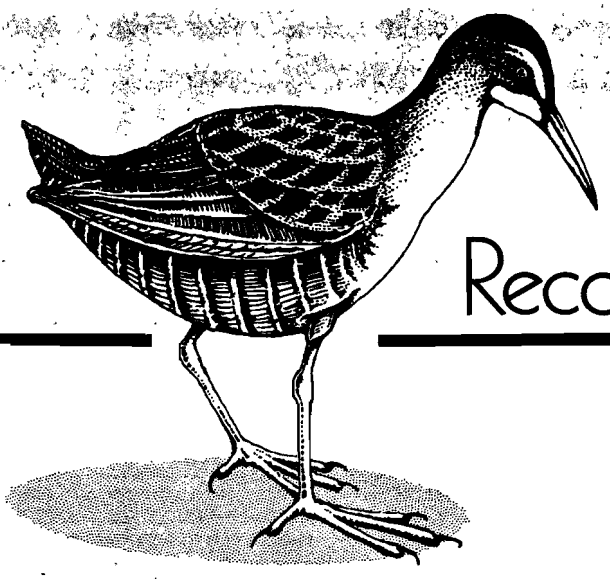

Recovery Plan

Light-Footed Clapper Rail

LIGHT-FOOTED CLAPPER RAIL

RECOVERY PLAN

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THIS IS THE COMPLETED REVISED LIGHT-FOOTED CLAPPER RAIL RECOVERY PLAN. IT HAS BEEN APPROVED BY THE U.S. FISH AND WILDLIFE SERVICE. IT DOES NOT NECESSARILY REPRESENT OFFICIAL POSITIONS OR APPROVALS OF COOPERATING AGENCIES AND IT DOES NOT NECESSARILY REPRESENT THE VIEW OF ALL INDIVIDUALS WHO PLAYED THE KEY ROLE IN PREPARING THIS PLAN. IT HAS BEEN REVISED BY KATHLEEN E. FRANZREB AND DELINEATES REASONABLE ACTIONS WHICH ARE BELIEVED TO BE REQUIRED TO PLACE THE ASSIGNED SPECIES IN THE BEST POSSIBLE POSITION. THIS PLAN IS SUBJECT TO MODIFICATION AS DICTATED BY NEW FINDINGS AND CHANGES IN SPECIES STATUS AND COMPLETION OF TASKS DESCRIBED IN THE PLAN. GOALS AND OBJECTIVES WILL BE ATTAINED AND FUNDS EXPENDED CONTINGENT UPON APPROPRIATIONS, PRIORITIES, AND OTHER BUDGETARY CONSTRAINTS.

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LIGHT-FOOTED CLAPPER RAIL RECOVERY PLAN

EXECUTIVE SUMMARY

1. At what point or condition can the subspecies be considered "recovered"? When the breeding population in California has increased to 800 pairs within 4,000 ha of adequately protected, suitably managed secure wetland habitat consisting of at least 50% appropriate marsh vegetation in at least 20 marsh complexes the subspecies can be considered for reclassification to threatened status. Although at the present time it appears that delisting is not feasible in the near future, once the subspecies qualifies for consideration of reclassification to threatened status, additional actions designed to delist it will be formulated.

2. What must be done to reach recovery? Full recovery may not be possible. For greater security, protect existing marshes, restore or create new habitat, conduct research on life history requirements, protect and secure existing populations, increase rail population numbers.

3. What specifically must be done to meet the needs of #2? Undertake various actions such as restore tidal action, construct nest hummocks, develop high marsh, develop low marsh, minimize human disturbance, minimize effects of predation, insure adequate prey base, and determine factors limiting rail population size. Marsh restoration and protection from adverse modification are

important aspects of recovery. Specific actions for individual marsh maintenance/restoration have been outlined. Potential for rails in areas currently not inhabited by them should be assessed, and, if the potential is good, undertake actions necessary for recolonization by rails.

4. What management/maintenance needs have been identified to keep species recovered? Marshes must be properly managed and not adversely modified by direct habitat loss or indirect effects such as pollution and/or water quality problems, etc. Public support for maintaining the subspecies must be encouraged.

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PART I

INTRODUCTION

Brief Overview

The light-footed clapper rail (*Rallus longirostris levipes*) is distributed in coastal salt marshes from Santa Barbara County, California, to San Quintín Bay, Baja California, Mexico. Within its historical range the amount of suitable habitat has been severely reduced by conversion of marshes for other uses. This subspecies is one of three clapper rail subspecies in California formally recognized as endangered by the Federal government and endangered or rare by the State of California. It was added to the Federal list on 13 October 1970 (35 *Federal Register* 16047-16048).

This recovery plan discusses and outlines the actions and circumstances that, if implemented, will make possible consideration of reclassification of this subspecies to threatened status. Although it is highly unlikely that delisting is a reasonable goal in the forseeable future, as implementation of the plan progresses and additional information becomes available on the subspecies and its habitat requirements, it may be possible to develop additional actions that, when implemented, will result in considering the light-footed clapper rail for delisting.

Taxonomy

The taxonomic status of clapper rails is a matter of some debate. Distributional boundaries are still being defined, and the validity of certain subspecies is in question. When first described, the light-footed clapper rail was considered a king rail (Rallus elegans) (Henshaw 1876). Later, it was listed as a California clapper rail, which at that time was designated a full species, Rallus obsoletus (Belding 1883). The light-footed rail became recognized as a unique entity when Bangs (1899) named it Rallus levipes. It remained classified as a full species until Van Rossem (1929) showed that all Pacific Coast clapper rails were at most, geographical races of one species. The light-footed rail became Rallus obsoletus levipes. Later, Oberholser (1937) lumped all North American clapper rails into one species, and the name of this subspecies became Rallus longirostris levipes. No significant changes in the taxonomy or distributional limits of levipes have occurred since Oberholser, except for delineation of the subspecies' southern limits (Wilbur 1976).

Description

The light-footed clapper rail has a tawny breast, gray-brown back, and vertical dusky and white bars on flanks. There is a white patch under its short upcocked tail. Although similar to the California clapper rail (R. l. obsoletus) it is slightly smaller, the bill is more slender, the back is less gray (darker, browner, or more olive), the

breast is a richer cinnamon color, and the stripe over the eye is more whitish (less rusty) (Bangs 1899, Bent 1926, van Rossem 1929, Ridgway and Friedmann 1941).

Measurements for adult males include: wing, 155-167 mm (avg. 161.9); tail, 63-69 mm (avg. 66.7); exposed culmen, 56-61 mm (avg. 58.9); tarsus, 53-61 mm (avg. 56.9); middle toe without claw, 50-54 mm (51.2). Adult female measurements are: wing; 138-156 mm (avg. 147.3); tail, 57-67 mm (avg. 62.6); exposed culmen, 52-58 mm (avg. 54.2); tarsus, 47-51 mm (avg. 49.5); middle toe without claw, 41-48 mm (44.9) (Oberholser 1937).

Reproductive Biology

Nest Description and Placement -- Light-footed clapper rails build several types of nests; these include incubation nests and those used for brooding the young. Often an incubation nest is used later as a brood nest*.

The nest location was most often described as being located on the ground under clumps of pickleweed (Salicornia spp.) (Edwards 1922, Bent

* Unless otherwise noted, the following information is from Zembal and Massey (ms); Richard Zembal, Ecological Services, U.S. Fish and Wildlife Service; Barbara Massey, Long Beach, California.

1926, and 28 out of 44 museum nest records). However, Jorgensen (1975) found that 22 of 34 nests at Tijuana Marsh were built in cordgrass (Spartina foliosa).

Nests in Salicornia are most often placed directly on the ground, while those in Spartina are elevated 10 to 45 cm (4-18 inches) above ground level. Zembal and Massey (ms) found that all the nests located in upper marsh vegetation were placed near the ground, in contrast to nests in Spartina which were often suspended above the ground. All nests in Russian thistle (Salsola australis) or freshwater reeds (Scirpus spp.) were well above the ground to a maximum of 60 cm in height.

Typical incubation nests of light-footed clapper rails in Upper Newport Bay and Anaheim Bay were constructed near or on the ground and composed almost totally of dried cordgrass stems. The outside edges of the nesting platforms were woven into the surrounding live cordgrass which secured the nest as it floated during high tide. Each nest had one and occasionally two ramps to the ground.

Nests constructed in Salicornia and Scirpus lacked a woven canopy as the living stems of these plants provided adequate cover. However, other nests were covered overhead by a loosely woven canopy of live stems and leaves, providing effective camouflage.

Atypical incubation nests can be found in situations where the habitat is less than ideal. For example, in Anaheim Bay, the height and cover

of cordgrass is much less than in good clapper rail habitat such as found in Upper Newport Bay, and is apparently insufficient at many nesting sites. Also, this coupled with subsidence problems (to be addressed later), presumably resulted in the rails using Russian thistle or wrack (vegetative and other debris) for nest sites.

Clapper rails are somewhat flexible in nest placement. During the 1980 nesting season, rails shifted nesting sites to higher marsh because of recent storm damage to the preferred lower marsh areas in Upper Newport Bay. This necessitated using a variety of vegetation as nest sites. Nests constructed in Russian thistle or wrack were built of cordgrass. Vegetation used in upper marsh nest building included Salicornia, alkali heath (Frankenia spp.), sea lavender (Limonium californicum), salt grass (Distichlis spicata), shore grass (Montanthochloe littoralis), and mixtures of these and less common species. These species generally provided sufficiently dense canopy cover. Nests are usually well concealed. Most nest platforms were built from Spartina.

Clutch Size -- Clutch size ranged from 4-8 eggs (mean 5.5) in 1979 and from 5-8 (mean 6.5) in 1980 for nests in Upper Newport Bay and Anaheim Bay. Mean clutch size was 5.3 for Tijuana Marsh in 1974 (Jorgensen 1975). Data from 143 egg sets from the Western Foundation of Vertebrate Zoology and collected considerably earlier in this century, indicated a wider range in clutch size (3-11) and higher mean value (7 eggs).

Length of Nesting Period and Renesting -- Nesting takes place from mid to late March into mid-August. Most egg laying takes place from early April to early May, although extreme dates for complete clutches are March 18 and July 21. However, later nesting has been observed as evidenced by the presence of downy chicks in early October at Upper Newport Bay in 1977.

Available information indicates that the hatching period may in some years be closely synchronized between marshes or marsh segments but this is not always the case. Clapper rails have been known to renest after failure of the first nest (Bent 1926, Johnson 1973). Following the definition** used by Zembal and Massey (ms), light-footed clapper rails are said to renest when a single pair reuses a previously active nest in the same season or when an active nest is located very near a known nesting site that showed no evidence of current use. A second peak of hatching may represent renesting attempts as found in 1979 in Upper Newport Bay and Anaheim Bay. However, the later wave of nesting in 1980 in these two bays was not primarily the result of renesting, but of late nesting.

Incubation Period -- The incubation period is considered to begin with the laying of the last egg and end with the hatching of the first chick. In Tijuana Marsh, incubation ranged from 18-27 days with an average of 23 days (Jorgensen 1975). Incubation lasted from 21-25 days in Upper Newport Bay and Anaheim Bay.

** Defined to include a second nest in the same season by either unsuccessful or successful pairs.

Nest Attendance -- In examining the incubation behavior of three pairs in Anaheim Bay, it was found that both parents attended the nest which was constantly incubated during daylight hours. Nest exchange occurred at intervals of 1 hr 17 min - 4 hr 36 min, with a mean of 2 hr 50 min.

Maintenance of the nest and canopy was performed by both adults while incubating. This included modification of the canopies and augmentation of materials to the nests.

Brood Nests -- Subsequent to the hatching of the young, clapper rail adults construct brood nests. In contrast to incubation nests, these lack ramps and canopies. They are most often situated in low marsh and are constructed of dried cordgrass. Brood nests are located from 0.5-100 m (avg. 23 m) from their respective incubation nests. Most pairs use two brood nests but as many as four have been reported.

Incubation nests are frequently used to brood young. Canopies often disappear just prior to hatching, but if not, usually are gone within a few days. Although it is not known how soon after hatching the adults construct brood nests, it is clear that this activity does not occur until chicks are present.

Hatching Success -- Data on nest success are limited, but Jorgensen (1975) found that 86 percent of 28 active nests at Tijuana Marsh successfully hatched at least one egg. Losses resulted from eggs being washed away by high tides, and some eggs failed to hatch for

unknown reasons. Chicks were found dead (apparently drowned) in several nests. Nests also have been destroyed by rats.

Nest success (defined as the successful hatching of at least one egg in a clutch) in the study of Upper Newport Bay and Anaheim Bay varied from 60-74% with 14-45% of the eggs known to have been unhatched.

Care and Survival of Chicks -- Both parents care for the young; while one forages, the other adult broods the chicks. By the age of two days, chicks will accompany adults on foraging trips. Adults have been observed feeding fully grown chicks of at least 6 weeks of age within 25 m of their incubation nest.

Food Habits and Foraging Strategies

In studying Upper Newport Bay and Anaheim Bay, Zembal and Massey (ms) noted that foraging occurred throughout the salt marsh community and occasionally in surrounding habitats. Considerable foraging was observed in vegetation of the higher marsh in which Salicornia virginica, Limonium californicum, and arrow-grass (Triglochin maritima) were prevalent. Foraging birds were also observed along vegetation-mud flat interfaces, along mud banks of tidal creeks, in freshwater vegetation and ditched/ponded water, and to a lesser extent on open mudflats, and upland hillsides.

Foraging methods included surface gleaning, probing, diving, and scavenging. Rails were reluctant to spend extended periods of time far from sufficiently dense plant cover.

Rails are omnivorous and opportunistic foragers. The diet probably includes insects, spiders and isopods. They are known to take tree frog tadpoles (Hyla sp.), California killifish (Fundulus parvipinnis), crayfish (Pacifastacus sp.), beetles (Coleoptera), garden snails (Helix sp.), and dead mullet (Mugil cephalus) (Zembal and Massey, unpub. ms). California meadow mice (Microtus californicus) also are believed to be prey. Birds ingest some vegetable matter, including broken Spartina stems and Salicornia tips.

