deep dominated by

California bulrush and three-square bulrush are used most frequently. Areas dominated by cattail are also used regularly, but only in a small proportion to their availability and generally within 165 feet of upland vegetation where water depth is 1.2 inches. Telemetry studies at Mittry Lake found black rails to be sedentary, with home ranges averaging 1.2 acres or less (Flores and Eddleman 1991). The erratic movements recorded for some juvenile and unmated birds during this research were consistent with the "wandering" behavior attributed to this subspecies and supports the idea that black rails may be capable of quickly occupying newly created habitats (Flores and Eddleman 1991).

Flores and Eddleman (1991) also studied black rail diets and food availability at Mittry Lake and found that black rails consume a wide variety of invertebrates throughout the year, including beetles, earwigs, ants, grasshoppers, and snails. When invertebrate availability drops during the winter months, a larger portion of cattail and bulrush seeds is consumed. Lower resource availability in winter causes black rails to experience a significant weight loss, indicating they are more vulnerable to stress during this time.

Nesting biology of the California black rail is poorly understood. Double clutching and renesting may be fairly common in this subspecies. These behaviors, combined with a relatively large clutch size, long breeding season, apparently low predation rates, and aggressive nest defense, suggest that the black rail has a high reproductive potential that is likely limited by the availability of shallow water environments (Eddleman et al. 1994; Flores and Eddleman 1991).

Habitat in the Proposed Project Area

California black rails are associated with dense wetland vegetation consisting of cattails and bulrushes in shallow water. In the proposed project area, these characteristics are found primarily in the managed wetlands on the state and federal wildlife refuges, in wetland areas adjacent to the Salton Sea, and in marsh habitats supported by seepage from the AAC between Drops 3 and 4 and adjacent to the East Highline Canal. Black rails may use agricultural drains in the valley, although they have not been found to make extensive use of agricultural drains in previous surveys. Vegetation along agricultural drains mainly consists of common reed and tamarisk, species that are not generally used by black rails. Areas of cattails and bulrushes do exist along the drains. However, these areas are small and narrow and often interspersed with other vegetation, such as common reed. The habitat value of marsh vegetation supported by agricultural drains is probably limited and may only support foraging by black rails.

Proposed Project Area Occurrence

The species is known to use marsh habitats at Finney Lake on the Imperial Wildlife Area, seepage communities along the All American, Coachella, and East Highline Canals; and wetland areas adjacent to the Salton Sea, including the New River Delta (Evans et al. 1991; Jurek 1975; Garrett and Dunn 1981; and Jackson 1988).

Few surveys for the California black rail have been conducted in the proposed project area. A study by Jurek (1975) and other investigators in 1974 and 1975 identified eight marsh areas with black rails between the Coachella and East Highline Canals south of Niland. The Coachella Canal south of Niland was concrete-lined in 1981, and all black rail habitat supported by canal seepage was dessicated (Evans et al. 1991). Subsequent surveys of seepage communities along unlined portions of the Coachella Canal north of Niland detected rails at another eight sites (Jackson 1988; Evans et al. 1991).

Along the AAC, Kasprzyk et al. (1987) recorded 30 to 50 California black rails in the marsh located between Drops 3 and 4 during surveys in April and May 1984. More recently, California black rails were censured along the AAC during April and May 1988, in conjunction with surveys for Yuma clapper rails. A minimum population of three black rails was recorded for the area between Drops 3 and 4.

In the only systematic survey for the species at the Salton Sea and surrounding areas in 1989, 13 birds were recorded at the mouth of the New River, 8 in seepage communities along the Coachella Canal, and 1 at Finney Lake. Up to seven rails have been observed at Finney Lake on other occasions (Shuford et al. 1999). The reproductive status of these birds is uncertain, although some locations have had numerous calling birds over periods of several weeks in the spring, suggesting a breeding population (Salton Sea Authority and Reclamation 2000).

Yuma Clapper Rail *(Rallus longirostris yumanensis)*

Range and Distribution

The Yuma clapper rail is one of seven North American subspecies of clapper rails. It occurs primarily in the LCR Valley in California, Arizona, and Mexico and is a fairly common summer resident from Topock south to Yuma in the U.S., and at the Colorado River Delta in Mexico. There are also populations of this subspecies at the Salton Sea in California, and along the Gila and Salt Rivers to Picacho Reservoir and Blue Point in central Arizona (Rosenberg et al. 1991). In recent years, individual clapper rails have been heard at Laughlin Bay and Las Vegas Wash in southern Nevada (NDOW 1998). Population centers for this subspecies include Imperial Wildlife Management Area (Wister Unit), Salton Sea National Wildlife Refuge, Imperial Division, Imperial National Wildlife Refuge, Cibola National Wildlife Refuge, Mittry Lake, West Pond, Bill Williams Delta, Topock Gorge, and Topock Marsh.