In an analysis of regurgitated pellets, the most common remains were of California hornsnails (Cerithidea californica) and salt marsh snails (Melampus olivaceus). Fiddler and hermit crabs (including Pachygrapsus crassipes, Hemigrapsus oregonensis, and probably Uca crenulata), crayfish, beetles, isopods, and decapods were also encountered (Jorgensen 1975, Zembal and Massey ms). Other races of clapper rails consume various bivalve molluscs (e.g., clams of the genus Macoma), and it is assumed that the light-footed clapper rail does also.

Predation

Potential predators on eggs, nestlings, or adults include California ground squirrel (Spermophilus beecheyi), Old World rats (Rattus spp.),

striped skunk (Mephitis mephitis), feral house cats (Felis cattus), dogs (Canis familiaris), gray fox (Urocyon cinereoargenteus), Virginia opossum (Didelphis marsupialis), and a variety of raptorial birds.

Ribbed mussel (Geukensia demissa) may also affect clapper rails though not directly from predation. DeGroot (1927) indicated that the introduced mussel may pose a threat to rails in San Francisco Bay. One limping individual was recently observed in Upper Newport Bay with a mussel clamped to one toe; it was captured and the mussel removed (Zembal and Massey, ms). The extent of this threat is unknown.

Distribution, Numbers, and Current Population Status

As originally described the range of the light-footed clapper rail extended from Santa Barbara County, California, to San Quintín Bay, Baja California, Mexico (Cooke 1914, Grinnell et al. 1918, Bent 1926). Because of disagreement over the identity of clapper rails in Baja California, Mexico, some authorities (Friedmann et al. 1950, American Ornithologists' Union 1957) shortened the southern portion of the range to Ensenada, Baja California, although suggesting that the light-footed clapper rail might occasionally reach San Quintín Bay as a winter straggler. This range limitation was based on examination of only a few Baja California rail specimens. Analysis of a larger sample of rails from various localities (Wilbur 1976) showed no significant difference in size or coloration between the rails at San Quintín Bay and those from coastal southern California. Those from Scammon's Lagoon and vicinity, the next habitat to the south of San

Quintín, are decidedly darker in color. Therefore, it appears that the San Quintin rails are assignable to the subspecies levipes; however, the taxonomic status of rails in much of Baja California is not clear (Wilbur and Tomlinson 1976).

Within the light-footed clapper rail's total range the population has been discontinuous because salt marsh habitat occurs in scattered parcels. However, it is believed that most salt marshes along the coastline at one time supported clapper rails (Grinnell et al. 1918).

At present, light-footed clapper rails probably occur in 24 California marshes (Figure 1), and at least two in Baja California. These birds are usually year-long residents in their home marshes. In fact the light-footed clapper rail is primarily sedentary. Unless marshes are fairly close together there is little opportunity for genetic exchange or recruitment. On occasion, however, individual marshes appear to have been repopulated so there may be some limited interchange between certain areas. Figure 1 depicts those areas known to be inhabited by light-footed clapper rails in California.

Henshaw (1876) considered the light-footed clapper rail to be common near Santa Barbara, and the number of skins and eggs in museum collections indicate they must have been common in the marshes of Orange County and southern San Diego County as well. Collectors also found clapper rails in various marshes in Los Angeles County, and a few in the lagoons of northern San Diego County.

Figure 1. Current and potential distribution of light-footed clapper rails in California.

LEGEND

Santa Barbara County
1) Goleta Slough*
2) Carpinteria Marsh*

Ventura County
3) Ventura River Mouth
4) Santa Clara River Mouth
5) Mugu Lagoon*

Los Angeles County
6) Malibu Lagoon
7) Ballona Wetlands
8) Cabrillo Wetlands
9) Cerritos Wetlands

Orange County
10) Anaheim Bay*
11) Bolsa Chica*
12) Santa Ana River Mouth (including Coast Hwy. frontage)
13) San Joaquin Marsh*
14) Upper Newport Bay*

San Diego County
15) San Mateo Creek Mouth
16) Las Pulgas Creek Mouth
17) Los Flores Marsh
18) Cockleburr Canyon Marsh*
19) Santa Margarita River Esturary*
20) Guajome Lake Marsh*
21) Buena Vista Lagoon*
22) Agua Hedionda Lagoon*
23) Batiquitos Lagoon
24) San Elijo Lagoon*
25) San Dieguito Lagoon
26) Los Penasquitos Lagoon
27) Kendall-Frost Reserve*
28) San Diego Flood Control Channel*
29) Paradise Marsh*
30) Sweetwater Marsh*
31) E Street Marsh*
32) F Street Marsh*
33) J Street Marsh*
34) South Bay Marine Reserve*
35) Otay River Mouth*
36) Dairy Mart Ponds
37) Tijuana Marsh*

* Indicates current use (includes winter sightings, additional spring data since late 1970's, and breeding locations) by light-footed clapper rail.

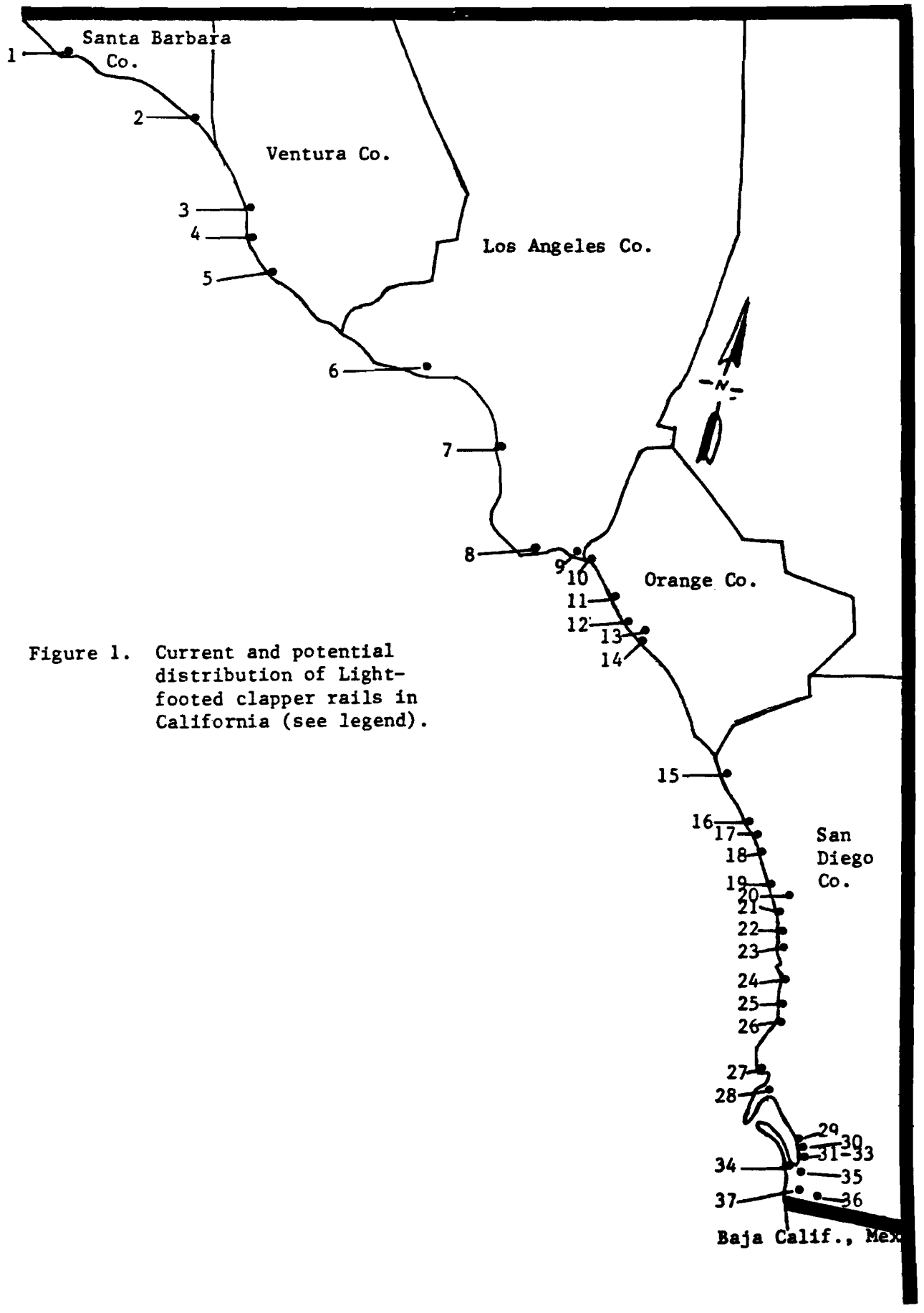

Figure 1. Current and potential distribution of Light-footed clapper rails in California (see legend).

Wilbur (1974) gave a preliminary estimate of 500-750 light-footed clapper rails in California. This figure was based on his own field work in selected marshes in 1972-1973, plus reports and estimates from various cooperators. Later work in Santa Barbara and Ventura Counties, Anaheim Bay, and at Tijuana Marsh have made it apparent that first estimates were too high, and Wilbur et al. (1979) felt that it was probable that no more than 300 light-footed clapper rails occurred in California by the late 1970's. The estimate of numbers in California as of 1984 is approximately 550 birds.

Light-footed clapper rail estimated numbers and distribution within the respective salt marshes are given in Table 1. In comparing the number of active nests to vocalization data over a three-year period, Zembal and Massey (unpub. data) estimate that only approximately 2 percent of the territorial males were unpaired (Zembal, pers. comm.). Hence, using number of territories to provide population estimates is reasonable. It should be emphasized that the increase in numbers is primarily the result of more intensive, thorough surveys in latter years rather than to a natural increase in rail numbers.

Habitat Description and Preferences

A recent study comparing light-footed clapper rail populations and various habitat parameters in Upper Newport Bay and Anaheim Bay provides insight into habitat use and preferences of rails (Zembal and Massey, ms). In Upper Newport Bay, the nesting population is more

Table 1. Light-footed clapper rail breeding birds estimated numbers by county, marsh, and year.

	NUMBER OF BREEDING INDIVIDUALS							
	1976[a,b]	1977-1978[b]	1979[c]	1980[d]	1981[d]	1982	1983	1984
Santa Barbara County								
Goleta Slough	v.s.	v.s						
Carpinteria	10	10		32	28	40	36	52
Ventura County								
Mugu Lagoon	v.s.				0		2	6
Orange County								
Anaheim Bay	45-55	40-60	46	60	38	56	40	48
Bolsa Chica	v.s.?			0	0	0		
Upper Newport Bay	40-50	60-75	190	196	132	206	224	224
San Joaquin Marsh						10	8	2
San Joaquin - Carlson Rd. Marsh						10	8	4
San Diego County								
Cocklebur Canyon						2		0
Santa Margarita Lagoon						4	4	4
Guajome Lake Marsh						2		4
Buena Vista Lagoon						2	**	0
Aqua Hedionda				2	4	2	14	12
Kendall-Frost Reserve				36	32	12	40	48
Paradise Creek				2	4	6	2	2
Sweetwater Marsh				8	10	14	12	28
E Street Marsh	40-50	5		6	2	6	6	4
F Street Marsh					2	2		2
J Street Marsh					2	0	6	
Otay River Mouth				6	8	10		10
South Bay Marine Reserve*				6	6	2	2	4
Tijuana Marsh (Oneonta Lagoon)	75-85	99		52	62	50	82	76
San Elijo Lagoon					10	8	8	20
San Diego River Mouth (flood control channel)	5				6	2	4	4
Mission Bay	8	12						
Los Penasquitos Lagoon	5						0	
	250	-	-	406	346 in U.S.	444	498	554

Mexico	1981[f]
El Estero, Ensenada	544
Bahía de San Quintín	1070
	1614 in Mexico

a - First edition Light-footed Clapper Rail Recovery Plan

b - Wilbur et al. (1979) (estimates based on work in 1977-79)

c - Massey and Zembal (1979). Prelim. rept. USFWS

d - Zembal and Massey, (1981a). Unpub. Rept. CDFG; Zembal and Massey, ms.; Zembal and Massey (1981b); Massey and Zembal (1982)

* Also includes Naval Station Marsh (Imperial Beach).

** At least one pair of rails was present in winter but presence during the breeding season was not confirmed.

v.s. = very small population

than three times as large as that of Anaheim Bay, yet the marsh is less than half the size. This difference in numbers of pairs appears correlated to the lack of Spartina stands providing sufficient cover in Anaheim Bay and also to the low elevations of many of the Spartina stands (Zembal and Massey, ms). Low elevation Spartina stands may result from the lack of a major freshwater source (Mahall and Park 1976, Zedler et al. 1979), and perhaps is the gradual result of lowering elevations from subsidence (the result of oil extraction) (Zembal and Massey, ms). In general the presence of small freshwater streams, ponds, and rushes is beneficial for nesting, foraging, and cover.

Severe storms and excessive runoff can adversely affect the marsh community. Patches of Spartina may be torn away or matted down to the extent that rails cannot use them for nesting. The severe winter storms of 1980 were particularly deleterious to Upper Newport Bay. Major freshwater intrusion, extensive sedimentation, and increased mobility of pollutants is believed to be affecting invertebrate populations and destroying some clapper rail food resources in Upper Newport Bay (Zembal and Massey, ms; Wahl et al., 1980; Seapy, 1981).

During 1979, nest loss was primarily because of high tides, whereas in 1980 (when many nests were in the upper marsh area) most nest losses were attributed to predation. Because birds are known to nest successfully on isolated hummocks and small berms that are covered with upper-marsh vegetation, these isolated sites should be provided at marshes being rehabilitated or created (Zembal and Massey, ms).

These sites would be particularly important in years of severe winter storms and habitat disruption.

Another recent study addressed the basic ecological requirements and distribution of Spartina foliosa in Tijuana Marsh (Zedler 1979). Spartina is expanding in distribution in Tijuana Marsh. It is not known yet whether these areas will become suitable clapper rail habitat. In at least one area, it appears that five years is sufficient time for Spartina-dominated community to be converted to one in which the less desirable Salicornia is dominant. Changes in tidal flow, the result of sand blockage of the main north-south channel reducing circulation, may be causing a decline in the robustness of Spartina.

The landward limit of Spartina foliosa is affected by higher soil salinity. It is not known what controls the seaward limit of Spartina. The possibility exists that soil aeration and inundation determine the maximum depth for the growth and reproduction of this species (Zedler[1] ms.). There appears to be little relationship between environmental variables such as percent soil moisture, soil bulk density, percent organic matter, organic matter concentration, soil oxygen (ppm), water temperature, soil salinity, and Spartina vigor, even when growing alone (Zedler pers. comm.). The height, density, and flowering of this species is probably strongly influenced by interspecific competition. According to Zedler (pers. comm.), elevation is a good indicator of optimum

[1] Dr. Joy Zedler, Department of Biology, California State University, San Diego.

Spartina habitat on an entire marsh basis; however, microtopography and the elevational location relative to tidal channels are more important on a local level.

Reasons for Decline

By 1915, ornithologists were beginning to speak of scarcity of light-footed clapper rails in southern California. Willett (1912) believed that the rails were "becoming scarcer every year," and Grinnell (1915) noted that "in many marshes where it formerly occurred commonly it is now unknown." Grinnell et al. (1918) and Stephens (1919) felt it was then almost completely gone from Santa Barbara and San Diego counties.

Early losses around Santa Barbara and San Diego were attributed to overshooting. A. B. Howell (in Bent 1926) noted the ease with which rails could be taken by museum collectors or meat hunters at high tide, and it is possible that overharvesting occurred in some areas. However, major losses occurred because of destruction of habitat. Edwards (1922) describes one area which one year had "close to a dozen nests, " and the next year was buried under several feet of dredged mud and sand. Howsley (unpublished field notes) in 1934 found an oil derrick on a site that had been occupied by clapper rails in 1932. Dredging and filling for various reasons continued at an accelerated rate until only about 3441 ha (8,500 ac) of salt marsh remained in the early 1970's between Santa Barbara and the Mexican border, an area that at one time had an estimated 10,256 ha (26,000 ac) of salt marsh

(Speth 1971). Particularly hard hit were several areas known to have supported large populations of light-footed clapper rails: San Diego Bay, reduced from 996 ha (2,450 ac) to 146 ha (360 ac); Mission Bay, from 972 ha (2,400 ac) to 8.5 ha (21 ac); and the Los Angeles-Long Beach area, from 2,753 ha (6,800 ac) to 28.3 ha (70 ac). Because this species is dependent on the coastal salt marsh environment, entire local populations have been extirpated.

Although important strides have been made to preserve coastal wetlands in recent years, clapper rail habitat is still being lost and in some areas is in immediate jeopardy. Destruction of additional habitat will further endanger these birds.

Recent information (November 1984) indicates that a large industrial development for the fabrication of offshore oil and gas exploration and development equipment is currently under construction at El Estero Bay, Ensenada, Baja California. Dredging, filling, diking and other construction activities could eliminate most or all of the rail population (about 300 breeding pairs) at this location--about 30 percent of world's known population.

Thus, the rail population at San Quintín (about 500 breeding pairs) would represent the last stronghold for the species in Mexico. However, given the lack of protection against future development at San Quintín, the rail indeed faces an uncertain future in Mexico as well as throughout its entire range.

Recent Conservation Measures

Since the plan was originally published in 1979, the Fish and Wildlife Service has funded a number of studies designed to enhance our knowledge of light-footed clapper rail requirements in anticipation of undertaking additional management actions. One study involved a detailed analysis of breeding populations in Upper Newport Bay and Anaheim Bay to delineate reasons for the low population numbers in the latter bay. California Department of Fish and Game funded a telemetry study of the rails to estimate territory size, assess foraging habits, and estimate numbers. Additional work has been done on evaluating methods to improve habitat conditions (Zedler 1979, Zedler et al. 1979). The U.S. light-footed clapper rail population is monitored on a yearly basis through the cooperative efforts of a number of individuals and agencies. Habitat restoration and enhancement has occurred in several marshes. For example, hummocks have been provided in Anaheim Bay for nesting purposes. The U.S. Fish and Wildlife Service has funded a study to develop a conceptual habitat model that will predict habitat quality for light-footed clapper rail and salt marsh bird's-beak (Cordylanthus maritimus ssp. maritimus) when certain habitat parameters are manipulated. The Service anticipates testing the reliability and validity of the model in the near future and will make refinements in the model accordingly.

PART II

RECOVERY

Objectives

The prime objective of the Light-footed Clapper Rail Recovery Plan is to increase the breeding population of LFCR in California to at least 800 pairs by preserving, restoring, and/or creating approximately 4,000 ha (10,000 ac) of adequately protected, suitably managed wetland habitat consisting of at least 50 percent of marsh vegetation suitable for LFCR in at least 20 marsh complexes. If these levels are obtained, reclassifying the subspecies to threatened status should be considered. Once the subspecies qualifies for threatened status, it may be possible (although at the present this appears unlikely) to devise additional actions that when implemented may warrant considering the light-footed clapper rail for delisting.

The light-footed clapper rail is endangered because its range is limited to a relatively small acreage, and this acreage continues to be destroyed or adversely modified. Arresting the decline of the species requires stopping all loss and degradation of existing habitat. Even then, the population will remain threatened because each population segment is so small it could be easily extirpated by pollution, disease, predation, or other local catastrophe. Therefore, the rationale in restoring the subspecies to a more secure status involves: (1) protecting all existing habitat; (2) increasing the carrying capacity and stability of existing habitat, thereby

increasing the size of each population unit; (3) creating and stocking new habitat; and (4) adequately protecting and managing the Mexican population.

Clapper rails require a healthy marsh environment with cordgrass or pickleweed for nesting and escape cover; abundant food in the form of crabs, clams and other saltmarsh invertebrates; tidal flats interspersed with salt marsh vegetation as feeding areas; and limited human disturbance. These conditions prevail in coastal salt marshes that have, for example, a tidal prism adequate to provide an appropriate salinity range of the water and soil, a daily flush of nutrients, and to prevent stagnation. If a suitable physical environment is available, other factors seem to have limited influence. For example, predation apparently is seldom a limiting factor. Rails seem able to tolerate a limited level of human use of their habitat, provided such use does not result in habitat degradation or loss of birds. Therefore, this Recovery Plan focuses on protecting and restoring habitat.

It should be noted that the feasibility of restoration actions in particular marshes must be addressed as part of the rehabilitation effort. This should include a review of potential impacts on any other endangered/threatened species such as the salt marsh bird's-beak and the California least tern [Sterna antillarum (=albifrons) browni].

As marshes are destroyed, remaining marshes are further isolated. Because the light-footed clapper rail is such a sedentary species, additional isolation of marshes can reduce gene flow and result in a decline in genetic diversity in the rail population.

The majority of light-footed clapper rails reside in marshes within Baja California, Mexico. Protection of these habitats is also of importance in maintaining the subspecies. The relationship of the U.S. and Mexican populations is unclear at this time. The Mexican population is roughly estimated at a minimum of 800 pairs (Zembal, pers. comm.). It is doubtful that much recruitment or genetic exchange occurs between rails in the U.S. and Mexico. Such genetic exchange would be facilitated by the presence of a series of small marshes between larger marshes that are fairly close in proximity. Restoration of marshes would aid in maintaining gene flow and in improving recruitment. However, if marsh habitat continues to diminish, gene flow between marshes will be even more limited than at present, thus reducing genetic diversity and increasing genetic isolation.

Some of the Plan items are likely to be extremely expensive and long term (e.g., restoration of portions of the Bolsa Chica marsh is currently being undertaken by California Department of Fish and Game). However, it is anticipated that some actions proposed for clapper rail protection will benefit many other wildlife and fish species, and will also enhance opportunities for outdoor recreation and education.

Presently, there are no secure marshes that are managed to maximize the population size of the light-footed clapper rail.

Step-down Outline

Prime Objective: To increase the light-footed clapper rail breeding population in California to at least 800 pairs by preserving, restoring, and/or creating approximately 4,000 ha (10,000 ac) of adequately protected and suitably managed wetland habitat of which at least 50 percent must be suitable marsh vegetation, in at least 20 marsh complexes. Quantitative values in the prime objective are subject to modification pending results of future research studies and population/habitat monitoring. Upon reaching this objective, it will be possible to consider reclassification of the subspecies to threatened status.

1. Manage habitat to preserve and/or enhance existing populations.
    11. Preserve and manage existing secure[1] habitat.
        111. Kendall-Frost Ecological Reserve.
            1111. Remove exotic vegetation.
            1112. Identify and resolve water quality problems.
            1113. Coordinate with vector control personnel.
        112. Upper Newport Bay.
            1121. Restore tidal influence to salt ponds (salt pan area).

[1] Secure habitat is that whose ownership (i.e., public ownership) is such that it is likely to be managed for its natural resource values.

1122. Develop and implement program to prevent siltation in Upper Newport Bay.

1123. Control pollutants.

1124. Control debris.

1125. Identify and resolve water quality problems.

1126. Coordinate with vector control personnel.

113. Anaheim Bay.

1131. Restore tidal action to surrounding uplands.

1132. Determine causes of elevational differences between Anaheim Bay and Upper Newport Bay, investigate feasibility of corrective actions, and initiate corrective actions.

1133. Develop fringing freshwater marsh.

1134. Create nest hummocks.

1135. Enhance Spartina vigor.

1136. Control pollutants.

1137. Control debris.

1138. Identify and resolve water quality problems.

1139. Coordinate with vector control personnel.

114. South Bay Marine Reserve.

1141. Develop low marsh.

1142. Investigate possibility of introducing Spartina.

1143. Control human disturbance.

1144. Improve tidal channel network.

1145. Create nest hummocks.

115. Santa Margarita River Estuary.

1151. Improve/restore tidal action.

1152. Develop fringing freshwater marsh.

1153. Create nest hummocks.

1154. Develop additional salt marsh vegetation with an emphasis on low marsh.

1155. Enhance Spartina vigor.

1156. Improve tidal channel network.

1157. Control human disturbance.

1158. Identify and control predators.

1159. Develop and implement program to control or reduce sedimentation.

116. Tijuana Marsh.

1161. Remove sand obstructing tidal circulation in channel.

1162. Develop fringing freshwater marsh.

1163. Enhance Spartina vigor.

1164. Control human disturbance and free-roaming pets.

1165. Control pollutants.

1166. Control debris.

1167. Identify and resolve water quality problems.

1168. Coordinate with vector control personnel.

117. Assess potential for light-footed clapper rail populations in Cocklebur Canyon Marsh.

12. Preserve and manage non-secure[1] habitat where light-footed clapper rail currently exist.

    121. Carpinteria Marsh

        1211. Identify land ownership and pursue appropriate protective measures.

        1212. Enhance tidal channel network action.

        1213. Identify and resolve water quality problems.

        1214. Develop and implement program to control or reduce sedimentation.

        1215. Develop nest hummocks.

    122. San Joaquin Marsh and adjacent marsh lands.

        1221. Identify land ownership and pursue appropriate protective measures.

        1222. Identify and control predators.

        1223. Control pollutants.

        1224. Identify and resolve water quality problems.

        1225. Coordinate with vector control personnel.

    123. Agua Hedionda Lagoon.

        1231. Identify land ownership and pursue appropriate protective measures.

        1232. Develop fringing freshwater marsh.

        1233. Develop high marsh.

        1234. Develop nest hummocks.

        1235. Develop low marsh.

[1] Habitat not in public ownership or governed by a conservation agreement or other arrangement that provides for its management for the benefit of endangered species or other natural components.