Population Status and Threats

In 1985, Anderson and Ohmart (1985) estimated a population size of 750 birds along the Colorado River north of the international boundary. The USFWS (1983) estimated a total of 1,700 to 2,000 individuals throughout the range of the subspecies. Between 1990 and 1999, call counts conducted throughout the species range in the U.S. have recorded 600 to 1,000 individuals. These counts are only estimates of the minimum number of birds present. The population is probably higher than these counts show, since up to 40 percent of the birds may not respond in call surveys (Piest and Campoy 1998). Based on the call count surveys, the population of Yuma clapper rail in the U.S. appears stable (USFWS, unpublished data). The range of the Yuma clapper rail has been expanding over the past 25 years, and the population may increase (Ohmart and Smith 1973; Monson and Phillips 1981; Rosenberg et al. 1991; and McKernan and Brandon 1999).

A substantial population of Yuma clapper rail exists in the Colorado River Delta in Mexico. Eddleman (1989) estimated that 450 to 970 rails inhabited this area in 1987. Piest and Campoy (1998) reported a total of 240 birds responding to taped calls in the Cienega. Accounting for nonresponding birds, they estimated a total population of about 5,000 birds in cattail habitat in the Cienega.

The Yuma clapper rail is threatened by river management activities that are detrimental to marsh formation, such as dredging, channelization, bank stabilization, and other flood control measures. Another threat is environmental contamination due to selenium. High selenium levels have been documented in crayfish, a primary prey of clapper rails, and some adult birds and eggs. Other threats to the Yuma clapper rail include mosquito abatement activities, agricultural activities, development, and the displacement of native habitats by exotic vegetation (CDFG 1991). The large population of Yuma clapper rails at the Cienega de Santa Clara is threatened by the loss of the source of water that maintains the wetland habitat. This threat is significant, given that the recent population estimate of approximately 5,000 individuals suggests the majority of Yuma clapper rails found in North America inhabit this area.

Habitat Requirements

The Yuma clapper rail is associated primarily with freshwater marshes with the highest densities of this subspecies occurring in mature stands of dense to moderately dense cattails and bulrushes. Dense common reed and sparse cattail-bulrush marshes may support the rail at lower densities (Rosenberg et al. 1991). A mosaic of uneven-aged marsh vegetation and open water areas of variable depths appear to provide optimal habitat for Yuma clapper rails (Conway et al. 1993). Similarly, Anderson (1983) found the highest densities of clapper rails in stands of cattails dissected by narrow channels of flowing water.

Anderson and Ohmart (1985) found home ranges of single or paired birds in the LCR Valley encompassed up to 100 acres, with an average home range of 18.5 acres. Home ranges were found to overlap extensively. Estimates of rail densities vary widely, ranging from 0.06-rail/acre to 1.26 rails/acre (Table A-2).

TABLE A-2
Reported Densities of Yuma Clapper Rails

Location	Density rails/acre[a]	Source
Lower Colorado River	0.1	Anderson and Ohmart (1985)
Cienega de Santa Clara	0.36	Piest and Campoy (1998)
Cienega de Santa Clara	0.60[b]	Piest and Campoy (1998)
Topock Marsh	0.06	Smith (1975, reported in Piest and Campoy [1998])
Mittry Lake Wildlife Area	0.39	Todd (1980, reported in Piest and Campoy [1998])
Hall Island	1.26	Todd (1980, reported in Piest and Campoy [1998])

[a] acres of cattail habitat
[b] estimated density, taking into account nonresponding birds

Food primarily consists of crayfish, but Yuma clapper rails will also feed on small fish, isopods, insects, spiders, freshwater shrimp, clams, and seeds when available (Ohmart and Tomlinson 1977; CDFG 1991; and Rosenberg et al. 1991). Crayfish have been found to constitute up to 95 percent of the diet of Yuma clapper rails in some locations (Ohmart and Tomlinson 1977). The availability of crayfish has been suggested as a factor limiting clapper rail populations (Rosenberg et al. 1991).

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Yuma clapper rails begin courtship and pairing behavior as early as February, with nesting and incubation beginning as early as mid-March. Most nesting starts between late April and late May (Eddleman 1989; Conway et al. 1993). Young hatch in the first week of June and suffer high mortality from predators in their first month of life (Rosenberg et al. 1991). The majority of rail chicks fledge by August.

Nests are constructed on dry hummock or under dead emergent vegetation and at the bases of cattail/bulrush vegetation. Nests may be located throughout a marsh over shallow or deep water, near the marsh edge, or in the interior of the marsh (Eddleman 1989). Usually, nests have no overhead canopy because the dense marsh vegetation surrounding the nest provides protective cover. Occasionally, nests are located in small shrubs over shallow water areas.