1236. Enhance *Spartina* vigor.

1237. Control human disturbance.

1238. Identify and control predators.

1239. Develop and implement program to control or reduce sedimentation.

124. San Elijo Lagoon.

1241. Identify land ownership and pursue appropriate protective measures.

1242. Improve/restore tidal action and tidal channel network.

1243. Develop low marsh.

1244. Enhance *Spartina* vigor.

1245. Identify and control predators.

1246. Control pollutants.

1247. Develop and implement program to control or reduce sedimentation.

1248. Identify and resolve water quality problems.

1249. Coordinate with vector control personnel.

125. San Diego Flood Control Channel.

1251. Identify land ownership and pursue appropriate protective measures.

1252. Develop high marsh.

1253. Create nest hummocks.

126. Complex of marshes.

1261. Paradise Marsh.

12611. Identify land ownership and pursue appropriate protective measures.

12612. Improve/restore tidal action.

12613. Create nest hummocks.

12614. Develop low marsh.

12615. Investigate possibility of introducing Spartina.

12616. Improve tidal channel network.

12617. Control human disturbance.

1262. Sweetwater Marsh.

12621. Identify land ownership and pursue appropriate protective measures.

12622. Develop fringing freshwater marsh.

12623. Develop additional salt marsh vegetation with an emphasis on low marsh.

12624. Determine feasibility of enhancing Spartina.

12625. Improve tidal channel network.

12626. Control human disturbance.

12627. Identify and resolve water quality problems.

12628. Coordinate with vector control personnel.

1263. E Street Marsh.

12631. Identify land ownership and pursue appropriate protective measures.

12632. Develop low marsh.

12633. Investigate possibility of introducing Spartina.

12634. Improve tidal channel network.

12635. Control human disturbance.

1264. F Street Marsh.

12641. Identify land ownership and pursue appropriate protective measures.

12642. Improve/restore tidal action.

12643. Develop low marsh including planting Spartina.

12644. Improve tidal channel network.

12645. Control human disturbance.

1265. J Street Marsh.

12651. Identify land ownership and pursue appropriate protective measures.

12652. Determine potential for light-footed clapper rail populations.

12653. Develop low marsh.

12654. Enhance Spartina vigor.

12655. Improve tidal channel network.

12656. Control human disturbance.

12657. Control pollutants.

127. Otay River Mouth.

1271. Identify land ownership and pursue appropriate protective measures.

1272. Determine potential for light-footed clapper rail populations.

1273. Enhance Spartina vigor.

1274. Control human disturbance.

128. Preserve Baja California, Mexico, habitat.

1281. Coordinate and cooperate with personnel in Fauna Silvestre regarding rail conservation.

1282. Determine rail status and distribution in Mexico.

1283. Investigate individual marshes, delineate management problems, and indicate possible solutions.

2. Preserve and manage habitat to reestablish former populations.

21. Manage habitat in Santa Barbara County.

211. Assess potential for rails in Goleta Slough.

212. If good potential, undertake appropriate actions to reestablish rails in Goleta Slough.

2121. Improve/restore tidal action.

2122. Develop low marsh.

2123. Investigate the possibility of introducing Spartina.

2124. Improve tidal channel network.

2125. Control debris.

2126. Identify and resolve water quality problems.

22. Manage habitat in Ventura County.

221. Assess potential for rails at the Ventura River mouth.

222. If good potential, undertake appropriate actions to reestablish rails at the Ventura River Mouth.

2221. Identify land ownership and pursue appropriate protective measures.

2222. Improve/restore tidal action.

2223. Control pollutants.

223. Assess potential for rails at the Santa Clara River Mouth.

224. If good potential, undertake appropriate actions to reestablish rails at the Santa Clara River Mouth.

2241. Identify land ownership and pursue appropriate protective measures.

2242. Improve/restore tidal actions.

225. Assess potential for rails at Mugu Lagoon.

226. If good potential, undertake appropriate actions to reestablish rails in Mugu Lagoon.

2261. Develop fringing feshwater marsh.

2262. Create nest hummocks.

23. Manage habitat in Los Angeles County.

231. Assess potential for rails at Malibu Lagoon.

232. If good potential, undertake appropriate actions to reestablish rails at Malibu Lagoon.

2321. Identify land ownership and pursue appropriate protective measures.

2322. Improve/restore tidal action.

233. Assess potential for rails at Ballona Wetlands.

234. If good potential, undertake appropriate actions to reestablish rails at Ballona Wetlands.

2341. Identify land ownership and pursue appropriate protective measures.

2342. Improve/restore tidal action.

2343. Develop fringing freshwater marsh.

2344. Create nest hummocks.

2345. Develop low marsh.

2346. Enhance Spartina vigor.

235. Assess potential for rails at Cabrillo Wetlands.

236. If good potential, identify land owership and pursue appropriate protective measures.

237. Assess potential for rails at Cerritos Wetlands.

238. If good potential, undertake approprate actions to reestablish rails at Cerritos Wetlands.

2381. Identify land ownership and pursue appropriate protective measures.

2382. Create nest hummocks.

2383. Create low marsh.

2384. Enhance Spartina vigor.

24. Manage habitat in Orange County.

241. Assess potential for rails at Bolsa Chica.

242. If good potential, undertake appropriate actions to reestablish rails at Bolsa Chica.

2421. Identify land ownership and pursue appropriate protective measures.

2422. Improve/restore tidal action.

2423. Develop/enhance fringing freshwater marsh, high marsh, and low marsh.

2424. Create nest hummocks.

2425. Enhance Spartina vigor.

2426. Improve tidal channel network.

2427. Control human disturbance.

2428. Identify and resolve water quality problems.

2429. Coordinate with vector control personnel.

243. Assess potential for rails at Santa Ana River Mouth.

244. If good potential, undertake appropriate actions to reestablish rails at Santa Ana River Mouth.

2441. Identify land ownership and pursue appropriate protective measures.

2442. Improve/restore tidal action.

2443. Develop fringing freshwater marsh.

2444. Develop low marsh including planting of Spartina.

2445. Improve tidal channel network.

2446. Develop and implement a program to control or reduce sedimentation.

2447. Identify and resolve water quality problems.

25. Manage habitat in San Diego County.

251. Assess potential for rails at Buena Vista Lagoon.

252. If good potential, undertake appropriate actions to restore rails at Buena Vista Lagoon.

2521. Identify land ownership and pursue appropriate protective measures.

2522. Develop high marsh.

253. Assess potential for rails at Batiquitos Lagoon.

254. If good potential, undertake appropriate actions to reestablish rails at Batiquitos Lagoon.

2541. Identify land ownership and pursue appropriate protective measures.

2542. Improve/restore tidal action.

2543. Develop fringing freshwater marsh.

2544. Develop low marsh including planting of Spartina.

255. Assess potential for rails in San Dieguito Lagoon.

256. If good potential, undertake appropriate actions to reestablish rails in San Dieguito Lagoon.

2561. Identify land ownership and pursue appropriate protective measures.

2562. Improve/restore tidal action.

2563. Develop fringing freshwater marsh.

2564. Create nest hummocks.

2565. Create low marsh including planting of Spartina.

257. Assess potential for rails at Los Penasquitos Lagoon.

258. If good potential, undertake appropriate actions to reestablish rails at Los Penasquitos Lagoon.

2581. Identify land ownership and pursue appropriate protective measures.

2582. Improve/restore tidal action.

2583. Develop fringing freshwater marsh.

2584. Develop low marsh including planting of Spartina.

2585. Develop and implement program to control or reduce sedimentation.

2586. Identify and resolve water quality problems.

2587. Improve tidal channel network.

259. Assess potential for rails at other sites in San Diego County.

2591. Dairy Mart Ponds and if good potential, control human disturbance.

2592. San Mateo Creek Mouth.

2593. Las Pulgas Creek.

2594. Los Flores Marsh.

3. Obtain information on the biology of the light-footed clapper rail and its ecosystem to enhance recovery.

31. Determine the parameters limiting rail population size.

311. Investigate factors limiting rail population size in Mugu Lagoon.

312. Investigate factors limiting rail population size in Anaheim Bay.

313. Investigate factors limiting rail population size in other marshes.

32. Determine factors that limit dispersal of Spartina foliosa.

33. Examine rail population dynamics.

34. Assess specific rail habitat requirements and relate to year-to-year rail population fluctuations.

35. Analyze rail habitat utilization patterns.

36. Obtain information on breeding biology.

37. Determine foraging time budgets in different habitats.

38. Assess rate of growth and development.

4. Determine progress of management as reflected by up-to-date status of the species and its habitat.

41. Monitor populations and habitat.

411. Determine numbers, distribution, and population trends on annual basis in the U.S.

412. Determine numbers, distribution, and population trends every third year in Baja California, Mexico.

413. Maintain surveillance for pollutants that are known to affect or have the potential to affect rail populations.

414. Establish and monitor permanent vegetation transects.

4141. Upper Newport Bay.

4142. Tijuana Marsh

4143. Anaheim Bay.

42. Evaluate interrelationships of tidal dynamics and habitat quality.

43. Determine changes in land use, vegetation distribution, and overall habitat quality.

44. Monitor invertebrate populations.

441. Assess species composition, numbers, density, and distribution.

442. Determine pesticide load.

45. Monitor water quality.

46. Monitor effects of sand removal and tidal enhancement on vegetation in Tijuana Marsh.

5. Maintain and revise essential habitat maps and descriptions.

6. Inform public of status of the rail and its habitat, and solicit support for necessary conservation actions.

7. Utilize existing laws and regulations pertaining to the protection of the rail and its habitat.

71. Enforce existing laws and regulations.

72. Evaluate effectiveness of law enforcement.

73. Propose appropriate new laws or revisions.

74. Devise and implement oil spill containment strategies to protect marshes in the event of oil spills.

Narrative

Many of the recovery actions for the 36 individual areas discussed in this plan are complex and long-range. To aid the reader in assimilating and visualizing the complexity of the recovery effort, the management actions for the individual areas are summarized in a matrix (Table 2).

Numerous actions are common to more than one marsh. To simplify the Narrative discussion, the common actions will be described below and thereafter referenced by item number.

Item a. Identify land ownership and pursue appropriate protective measures. Once land ownership has been identified, it will be possible to determine the most feasible protective measures that should be implemented. Such measures include acquisition, conservation easement, and cooperative agreement.

Item b. Assess potential for rails. An assessment of the potential of various marshes to support a population of rails or additional rails, should be obtained prior to allocating funds to manage and restore these areas. If long-term use by rails does not appear feasible, then management emphasis should be placed elsewhere.

Item c. Restore or improve tidal action. One of the major reasons that certain habitats support few rails, stems from a decline in tidal prism and increase in freshwater influence when normal tidal action is

Table 2. Summary of management actions for individual habitat areas.

	Identify land ownership & protective measures needed*	I.D. potential for LFCR pops.	Improve/restore tidal action	Create/expand fringing freshwater marsh	Create high marsh	Create nesting hummocks	Create low marsh (Spartina)	Enhance vigor of Spartina	Improve network of tidal channels	Remove exotic vegetation	Control human disturbance	Identify & control predators	Control pollutants	Control debris	Control sedimentation	Identify water quality problems	Coordinate with vector control personnel
1) Goleta Slough		X	X				X		X					X		X	
2) Carpinteria Marsh	X					X			X						X	X	
3) Ventura River Mouth	X	X	X										X				
4) Santa Clara River Mouth	X	X	X														
5) Mugu Lagoon		X		X		X											
6) Malibu Lagoon	X	X	X														
7) Ballona Wetlands	X	X	X	X		X	X	X									
8) Cabrillo Wetlands	X	X															
9) Cerritos Wetlands	X	X				X	X	X									
10) Anaheim Bay				X		X		X	X				X	X		X	X
11) Bolsa Chica	X	X	X	X	X	X	X	X	X		X					X	X
12) Santa Ana River Mouth	X	X	X	X			X		X						X	X	
13) San Joaquin Marsh (and adjacent marsh)	X											X	X			X	X
14) Upper Newport Bay			X										X	X	X	X	X
15) San Mateo Creek Mouth		X															
16) Las Pulgas Creek Mouth		X															
17) Los Flores Marsh		X															
18) Cocklebur Canyon Marsh		X															
19) Santa Margarita River Estuary			X	X		X	X	X	X		X	X			X		
20) Buena Vista Lagoon	X	X			X												
21) Agua Hedionda Lagoon	X			X	X	X	X	X			X	X			X		
22) Batiquitos Lagoon	X	X	X	X			X										
23) San Elijo Lagoon	X		X				X	X	X			X	X		X	X	X
24) San Dieguito Lagoon	X	X	X	X		X	X										
25) Los Penasquitos Lagoon	X	X	X	X			X		X						X	X	
26) Kendall-Frost Reserve										X						X	X
27) San Diego Flood Control Channel	X				X	X											
28) Paradise Marsh	X		X			X	X	X	X		X						
29) Sweetwater Marsh	X			X			X	X	X		X					X	X
30) E St. Marsh	X						X	X	X		X						
31) F St. Marsh	X		X				X		X		X						
32) J St. Marsh	X	X					X	X	X		X		X				
33) South Bay Marine Reserve						X	X	X	X		X						
34) Otay River Mouth	X	X						X			X						
35) Dairy Mart Ponds		X									X						
36) Tijuana Marsh			X	X				X			X		X	X		X	X

* Including acquisition, conservation easement, cooperative agreement.

restricted, as in the case of sand bars or heavy siltation. To restore and maintain the proper vegetation for rails, adequate tidal flow through the habitat is essential. This may be accomplished by opening the mouth(s) of lagoons by using a drag-line or other suitable equipment and maintaining the openings. Ideally, sufficient tidal volume and prism should be restored so that the mouths are kept open naturally. Widening, not just opening, the mouths in many cases will be instrumental in this regard. Before any restoration of tidal action is initiated, the effect of increasing tidal influence on other endangered (i.e., salt marsh bird's beak) and candidate species should be evaluated.

Item d. Develop or expand fringing freshwater marsh. Recent studies indicate that rails will utilize components of freshwater marsh especially for foraging and nesting and that a freshwater influence enhances Spartina vigor. Creation of such habitat would probably increase rail use in a particular location. Incidental freshwater intermittently present in existing ditches could be redirected into certain marsh habitats once the quality of the water has been evaluated. Care should be exercised to ensure that such marshes do not degenerate with respect to habitat quality of other species because of the infusion of freshwater.

Item e. Develop high marsh. High marsh is particularly important to provide nest sites that are relatively protected from vagaries of extreme high tide. Creation of high marsh would aid in this regard and also might reduce predation from terrestrial species. A major

limiting factor in at least one marsh (Anaheim Bay) is thought to be the lack of suitable nesting sites. Too much water is believed to be deleterious because it can reduce the amount of suitable extensive foraging substrate. Berms of upper marsh vegetation, if isolated, could provide for both nesting and foraging habitat that presently seems to be insufficient in some marshes.

Item f. Create nest hummocks. In some areas it is apparent that sufficiently high land is not available to prevent damage to nests during high tides. The construction of earthen hummocks (which can be quite small) will provide the needed higher nesting sites. Details of nest hummock construction are available in Massey and Zembal (1982).

Item g. Develop low marsh. Low marsh (defined to include Spartina and Spartina - mudflat interface) is desirable because the preferred vegetative type, Spartina, is frequently found there. However, in areas where Spartina does not currently exist or was not known historically, the feasibility of introducing this species must be carefully considered. In areas that are constantly under water, it will be necessary to raise the elevation to provide low marsh. In contrast, in high marsh situations, it may be necessary to reduce the elevation in portions of the marsh so that the habitat is tidally inundated at such a frequency so as to develop and maintain low marsh habitat. Once individual marshes have been identified as requiring an increase in the proportion of low marsh, the actual mechanical process to achieve this end will be dictated on a site-specific basis.

Item h. Enhance Spartina vigor. Preferred marsh habitat for light-footed clapper rail consists of Spartina-dominated vegetation. If the robustness of Spartina is enhanced, many areas could support additional rails. The feasibility of introducing freshwater influence (believed to have a positive effect on Spartina robustness) and transplanting Spartina will be examined to increase rail productivity.

Item i. Improve tidal channel network. If the existing tidal channel network could be restored or expanded in certain marshes, additional rail habitat would be created. Such networks provide rail thoroughfares, cover, and foraging substrate. The channel network can be designed to isolate areas of upper marsh that provide relatively predator-free nest sites; thus rail productivity could be increased substantially. Expansion of the channel network could be accomplished at high tide using small equipment (a modified drag line or dredge) or possibly by hand but must be only minimally disruptive to the habitat and rails.

Item j. Control human disturbance. Human disturbance including off-road vehicles, hikers, joggers, dog-walkers, etc. must be limited to prevent adverse impacts on rails especially during the nesting season. In these marshes human intrusion is a known primary concern. Control may involve fencing, signing, patroling, or cutting a channel around adjacent uplands (where feasible) to reduce or eliminate such disruption. The method used will depend upon land ownership and future agreements with land owners.

Item k. Identify and control predators. In certain marshes predation is thought to be a significant problem; the extent of predation (especially by pets or feral animals) must be determined to reduce the potential impact on rail populations. Once the predators have been identified appropriate control measures may be instituted such as trapping, construction of electric fences or water barriers, etc.

Item l. Control pollutants. Pollution should be monitored so that problems can be effectively and expeditiously resolved. Pollution can enter most of the marshes from seaward passages (i.e., sewerage or oil spills) or from freshwater flows (i.e., insecticides in runoff water). If pollutants or other factors are identified as creating water quality problems, then suitable preventive measures must be undertaken.

Item m. Control debris. Refuse from the local watersheds can find its way into marsh environs and clog the channel networks or reduce tidal action by closing saltwater passages. Such debris may reduce the number of rails a given marsh can support. Debris should be removed using appropriate equipment such as a drag-line, dredge, or caterpillar/tractor whenever it accumulates in sufficient quantities to adversely affect tidal action.

Item n. Develop and implement program to prevent or minimize siltation. Siltation is a frequent problem in some of these marshes. Sediments from erosion often precipitated by urban development on hilly areas, and from creeks and channels, tend to slowly fill the

wetlands causing them eventually to form upland habitat. The net result is a reduction in rail numbers. To combat this, methods to reduce siltation and to remove sediments need to be explored, evaluated, and then implemented. Possible methods include the construction of silt basins in the upper watersheds, better erosion control through appropriate grading and planting of vegetation on hillsides, or culvert construction (if appropriate).

Item o. Identify and resolve water quality problems. Any abnormalities with either the water quality or suitability must be identified and resolved so that adverse effects on wetland vegetation, invertebrate fauna (on which the rails feed), and on the rails themselves can be minimized and, if possible, prevented.

Item p. Coordinate with vector control personnel. Biologists with knowledge of the distribution and needs of the rails should coordinate with the vector or mosquito control agencies to facilitate protection of rail habitat. Some insecticides used for the control of mosquitoes or other vectors may have a deleterious effect on food resources of the light-footed clapper rail or upon the rail itself. Therefore, control methods (biological, chemical, physical) that have the least damage upon the rail, its food, or habitat should be used.

Item q. If good potential, undertake appropriate actions to reestablish rails. Conditions in a particular habitat may have changed so drastically that it would not be practical or feasible to restore the area so it could again support rails. Actions pertaining

to the reestablishment of rails should not be undertaken until an analysis of the probability of success has been evaluated. Ideally reestablishment will result from natural reinvasion of the area. However, it this is not feasible or probable, transplantation of rails from other marshes will be studied and evaluated.

1. Manage habitat to preserve and/or enhance existing populations.

In order to achieve a breeding population of 800 pairs in California, it is necessary to adequately protect and properly manage all habitat currently inhabited by light-footed clapper rail. Only a small portion of the rails' historical habitat remains.

Six marshes are currently protected under public ownership or otherwise relatively safe from modification or destruction: (1) Kendall-Frost Ecological Reserve, San Diego County, owned by University of California and the City of San Diego; (2) Anaheim Bay, Orange County, owned by the U.S. Navy and administered by the Fish and Wildlife Service as the Seal Beach National Wildlife Refuge; (3) Upper Newport Bay, Orange County, for which management responsibilities are vested in California Department of Fish and Game; (4) Goleta Slough, Santa Barbara County, owned by the City of Santa Barbara, California Department of Fish and Game, and the University of California; (5) South Bay Marine Reserve, San Diego County, owned by the U.S. Navy; (6) Tijuana Marsh, San Diego County, with land ownership divided among the U.S. Fish and Wildlife Service, the U.S. Navy, and the California Department of Parks and Recreation.

Most marshlands appear to be supporting less than optimum densities of rails. In many cases this is because the habitat has been degraded following restriction of tidal flow. Reestablishing tidal flow should automatically improve conditions for rails. In certain cases where degradation has been severe, some reestablishment of vegetation may be necessary.

11. Preserve and manage existing secure habitat. There are presently six wetland habitats that are occupied by light-footed clapper rail and are considered secure, or adequately protected. However, even within these areas proper management is needed to either restore the habitat or prevent further degradation of its quality.

111. Kendall-Frost Ecological Reserve. It is essential to adequately protect and manage all remaining secure light-footed clapper rail habitat because so little habitat remains for this subspecies and the chance of enhancing rail numbers should be relatively good.

1111. Remove exotic vegetation. In most cases non-native plant species do not pose a substantial hazard to the continued suitability of marsh lands as habitat. However, the Kendall-Frost Reserve is an exception in that mangroves were planted there a number of years ago. Recent efforts to remove the mangroves using manual labor have not been totally successful and additional efforts are needed.

1112. Identify and resolve water quality problems. See item o.

1113. Coordinate with vector control personnel. See item p.

112. Upper Newport Bay. A number of actions are needed in this area that when implemented should have a positive effect on the status of the rail. Such actions may enhance the suitability of the habitat; thus, eventually resulting in an increase in rail numbers.

1121. Restore tidal influence to salt ponds (salt pan area). Salt ponds in Upper Newport Bay would be useful to light-footed clapper rail if tidal action were reestablished by constructing a short channel and by removing the silt load. This will decrease the elevation so that the salt pans are partly open water and partly marsh habitat.

1122. Develop and implement program to prevent siltation in Upper Newport Bay. See item n.

1123. Control pollutants. See item l.

1124. Control debris. See item m.

1125. Identify and resolve water quality problems. See item o.

1126. Coordinate with vector control personnel. See item p.

113. Anaheim Bay. A number of actions are needed in this area that when implemented should have a positive effect on the status of the rail. Such actions may enhance the suitability of the habitat; thus, eventually resulting in an increase in rail numbers.

1131. Restore tidal action to surrounding uplands. See item c.

1132. Determine causes of elevational differences between Anaheim Bay and Upper Newport Bay, investigate feasibility of corrective actions, and initiate corrective actions. Oil extraction in Anaheim Bay may be causing the apparent subsidence with a concomitant lowering in elevation of the land. Although Spartina stands in Anaheim Bay appear sufficiently dense for nesting, they are totally inundated by moderately high tides. It should be determined if reinjection is sufficient to compensate for the amount of oil extraction. There may be other causes of the elevational differences that may be responsible for the low population number. Once the cause of the subsidence is determined, it may be possible to arrest further lowering of the elevation and deterioration of the habitat quality and to enhance the area for rails by increasing the elevation in portions of the marsh.

1133. Develop fringing freshwater marsh. See item d.

1134. Create nest hummocks. See item f.

1135. Enhance Spartina vigor. See item h.

1136. Control pollutants. See item l.

1137. Control debris. See item m.

1138. Identify and resolve water quality problems. See item o.

1139. Coordinate with vector control personnel. See item p.

114. South Bay Marine Reserve. To aid in the recovery of the light-footed clapper rail, it will be helpful to manage this area to increase rail numbers. This may involve actions to increase their reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat within this area, thus increasing the distribution of rails.

1141. Develop low marsh. See item g.

1142. Investigate possibility of introducing Spartina. Preferred marsh habitat for light-footed clapper rail consists of Spartina-dominated vegetation. If the robustness of Spartina is enhanced, many areas could support additional rails. The feasibility of introducing a freshwater influence (believed to have a positive effect on Spartina robustness) and transplanting Spartina will be examined to increase rail productivity.

1143. Control human disturbance. See item j.

1144. Improve tidal channel network. See item i.

1145. Create nest hummocks. See item f.

115. Santa Margarita River Estuary. This area is under the jurisdiction of the Marine Corps Base Camp Pendleton. A number of

actions are needed in this area that when implemented should have a positive effect on the status of the rail. Such actions may enhance the suitability of the habitat, thus, eventually resulting in an increase in rail numbers.

1151. Improve/restore tidal action. See item c.

1152. Develop fringing freshwater marsh. See item d.

1153. Create nest hummocks. See item f.

1154. Develop additional salt marsh vegetation with an emphasis on low marsh. See item g.

1155. Enhance Spartina vigor. See item h.

1156. Improve tidal channel network. See item i.

1157. Control human disturbance. See item j.

1158. Identify and control predators. See item k.

1159. Develop and implement program to control or reduce sedimentation. See item n.

116. Tijuana Marsh. A number of actions are needed in this area that when implemented should have a positive effect on the status of the

rail. Such actions may enhance the suitability of the habitat; thus, eventually resulting in an increase in rail numbers.

1161. Remove sand obstructing tidal circulation in channel. Sand removal will improve and restore tidal circulation. One of the major reasons that this habitat supports few rails stems from a decline in tidal prism and increase in freshwater influence when normal tidal action is restricted, as in the case of sand bars or heavy siltation. To restore and maintain the proper vegetation for rails, adequate tidal flow through the habitat is essential and must be maintained. This may be accomplished by opening the mouth of lagoon by using a drag-line or other suitable equipment and maintaining the openings. Ideally sufficient tidal volume and prism should be restored so that the mouths are kept open naturally. Widening, not just opening, the mouths in many cases will be instrumental in this regard. Before any restoration of tidal action is initated, the effect of increasing tidal influence on other endangered (i.e., salt marsh bird's beak) and candidate species should be evaluated.

1162. Develop fringing freshwater marsh. See item d.

1163. Enhance Spartina vigor. See item h.

1164. Control human disturbance and free-roaming pets. Human disturbance including off-road vehicles, hikers, joggers, dog-walkers, etc. and free-roaming pets must be limited to prevent adverse impacts on rails especially during the nesting season. In these marshes human

intrusion is a known primary concern. Pets are also disruptive and house cats prey on rails. Control may involve fencing, signing, patrolling, cutting a channel around adjacent uplands (where feasible), or trapping of pets to reduce or eliminate such disruption. The method used will depend upon land ownership and future agreements with land owners.

1165. Control pollutants. See item l.

1166. Control debris. See item m.

1167. Identify and resolve water quality problems. See item o.

1168. Coordinate with vector control personnel. See item p.

117. Assess potential for light-footed clapper rails in Cocklebur Canyon Marsh. This area is under the jurisdiction of the Marine Corps Base, Camp Pendleton. An assessment of the potential of this marsh to support a population of rails or additional rails should be obtained prior to allocating funds to manage and restore these areas. If long-term use by rails does not appear feasible, then management emphasis should be placed elsewhere.

12. Preserve and manage presently non-secure habitat where light-footed clapper rail currently exist. Twelve wetland habitats in California and several marshes in Baja California, Mexico, are inhabited by light-footed clapper rail. These areas are not managed

expressly for their natural resources and/or are in need of more permanent protective status.

121. Carpinteria Marsh. To facilitate the light-footed clapper rail's recovery it will be necessary to manage this area on their behalf so that rail numbers can increase. Actions to increase their reproductive success, to reduce mortality, an/or to increase the amount of suitable habitat within this area should be implemented to enhance the distribution of rails.

1211. Identify land ownership and pursue appropriate protective measures. See item a.

1212. Enhance tidal channel network action. See item i.

1213. Identify and resolve water quality problems. See item o.

1214. Develop and implement program to control or reduce sedimentation. See item n.

1215. Develop nest hummocks. See item f.

122. San Joaquin Marsh and adjacent marsh lands. To enhance the recovery of the light-footed clapper rail, it will be necessary to manage this area on their behalf so that rail numbers can increase. This may involve actions to increase their reproductive success, to reduce mortality, an/or to increase the amount of suitable habitat within this area.

1221. Identify land ownership and pursue appropriate protective measures. See item a.

1222. Identify and control predators. See item k.

1223. Control pollutants. See item l.

1224. Identify and resolve water quality problems. See item o.

1225. Coordinate with vector control personnel. See item p.

123. Agua Hedionda Lagoon. To aid in the recovery of the light-footed clapper rail it will be beneficial to manage this area to increase rail numbers. This may involve actions to increase their reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat within this area. Thus the distribution of light-footed clapper rails may increase.

1231. Identify land ownership and pursue appropriate protective measures. See item a.

1232. Develop fringing freshwater marsh. See item d.

1233. Develop high marsh. See item e.

1234. Create nest hummocks. See item f.

1235. Develop low marsh. See item g.

1236. Enhance Spartina vigor. See item h.

1237. Control human disturbance. See item j.

1238. Identify and control predators. See item k.

1239. Develop and implement program to control or reduce sedimentation. See item n.

124. San Elijo Lagoon. To aid in the recovery of the light-footed clapper rail, this area should be managed to increase rail numbers. This may involve actions to increase their reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat within the lagoon.