Habitat in the Proposed Project Area

In the proposed project area, habitat for Yuma clapper rails consists mainly of managed wetlands on the state and federal wildlife refuges. Yuma clapper rails will use agricultural drains dominated by common reed for foraging, but these areas do not provide suitable nesting habitat. Clapper rails are strongly associated with cattail stands for nesting, and few areas of cattails exist along the agricultural drains and the New and Alamo Rivers. Areas of cattails that do exist along these waterways are small and narrow and often interspersed with vegetation, such as common reed and offer suboptimal habitat conditions. Seepage from the AAC supports a wetland community between Drops 3 and 4, where clapper rails have been reported.

Proposed Project Area Occurrence

In the proposed project area, the principal concentrations of Yuma clapper rails are at the south end of the Salton Sea near the New and Alamo River mouths, at the Salton Sea Wildlife Refuge, at the Wister Waterfowl Management Area, and at Finney Lake in the Imperial Wildlife Area. Since 1990, an average of 365 (±10 percent) rails have been counted around the Salton Sea, which represents an estimated 40 percent of the entire U.S. population of this species (Point Reyes Bird Observatory 1999; USFWS 1999). Results of surveys conducted at the Salton Sea since 1994 are summarized in Table A-3.

Rails are also known to occur in the seepage community along the AAC between Drops 3 and 4 and in other seepage areas associated with the Coachella and East Highline Canals (Gould 1975; Jurek 1975; Bennett and Ohmart 1978; Kasprzyk et al. 1987). Surveys conducted between Drops 3 and 4 on April 30 and May 1 1981, detected 17 clapper rails (Reclamation and IID 1994). Ten birds were detected during a May 20 1982, survey. Additional surveys along the AAC were conducted in spring 1984. The area surveyed was the same as was surveyed in 1981. These surveys indicated a population of at least three clapper rails. The area was surveyed again in 1988, again indicating a population of three clapper rails in the marsh habitat between Drops 3 and 4 (Reclamation and IID 1994).

Yuma clapper rails have also been found using agricultural drains and the Alamo River. Surveys conducted by the USFWS (Steve Johnson, pers. comm.) found Yuma clapper rails in the Trifolium 1 drain and the Alamo River. Hurlbert et al. (1997) surveyed 10 drains in the Imperial Valley and found 1 clapper rail along the Holtville Main Drain in the southeastern part of the valley. Previous surveys by the USFWS of the Holtville Main Drain reported as many as 12 Yuma clapper rails (5 pairs and 2 individuals) using this drain.

TABLE A-3
Number of Yuma Clapper Rails Found at Traditional Survey Locations at the Salton Sea and Surrounding Areas from 1994 to 2000

Location	1994	1995	1996	1997	1998	1999	2000
Salton Sea NWR Unit 1							
Trifollium 1 Drain	4	3	1	1	1	0	1
A-1 Pond	2	N/S	6	4	3	6	6
B-1 Pond	N/S	N/S	4	9	11	10	10
Reidman 3	7	8	17	N/S	N/S	2	1
Reidman 4	9	8	N/S	N/S	1	3	7
Bruchard Bay	7	6	3	5	3	0	0
New River Delta	7	0	1	0	0	0	N/S
Salton Sea NWR Unit 2 and Hazard							
HQ 'B' Pond	5	3	4	2	2	2	3
Union Pond	9	9	12	15	15	9	6
Barnacle Bar Marsh	N/S	0	0	2	0	2	1
McKindry Pond	N/S	N/S	N/S	0	0	2	N/S
Hazard 5	3	N/S	N/S	N/S	N/S	N/S	N/S
Hazard 6	23	22	18	11	11	12	10
Hazard 7	6	3	10	7	5	6	10
Hazard 8 (east) (south)	2	N/S	N/S	N/S	N/S	2	1
Hazard 9 and Ditch	3	4	3	3	3	2	4
Hazard 10	7	7	N/S	N/S	2	6	6
Alamo River (east and delta)	5	4	4	4	4	3	4
Imperial Wildlife Area Wister Unit	309	307	239	211	185	191	N/A
Off-Refuge Areas							
Lack and Grumble	2	3	3	2	2	2	0
'T' Drain Marsh	N/S	N/S	10	15	10	6	6
Walt's Club (McDonald Rd.)	N/S	N/S	N/S	N/S	N/S	2	N/S
Barnacle Beach	N/S	20	20	7	8	3	N/S
Holtville Main Drain	N/S	12	10	5	6	5	1
Boyle and Martin Road	1	N/S	N/S	N/S	N/S	N/S	N/S

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