1241. Identify land ownership and pursue appropriate protective measures. See item a.

1242. Improve/restore tidal action and tidal channel network. See items c and i.

1243. Develop low marsh. See item g.

1244. Enhance Spartina vigor. See item h.

1245. Identify and control predators. See item k.

1246. Control pollutants. See item l.

1247. Develop and implement program to control or reduce sedimentation. See item n.

1248. Identify and resolve water quality problems. See item o.

1249. Coordinate with vector control personnel. See item p.

125. San Diego Flood Control Channel. To facilitate recovery of the light-footed clapper rail, it will be helpful to manage this area to increase rail numbers. This may involve actions to increase their reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat within the flood control channel. This will enhance the distribution of rails.

1251. Identify land ownership and pursue appropriate protective measures. See item a.

1252. Develop high marsh. See item e.

1253. Create nest hummocks. See item f.

126. Complex of marshes. Several areas consist of more than one discrete marsh. For simplicity, such areas have been grouped into complexes.

1261. Paradise Marsh. To aid in the recovery of the light-footed clapper rail, Paradise Marsh should be managed to increase rail numbers. This may involve actions to increase their reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat within this area to enhance the distribution of rails.

12611. Identify land ownership and pursue appropriate protective measures. See item a.

12612. Improve/restore tidal action. See item c.

12613. Create nest hummocks. See item f.

12614. Develop low marsh. See item g.

12615. Investigate possibility of introducing Spartina. See item g.

12616. Improve tidal channel network. See item i.

12617. Control human disturbance. See item j.

1262. Sweetwater Marsh. To aid in recovering the light-footed clapper rail, it will be necessary to manage this area to increase rail numbers. This may involve actions to increase reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat.

12621. Identify land ownership and pursue appropriate protective measures. See item a.

12622. Develop fringing freshwater marsh. See item d.

12623. Develop additional salt marsh vegetation with an emphasis on low marsh. See item g.

12624. Determine feasibility of enhancing Spartina. The feasibility of introducing freshwater influence (believed to have a positive effect on Spartina robustness) and transplanting Spartina will be examined to increase rail productivity.

12625. Improve tidal channel network. See item i.

12626. Control human disturbance. See item j.

12627. Identify and resolve water quality problems. See item o.

12628. Coordinate with vector control personnel. See item p.

1263. E Street Marsh. To aid in recovery of the light-footed clapper rail, it will be helpful to manage this area to increase rail numbers. Actions to increase their reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat may be necessary.

12631. Identify land ownership and pursue appropriate protective measures. See item a.

12632. Develop low marsh. See item g.

12633. Investigate possibility of introducing Spartina. Preferred marsh habitat for light-footed clapper rail consists of Spartina-dominated vegetation. If the robustness of Spartina is enhanced, many areas could support additional rails. The feasibility of introducing freshwater influence (believed to have a positive effect on Spartina robustness) and transplanting Spartina will be examined to increase rail productivity.

12634. Improve tidal channel network. See item i.

12635. Control human disturbance. See item j.

1264. F Street Marsh. To promote the recovery of the light-footed clapper rail, it will be beneficial to manage this area to increase rail numbers. This may involve actions to increase their reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat.

12641. Identify land ownership and pursue appropriate protective measures. See item a.

12642. Improve/restore tidal action. See item c.

12643. Develop low marsh including planting Spartina. See item g.

12644. Improve tidal channel network. See item i.

12645. Control human disturbance. See item j.

1265. J Street Marsh. It will be helpful to manage this area to increase rail numbers. Actions to increase their reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat may be required.

12651. Identify land ownership and pursue appropriate protective measures. See item a.

12652. Determine potential for light-footed clapper rail populations. See item b.

12653. Develop low marsh. See item g.

12654. Enhance Spartina vigor. See item h.

12655. Improve tidal channel network. See item i.

12656. Control human disturbance. See item j.

12657. Control pollutants. See item l.

127. Otay River Mouth. To aid in recovery of the light-footed clapper rail, it will be beneficial to manage this area to increase

rail numbers. This may involve actions to increase rail reproductive success, to reduce mortality, and/or to increase the amount of suitable habitat within the Otay River Mouth.

1271. Identify land ownership and pursue appropriate protective measures. See item a.

1272. Determine potential for light-footed clapper rails populations. See item b.

1273. Enhance Spartina vigor. See item h.

1274. Control human disturbance. See item j.

128. Preserve Baja California, Mexico, habitat. It is estimated that a minimum of 800 pairs of light-footed clapper rail inhabit two large marshes in Baja California. The importance of these birds to the long-term survival of the subspecies should be considered so that the population is appropriately managed.

1281. Coordinate and cooperate with personnel in Fauna Silvestre regarding rail conservation. The FWS counterpart in Mexico, Fauna Silvestre, should be contacted so that a coordinated effort can be made to manage the light-footed clapper rail.

1282. Determine rail status and distribution in Mexico. To date no thorough survey of potential habitat in Mexico has been conducted.

This is essential to assess the status and distribution of the subspecies. Such information is necessary to develop appropriate strategies for management.

1283. Investigate individual marshes, delineate management problems, and indicate possible solutions. Actions for each marsh need to be developed once specific needs have been elucidated. Since Mexico has probably more than three times the number of light-footed clapper rails than the U.S., it is imperative that these populations be carefully managed.

2. Preserve and manage habitat to reestablish former populations. To upgrade the light-footed clapper rail to threatened status, additional populations must be established so that at least 4,000 ha of suitable habitat in California are available to light-footed clapper rails.

As light-footed clapper rails are essentially nonmigratory, reestablishment into appropriately managed habitat will require two, and possibly three steps. First, tidal flow will have to be reestablished in potential marshlands. Second, some ditching and grading of lands may be necessary to achieve optimum marsh plant growth. If suitable vegetation does not volunteer in new areas, planting may be required. Finally, although rails will probably recolonize newly restored areas near currently large populations through their limited natural wandering tendencies, birds may have to be obtained from other areas or raised in captivity and released in the more remote new areas. It is necessary to restore the

light-footed clapper rail populations and manage habitat in the following sites.

21. Manage habitat in Santa Barbara County. Additional populations are needed so that overall rail population numbers will be enhanced, thus making the rail's status less precarious.

211. Assess potential for rails in Goleta Slough. See item b.

212. If good potential, undertake appropriate actions to reestablish rails in Goleta Slough. See item q.

2121. Improve/restore tidal action. See item c.

2122. Develop low marsh. See item g.

2123. Investigate the possibility of introducing Spartina. Preferred marsh habitat for light-footed clapper rail consists of Spartina-dominated vegetation. If the robustness of Spartina is enhanced, many areas could support additional rails. The feasibility of introducing freshwater influence (believed to have a positive effect on Spartina robustness) and transplanting Spartina will be examined to increase rail productivity. This should only be contemplated in areas where Spartina occurred historically.

2124. Improve tidal channel network. See item i.

2125. Control debris. See item m.

2126. Identify and resolve water quality problems. See item o.

22. Manage habitat in Ventura County. Additional populations are needed in this county so that overall rail population numbers will be enhanced, thus making the rail's status more secure.

221. Assess potential for rails in the Ventura River Mouth. An assessment of the potential of various marshes to support a population of rails or additional rails should be obtained prior to allocating funds to manage and restore these areas. If long-term use by rails does not appear feasible, then management emphasis should be placed elsewhere.

222. If good potential, undertake appropriate actions to reestablish rails at the Ventura River Mouth. See item q.

2221. Identify land ownership and pursue appropriate protective measures. See item a.

2222. Improve/restore tidal action. See item c.

2223. Control pollutants. See item l.

223. Assess potential for rails at the Santa Clara River Mouth. See item b.

224. If good potential, undertake appropriate actions to reestablish rails at the Santa Clara River Mouth. See item q.

2241. Identify land ownership and pursue appropriate protective measures. See item a.

2242. Improve/restore tidal action. See item c.

225. Assess potential for rails at Mugu Lagoon. See item b.

226. If good potential, undertake appropriate actions to reestablish rails at Mugu Lagoon. See item q.

2261. Develop fringing freshwater marsh. See item d.

2262. Create nest hummocks. See item f.

23. Manage habitat in Los Angeles County. Additional populations are needed in this county so that overall rail population numbers will be enhanced, thus making the rail's status less precarious.

231. Assess potential for rails at Malibu Lagoon. See item b.

232. If good potential, undertake appropriate actions to reestablish rails at Malibu Lagoon. See item q.

2321. Identify land ownership and pursue appropriate protective measures. See item a.

2322. Improve/restore tidal action. See iem c.

233. Assess potential for rails at Ballona Wetlands. See item b.

234. If good potential, undertake appropriate actions to reestablish rails at Ballona Wetlands. See item q.

2341. Identify land ownership and pursue appropriate protective measures. See item a.

2342. Improve/restore tidal action. See item c.

2343. Develop fringing freshwater marsh. See item d.

2344. Create nest hummocks. See item f.

2345. Develop low marsh. See item g.

2346. Enhance Spartina vigor. See item h.

235. Assess potential for rails at Cabrillo Wetlands. See item b.

236. If good potential, identify land ownership and pursue appropriate protective measures. See item q.

Once land ownership has been identified, it will be possible to determine the most feasible protective measures that should be

implemented. Such measures include acquisition, conservation easement, and cooperative agreement.

237. Assess potential for rails at Cerritos Wetlands. See item b.

238. If good potential, undertake appropriate actions to reestablish rails at Cerritos Wetlands. See item q.

2381. Identify land ownership and pursue appropriate protective measures. See item a.

2382. Create nest hummocks. See item f.

2383. Develop low marsh. See item g.

2384. Enhance Spartina vigor. See item h.

24. Manage habitat in Orange County. Additional populations are needed in this county so that overall rail population numbers will be enhanced, thus making the rail's status less precarious.

241. Assess potential for rails at Bolsa Chica. See item b.

242. If good potential, undertake appropriate actions to reestablish rails in Bolsa Chica. See item q.

2421. Identify land ownership and pursue appropriate protective measures. See item a.

2422. Improve/restore tidal action. See item c.

2423. Develop/enhance fringing freshwater marsh, high marsh, and low marsh. See items d, e, and g.

2424. Create nest hummocks. See item f.

2425. Enhance Spartina vigor. See item h.

2426. Improve tidal channel network. See item i. This will entail restoring existing culverts and may necessitate construction of new culverts.

2427. Control human disturbance. See item j.

2428. Identify and resolve water quality problems. See item o.

2429. Coordinate with vector control personnel. See item p.

243. Assess potential for rails at Santa Ana River Mouth. See item b.

244. If good potential, undertake appropriate actions to reestablish rails at Santa Ana River Mouth. See item q.

2441. Identify land ownership and pursue appropriate protective measures. See item a.

2442. Improve/restore tidal action. See item c.

2443. Develop fringing freshwater marsh. See item d.

2444. Develop low marsh including planting of Spartina. See item g.

2445. Improve tidal channel network. See item i.

2446. Develop and implement program to control or reduce sedimentation. See item n.

2447. Identify and and resolve water quality problems. See item o.

25. Manage habitat in San Diego County. Additional populations are needed in this county so that overall rail population numbers will be enhanced, thus making the rail's status less precarious.

251. Assess potential for rails at Buena Vista Lagoon. See item b.

252. If good potential, undertake appropriate actions to reestablish rails at Buena Vista Lagoon. See item q.

2521. Identify land ownership and pursue appropriate protective measures. See item a.

2522. Improve high marsh. See item e.

253. Assess potential for rails at Batiquitos Lagoon. See item b.

254. If good potential, undertake appropriate actions to reestablish rails at Batiquitos Lagoon. See item q.

2541. Idenfify land ownership and pursue appropriate protective measures. See item a.

2542. Improve/restore tidal action. See item c.

2543. Develop fringing freshwater marsh. See item d.

2544. Develop low marsh including planting of Spartina. See item g.

255. Assess potential for rails in San Dieguito Lagoon. See item b.

256. If good potential, undertake appropriate actions to reestablish rails in San Dieguito Lagoon. See item q.

2561. Identify land ownership and pursue appropriate protective measures. See item a.

2562. Improve/restore tidal action. See item c.

2563. Develop fringing freshwater marsh. See item d.

2564. Create nest hummocks. See item f.

2565. Develop low marsh including planting of Spartina. See item g.

257. Assess potential for rails at Los Penasquitos Lagoon. See item b.

258. If good potential, undertake appropriate actions to reestablish rails at Los Pensaquitos Lagoon. See item q.

2581. Identify land ownership and pursue appropriate protective measures. See item a.

2582. Improve/restore tidal action. See item c.

2583. Develop fringing freshwater marsh. See item d.

2584. Develop low marsh including planting of Spartina. See item g.

2585. Develop and implement program to control or reduce sedimentation. See item n.

2586. Identify and resolve water quality problems. See item o.

2587. Improve tidal channel network. See item i.

259. Assess potential for rails at other sites in San Diego County. There are several other marshes in San Diego County that have substantial potential to provide habitat for ligh-footed clapper rails. Each of these areas should be investigated.

2591. Dairy Mart Ponds and if good potential, control human disturbance. See items b and j.

2592. Assess potential for light-footed clapper rails in San Mateo Creek Mouth. The Marine Corps Base Camp Pendleton has jurisdiction over this area. A determination as to the suitability of this marsh to support a population of rails or additional rails should be made. If long-term use by rails does not appear feasible, then management emphasis should be placed elsewhere.

2593. Assess potential for light-footed clapper rails in Las Pulgas Creek. See item b.

2594. Assess potential for light-footed clapper rails in Los Flores Marsh. See item b.

3. Obtain information on the biology of the light-footed clapper rail or its ecosystem to enhance recovery. Basic information on the light-footed clapper rail such as habitat preferences, life history factors, etc. is just beginning to emerge; however, additional data that are essential for proper management are still lacking.

31. Determine the parameters limiting rail population size. Several marshes superficially appear to contain good light-footed clapper rail habitat but are either unoccupied or sustain low rail populations. The basic reasons limiting rail populations, whether biological or physical, need to be determined so that implementation of actions necessary to correct the habitat deficiencies can be undertaken.

311. Investigate factors limiting rail population size in Mugu Lagoon. One sighting of a clapper rail in the winter of 1980 was the first reported since 1971 (Wilbur et al. 1979). Recent restoration of salt marsh in the eastern arm of the lagoon may develop into suitable nesting habitat (Zembal and Massey, ms). This would be an excellent site to analyze habitat relationships and the success of the restoration project.

312. Investigate factors limiting rail population size in Anaheim Bay. Anaheim Bay is a relatively large salt marsh, yet it supports far fewer rails than the considerably smaller Upper Newport Bay marsh. Reasons for this discrepancy need to be investigated to help formulate other management actions for the area.

313. Investigate factors limiting rail population size in other marshes. It may become necessary to obtain data on factors limiting rail productivity and survivability in other marshes. Such information will aid in assessing carrying capacity of specific marshes and in making management recommendations to improve habitat quality.

32. Determine factors that limit Spartina foliosa. Spartina appears to be a key determinant of the value of a habitat to light-footed clapper rail. Additional information on Spartina ecology is needed that can be used in rehabilitation efforts and also in evaluating how to enhance existing Spartina vigor. Such data should include analyses of soil and water salinity. Upper Newport Bay, Kendall-Frost, Anaheim

Bay, and Tijuana Marsh would be suitable areas to investigate the community dynamics and ecology of Spartina.

33. Examine rail population dynamics. Such baseline information as age class structure, longevity, reproductive success, predation pressure, and clutch size is needed to monitor the status of rail populations and to assess the success of management actions.

34. Assess specific rail habitat requirements and relate to year-to-year rail population fluctuations. Habitat requirements of light-footed clapper rail are not yet adequately understood. Additional information is essential so that marshes can be managed to benefit light-footed clapper rail.

35. Analyze rail habitat utilization patterns. Precisely how rails use their habitat (including home range and seasonal movements, etc.) has not been investigated to any great extent. The extent of seasonal movement (from marsh to marsh, or within the same marsh) is unknown. Size of home range and other utilization patterns will aid in predicting how many rails a given marsh can support. Banding studies will be the key to making such determinations.

36. Obtain information on breeding biology. Hatching success, clutch size, chick survival, etc. should be evaluated so that factors affecting reproductive success can be determined. For example, if pesticide residues are causing problems in hatching success or if predators are taking an unusually high number of eggs/chicks, then

suitable control measures must be undertaken. Reproductive success in different habitat regimes should be investigated to assess the importance of various habitat parameters.

37. Determine foraging time budgets in different habitats. Little information exists on foraging behavior of rails. In different habitats various amounts of time probably are allocated to foraging. This may reflect prey abundance, distribution, or accessibility and may be instrumental in determining nesting success. Upper Newport Bay would be one of the best sites to obtain this information.

38. Assess rate of growth and development. This may entail raising hatchlings to adulthood to analyze the rate of growth, molt sequence, and the amount and type of food required for normal development.

4. Determine progress of management as reflected by up-to-date status on the subspecies and its habitat. If recovery of the rail is to occur, it will be necessary to evaluate the success of management actions so that modifications to such actions, if warranted, can be taken. Monitoring the progress of the recovery program may result in additional recommendations being proposed to enhance rail conservation.

41. Monitor population and habitat. One of the best ways to assess the efficiency of management actions is to monitor the rail population. This is also necessary to determine when the recovery goal has been achieved. To assess the effectiveness of recovery

actions on the light-footed clapper rail and to determine if additional problems affecting the recovery effort have developed, habitats should be monitored so that changes in vegetation species composition, distribution, and vigor can be ascertained.

411. Determine numbers, distribution, and population trends on an annual basis in the U.S. Only by censusing rail populations can a reasonably accurate estimate of rail status and success/efficiency of actions be determined. This should be done annually and is particularly important because rail numbers are so low.

412. Determine numbers, distribution, and population trends every third year in Baja California, Mexico. Because the Mexican population is larger, less prone to habitat destruction at the present time, and occupies larger areas, it can probably be censused every third year to monitor its status without loss in statistical accuracy and credibility.

413. Maintain surveillance for pollutants that are known to affect or have the potential to affect rail populations. Excessive pollutants from, for example, pesticide residues or sewerage, can have deleterious effects on rails, either directly or indirectly. Pollution may affect reproductive success and the availability of invertebrates, the main rail dietary component. Marshes must be monitored to determine the presence of pollution problems.

414. Establish and monitor permanent vegetation transects. Permanent vegetation plots can provide insight into changing habitat conditions and suitability.

4141. Upper Newport Bay. Because Upper Newport Bay is currently one of the best California habitats for light-footed clapper rail, the condition and status of this area should be systematically and carefully evaluated. If the condition of this habitat should deteriorate, there could be significant consequences to the recovery of the light-footed clapper rail.

4142. Tijuana Marsh. Much of Tijuana Marsh was recently established by the FWS as a National Wildlife Refuge. Hence, it should be relatively easy to manage this property for the benefit of the rail; it must be adequately monitored.

4143. Anaheim Bay. This large marsh has significant potential to support considerably more rails than it currently does. It is a prime candidate for enhancement and, hence, should be carefully monitored.

42. Evaluate interrelationships of tidal dynamics and habitat quality. The tidal influence appears to substantially affect the quality and suitability of rail habitat. The exact effects of the tidal action are not well understood. Information is needed on the interrelationship of tidal action and habitat quality to elucidate additional beneficial recovery actions.

43. Determine changes in land use, vegetation distribution, and overall habitat quality. Aerial photographs can be an extremely effective, inexpensive, and a rapid method of habitat monitoring. If photos of suitable scale are available, are taken on a yearly basis (depending on economic feasibility), and if the important plant species give distinctive signatures, it may be feasible to use them to quickly update and evaluate habitat status. This may document vegetational changes associated with rail population changes.

44. Monitor invertebrate populations. The food supply of the light-footed clapper rail appears to consist almost totally of invertebrates; therefore, the information on the condition of the invertebrate populations is critical.

441. Assess species composition, numbers, density and distribution. Precise quantitative information on the invertebrate fauna, when coupled with rail foraging preferences, should provide information to determine if invertebrate levels are limiting rail populations. If so, corrective measures can then be devised to enhance the specific invertebrate populations.

442. Determine pesticide load. Pesticide contamination could have severe adverse impacts on invertebrate populations and hence, on rails. Pesticides may also influence nesting success. The amount, type, and distribution of pesticides should be analyzed on a periodic basis, so that correlations with rail reproductive success, age-class structure, and population numbers can be elucidated.

45. Monitor water quality. The suitability of the habitat is intimately tied with water quality. Adverse water conditions can negatively affect rail prey abundance and distribution, which in turn, can influence rail survival and nesting success. If poor water quality reduces rail survivorship, overall rail population numbers may be depressed, thus slowing recovery.

46. Monitor effects of sand removal and tidal enhancement on vegetation in Tijuana Marsh. By evaluating the response of vegetation to an increase in tidal action, it should be possible to determine the effectiveness of increasing tidal action. Because an increase in tidal flushing is proposed for a number of marshes, the prospects of enhancement should be better understood prior to proceeding on a large scale basis.

5. Maintain and revise essential habitat maps and descriptions. Maps and descriptions of habitat believed to be essential to the survival and well-being of the light-footed clapper rail appeared in the appendix of the original recovery plan (dated 1979). These need to be updated and modified.

6. Inform public of status of the rail and its habitat and solicit support for necessary conservation actions. An education program would be beneficial in gaining public support for the recovery program. Little of the original coastal wetland habitat remains and support from the general public to adequately protect and manage the remaining marshes for light-footed clapper rails would be helpful when

habitat modification proposals are evaluated via the public review process. An education program can involve news releases, pamphlets, presentations, informational signs, and interpretive displays.

7. Utilize existing laws and regulations pertaining to the protection of the rail and its habitat. All Federal and State regulations and laws protecting the rail and its habitat should be used in order to ensure that the relatively limited amount of habitat remaining and reduced numbers of rails do not further deteriorate.

71. Enforce existing laws and regulations. All Federal and State regulations pertaining to the conservation and recovery of the light-footed clapper rail must be vigorously enforced. Without such enforcement there will be little, if any, opportunity for the population status of the rail to improve.

72. Evaluate effectiveness of law enforcement. Additional or more extensive efforts to enforce existing laws protecting the light-footed clapper rail may be needed. Periodic evaluations will provide an assessment of needed modifications in this area.

73. Propose appropriate new regulations or revisions. Revisions in existing regulations may be necessary to enhance conservation efforts for the rails. If revisions are not adequate to further conservation and recovery goals, new legislation may be proposed.

74. Devise and implement oil spill containment strategies to protect marshes in the event of oil spills. As offshore oil and gas exploration, development and production activities increase, the threat of oil spills increases throughout the range of this species. Interagency cooperation and coordination is needed to alleviate or minimize this threat. Various of strategies are possible, the most feasible of which need to be implemented immediately.

Literature Cited

American Ornithologists' Union. 1957. Checklist of North American birds. 5th edition. Baltimore, Maryland.

Bangs, O. 1899. A new rail for southern California. Proc. New England Zool. Club 1:45-46.

Belding, L. 1883. Catalogue of a collection of birds made at various points along the western coast of Lower California, north of Cape St. Eugenio. Proc. U.S. Nat'l. Museum 5:527-532.

Bent, A. C. 1926. Life histories of North American marsh birds. U.S. National Museum. Bull. 135.

California Department of Fish and Game. 1970. California coastal wetlands survey of 1969-70. Unpubl. rept.

California Department of Fish and Game. 1973. The natural resources of San Diego Bay. Coastal Wetlands Series. #5. State of Calif., The Resources Agency, Sacramento, CA.

California Department of Fish and Game. 1976a. The natural resources of Carpinteria Marsh. Coastal Wetlands Series #13. State of Calif., The Resources Agency, Sacramento, CA.

California Department of Fish and Game. 1976b. The natural resources of Anaheim Bay. Coastal Wetlands Series #18. State of Calif., The Resources Agency, Sacramento, CA.

California Department of Fish and Game. 1976c. The natural resources of Agua Hedionda Lagoon. Coastal Weltands Series #16. State of Calif., The Resources Agency, Sacramento, CA.

Cooke, W. W. 1914. Distribution and migration of North American rails and their allies. U.S. Department of Agri. Bull. 128. 50 p.

DeGroot, D. S. 1927. The California clapper rail, its nesting habits, enemies, and habitat. Condor 29:259-270.

Edwards, H. A. 1922. Some notes on the light-footed rail. Oologist 39:60-61.

Friedmann, H., L. Griscom, and R. T. Moore. 1950. Distributional checklist of the birds of Mexico. Pacific Coast Avifauna 29.

Grinnell, J. 1915. A distributional list of the birds of California. Pacific Coast Avifauna 11.

Grinnell, J., H. C. Bryant, and T. I. Storer. 1918. The game birds of California. Univ. Calif. Press, Berkeley.

Henshaw, H. W. 1876. Report on the ornithology of the portions of California visited during the field season of 1875. Ann. Rept. upon the Geogr. Survey west of the 100th Meridian...Appendix H8 of Appendix JJ, pp. 224-278.

Johnson, R. W. 1973. Observations on the ecology and management of the northern clapper rail, Rallus longirostris crepitans Gmelin in Nassau County, New York. Ph.D. dissertation. Cornell Univ., Ithaca, New York.

Jorgensen, P. D. 1975. Habitat preference of the light-footed clapper rail in Tijuana Marsh, California. M.S. thesis, San Diego State University, San Diego, CA.

Mahall, B. E., and R. B. Park. 1976. The ecotone between Spartina foliosa Trin. and Salicornia virginica L. in salt marshes of northern San Francisco Bay. II. Soil water and salinity. J. Ecol. 64:793-810.

Massey, B. W., and R. L. Zembal. 1979. A comparative study of the light-footed clapper rail (Rallus longirostris levipes) in Anaheim Bay and Upper Newport Bay, Orange County, California. Prelim Rept. to Endangered Species Office, U.S. Fish and Wildl. Serv., Sacramento, CA.

Massey, B. W., and R. Zembal. 1982. Light-footed clapper rail census, banding, and telemetry study, 1982. Final rept. to Calif. Dept. Fish and Game, Endangered Bird and Mammal Program, Sacramento, CA.

Oberholser, H. C. 1937. A revision of the clapper rails (Rallus longirostris Boddaert). Proc. U.S. National Museum 84:313-354.

Ridgway, R., and H. Friedmann. 1941. Birds of North and Middle America. Part IX. Bull. U.S. National Museum. 50:75.

Seapy, R. R. 1981. Structure, distribution, and seasonal dynamics of the benthic community in Upper Newport Bay, California. Calif. Dept. Fish and Game, Marine Res. Tech. Rept. #46. Sacramento, CA.

Speth, J. W. 1971. The status of coastal wetlands in southern California. Paper presented at annual meeting, Western Section of the Wildlife Society.

Stephens, F. 1919. An annotated list of the birds of San Diego County, California. Trans. San Diego Soc. Nat. Hist. 3:1-40.

Van Rossem, A. J. 1929. The status of some Pacific Coast clapper rails. Condor 31:213-215.

Wahl, K. L., J. R. Crippen, and J. M. Knott. 1980. Floods of January and February 1980 in California. U.S. Geo. Survey Open File Rept. 80-1005. Menlo Park, CA.

Wilbur, S. R. 1974. The status of the light-footed clapper rail. Amer. Birds 28:868-870.

Wilbur, S. R. 1976. Taxonomic studies of clapper rails in California and Baja California, Mexico. Unpubl. manuscript.

Wilbur, S. R. and R. E. Tomlinson. 1976. The literature of the western clapper rails. U.S. Fish and Wildlife Service Special Sci. Rept. Wildl. No. 194. Washington, D.C.

Wilbur, S. R., P. D. Jorgensen, B. W. Massey, and V. A. Basham. 1979. The light-footed clapper rail: an update. Amer. Birds 33:251.

Willett, G. 1912. Birds of the Pacific slope of southern California. Pacific Coast Avifauna 7.

Zedler, J. B. 1979. Clapper rail habitat: requirements and improvement. Rept. to Sacramento Endangered Species Office, U.S. Fish and Wildl. Serv., Sacramento, CA.

Zedler, J. B., C. Nordby, and P. W. Williams. 1979. Clapper rail habitat: requirements and improvement. Rept. to Sacramento Endangered Species Office, U.S. Fish Wildl. Serv., Sacramento, CA.

Zembal, R., and B. W. Massey. 1981a. Progress Rept: Light-footed clapper rail census and telemetry study, 1981. Rept. to Calif. Dept. Fish and Game, Sacramento, CA.

Zembal, R., and B. W. Massey. 1981b. A census of the light-footed clapper rail (Rallus longirostris levipes) in California. Western Birds 12:87-99.

Zembal, R., and B. W. Massey. A study of two breeding populations of the light-footed clapper rail. Ms. unpubl.

PART III

IMPLEMENTATION SCHEDULE

The table that follows is a summary of scheduled actions and costs for the light-footed clapper rail recovery program. It is a guide to meet the objectives of the Light-footed Clapper Rail Recovery Plan, as elaborated upon in Part II, Action Narrative Section. This table indicates the priority in scheduling tasks to meet the objectives, which agencies are responsible to perform these tasks, a time-table for accomplishing these tasks, and the estimated costs to perform them. Implementing Part III is the <u>action</u> of the recovery plan that, when accomplished, will satisfy the prime objective. Initiation of these actions is subject to the availability of funds.

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

RECOVERY ACTION PRIORITIES

1 = An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.

2 = An action that must be taken to prevent a significant decline in species' population/habitat quality, or some other significant negative impact short of extinction.

3 = All other actions necessary to provide for full recovery for the species.

PART III
IMPLEMENTATION SCHEDULE
LIGHT-FOOTED CLAPPER RAIL RECOVERY PLAN

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
	Kendall-Frost Reserve										
M3	Remove exotic vegetation	1111	1	3			CDFG* UC	.5 2.5	.5 2	.5 1.5	
M3	Identify and resolve water quality problems	1112	1	1	1	EC	 CDFG* UC	1 5 10			
M6	Coordinate with vector control	1113	1	continuous	1	ES	CDFG*, MAD, UC		TBD		
	Upper Newport Bay										
M3	Restore tidal action to salt ponds	1121	1	ongoing			See Comments	200	TBD		Supported by CDFG, Irvine Co., County of Orange, City of Newport Bay.
M3	Prevent siltation	1122	1	ongoing			See Comments	3,200	TBD		Supported by CDFG, City of Newport Bay, Co., County of Orange.

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Control pollutants	1123	1	Continuous	1	EC	CDFG*, WRCB		X TBD		
M3	Control debris	1124	1	Continuous			CDFG*	7.5	5	5	
M3	Identify and resolve water quality problems	1125	1	1	1	EC	 CDFG* WRCB		1 15 TBD		
M6	Coordinate with vector control	1126	1	Continuous	1	ES	CDFG*, MAD		TBD		
	Anaheim Bay										Seal Beach NWR.
M3	Restore tidal action to surrounding uplands	1131	3	completed	1	RE		160			
M3	Determine causes of elevational differences	1132	3	2			USN*		10	5	
M3	Develop fringing freshwater marsh	1133	3	1		RE	 USN*	5 20	5 20		
M3	Create nest hummocks	1134	3	2		RE	USN	X	TBD		
M3	Enhance Spartina	1135	3	3	1	RE	CDFG*		X	TBD	
M3	Control pollutants	1136	3	continuous	1	EC	USN, WRCB		TBD	X	
M3	Control debris	1137	3	continuous			USN	7.5	5	5	

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Identify and resolve water quality problems	1138	3	ongoing			USN WRCB*	15			Funding provided to WRCB by U.S. Navy.
M6	Coordinate with vector control	1139	1	ongoing	1	ES	USN, MAD		TBD		
	South Bay Marine Reserve										
M3	Develop low marsh	1141	3	3			USN* CDFG	2.5 1	2.5 1	2.5 1	
M3	Determine feasibility of establishing Spartina	1142	3	1			USN* CDFG	1.5 .5			
M3	Control human disturbance	1143	3	3			USN	.5	.5	.5	
M3	Improve tidal channel network	1144									
M3	Create nest hummocks	1145									
	Santa Margarita River Estuary										
M3	Improve/restore tidal action	1151	3	1			USN* CDFG		X TBD		
M3	Develop fringing freshwater marsh	1152	3	1			USN		TBD X		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Create nest hummocks	1153	3	2			USN*		XTBD		
M3	Develop low marsh	1154	3	3			USN*	10	10	10	
M3	Enhance Spartina vigor	1155	3	3			USN*	10	10	10	
M3	Improve tidal channel network	1156	3	2			USN*	5	5	5	
M3	Control human disturbance	1157	3	continuous			USN*		TBD		
M5	I.D. and control predators	1158	3	continuous			USN*		TBD X		
M3	Control and reduce sedimentation	1159	3	continuous			USN*		TBD		
	Tijuana Marsh										
M3	Restore tidal circulation	1161	1	1	1	RE*	 USN	10 10			
M3	Develop fringing freshwater marsh	1162	1	3	1	RE*	 USN CDFG	5 5 5			
M3	Enhance Spartina	1163	1	3	1	RE*	CDFG USN		X TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Control human disturbance	1164	1	continuous	1	RE*		10	2.5	2.5	
							CDPR	3	2	2	
							USN	3	2	2	
M3	Control pollutants	1165	1	continuous	1	RE*	CDFG, EC		TBD	X	
						EC	USN				
M3	Control debris	1166	1	continuous	1	RE*		7.5	2	2	
							CDPR, USN	3	2	2	
M3	Identify and resolve water quality problems	1167	1	1	1	RE*	EC, CDFG, WRCB, USN, CDPR	15			
M6	Coordinate with vector control	1168	1	continuous	1	RE*	CDFG, MAD, ES, USN, CDPR		TBD		
M3	Identify potential for rails at Cocklebur Canyon	117	3	2	1	SE*		1	1		
	Carpinteria Marsh										
A7	I.D. land ownership and pursue protective measures	1211	2	1	1	SE	CDFG*		TBD		
M3	Improve/restore tidal channel network	1212	2	1			CDFG*, UCSB		X TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Identify and resolve water quality problems	1213	2	1			CDFG*		15		
M3	Control sedimentation	1214	2	continuous			CDFG*		TBD X		
M3	Develop nest hummocks	1215	2	1			CDFG*		TBD		
	San Joaquin Marsh and adjacent lands										
A7	I.D. land ownership and pursue protective measures	1221	3	1	1	SE	CDFG*		TBD		
M5	I.D. and control predators	1222	3	continuous	1	SE	CDFG*		TBDX		
M3	Control pollutants	1223	3	continuous	1	EC	CDFG*, WRCB		TBD X		
M3	Identify and resolve water quality problems	1224	3	1			CDFG*	15			
M6	Coordinate with vector control	1225	3	continuous	1	ES	CDFG*, MAD		TBD		
	Aqua Hedionda Lagoon										
A7	I.D. land ownership and pursue protective measures	1231	3	1	1	SE	CDFG*		TBD		
M3	Develop fringing freshwater marsh	1232	3	3			CDFG*	10	10	10	

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Develop high marsh	1233	3	3			CDFG*	10	10	10	
M3	Develop nest hummocks	1234	3	2			CDFG		TBDX		
M3	Develop low marsh	1235	3	3			CDFG*	10	10	10	
M3	Enhance Spartina	1236	3	3			CDFG*	X	TBD		
M3	Control disturbance	1237	3	continuous			CDFG*	X	TBD		
M5	I.D. and control predators	1238	3	continuous			CDFG*	X	TBD		
M3	Control sedimentation	1239	3	continuous			CDFG*	X	TBD		
	San Elijo Lagoon										
A7	I.D. land ownership and pursue protective measures	1241	3	1	1	SE*	CDFG		TBD		
M3	Improve/restore tidal action	1242	3	1			CDFG*	20			
M3	Develop low marsh	1243	3	3			CDFG*	10	10	5	
M3	Enhance Spartina	1244	3	3			CDFG*		X TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M5	I.D. and control predators	1245	3	continuous	1	SE	CDFG*		TBD	X	
M3	Control pollutants	1246	3	continuous	1	EC	CDFG*, WRCB		TBD	X	
M3	Control sedimentation	1247	3	continuous	1	SE	CDFG*		underway		
M3	Identify and resolve water quality problems	1248	3	1			CDFG*	15			
M6	Coordinate with vector control	1249	3	continuous		ES	CDFG*, MAD		TBD		
	San Diego Flood Control Channel										
A7	I.D. land ownership and pursue protective measures	1251	3	1	1	SE	CDFG*		TBD		
M3	Develop high marsh	1252	3	3	1	SE	CDFG*		TBD	X	
M3	Create nest hummocks	1253	3	2			CDFG*		TBD	X	
	Paradise Marsh										
A7	I.D. land ownership and pursue protective measures	12611	2	1	1	SE	CDFG*		TBD		
M3	Improve/restore tidal action	12612	2	1	1	SE	CDFG*		X TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Create nest hummocks	12613	2	2			CDFG*		X TBD		
M3	Develop low marsh	12614	2	3			CDFG*		TBD X		
M3	Determine feasibility of introducing Spartina	12615	3	3	1	SE	CDFG*		TBD	X	
M3	Improve tidal channel network	12616	2	2			CDFG*		X TBD		
M3	Control disturbance	12617	2	continuous			CDFG*		TBD		
	Sweetwater Marsh										
A7	I.D. land ownership and pursue protective measures	12621	2	1	1	SE	CDFG*		TBD		
M3	Develop fringing freshwater marsh	12622	2	3			CDFG*	10	10	10	
M3	Develop low marsh	12623	2	3			CDFG*	10	10	10	
M3	Determine feasibility of establishing Spartina	12624	2	1			CDFG*	1.5			
M3	Improve tidal channel network	12625	2	2			CDFG*		X TBD		
M3	Control disturbance	12626	2	continuous			CDFG*		X TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Identify and resolve water quality problems	12627	2	1			CDFG*		15		
M6	Coordinate with vector control	12628	2	continuous	1	ES	CDFG*, MAD		TBD		
	E Street Marsh										
A7	I.D. land ownership and pursue protective measures	12631	3	1	1	SE	CDFG*		TBD		
M3	Develop low marsh	12632	3	1			CDFG*		2.5		
M3	Determine feasibility of establishing Spartina	12633	3	1			CDFG*		1		
M3	Improve tidal channel network	12634	3	2			CDFG*		5	5	
M3	Control human disturbance	12635	3	continuous			CDFG*	1	1	1	
	F Street Marsh										
A7	I.D. land ownership and pursue protective measures	12641	3	1	1	SE	CDFG*		TBD		
M3	Improve/restore tidal action	12642	3	1			CDFG*	7.5			
M3	Develop low marsh including planting Spartina	12643	3	1			CDFG*		5		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Improve tidal channel network	12644	3	2			CDFG*		TBD		
M3	Control human disturbance	12645	3	continuous			CDFG*	2	2	2	
	J Street Marsh										
A7	I.D. land ownership and pursue protective measures	12651	3	1	1	SE	CDFG*		TBD		
M3	I.D. potential for rails	12652	3	2	1	SE	CDFG*		1 .5	1 .5	
M3	Develop low marsh	12653	3	1			CDFG*	5			
M3	Enhance Spartina	12654	3	3			CDFG*	2.5	2.5	2.5	
M3	Improve tidal channel network	12655	3	2			CDFG*		5	5	
M3	Control human disturbance	12656	3	continuous			CDFG*		X TBD		
M3	Control pollutants	12657	3	continuous	1	EC	CDFG*, WRCB		TBD		
	Otay River Mouth										
A7	I.D. land ownership and pursue protective measures	1271	3	1	1	SE	CDFG*		TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Determine potential for rails	1272	3	2	1	SE	CDFG*		1.5	1.5	
M3	Enhance Spartina	1273	3	3			CDFG*		TBD	X	
M3	Control human disturbance	1274	3	continuous			CDFG*		TBD	X	
	Preserve Baja California habitat										
A7	Coordinate and cooperate with Fauna Silvestre	1281	2	continuous	1	SE*		2	2	2	
							FS	2.5	2.5	2.5	
I1	Determine status and distribution in Mexico	1282	2	1	1	SE	FS*	10	TBD		
M3	Delineate other management actions for individual marshes in Mexico	1283	2	2	1	SE	FS*		TBD		
	Goleta Slough										
M3	Restore tidal action	2121	3	1			CDFG*	X	TBD		
M3	Develop low marsh	2122	3	3			CDFG*	10	10	10	
M3	Investigate introducing Spartina	2123	3	3			CDFG*		X	TBD	
M3	Improve tidal network	2124	3	2			CDFG*	5	5		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Control debris	2125	3	continuous			CDFG*		X TBD		
M3	Identify and resolve water quality problems	2126	3	1	1	EC	CDFG WRCB	1.0 5 10			
	Ventura River Mouth										
M2	Assess potential for rails	221	3	2			CDFG		1.5	1.5	If potential good, undertake following actions.
A7	I.D. land ownership and pursue protective measures	2221	3	1	1	SE	CDFG*		TBD		
M3	Improve/restore tidal action	2222	3	1	1	SE	CDFG*		X TBD		
M3	Control pollutants	2223	3	continuous	1	EC	CDFG*,WRCB		TBD		
	Santa Clara River Mouth										
M2	Assess potential for rails	223	3	2			CDFG*		1.5	1.5	If potential good, undertake following actions.
A7	I.D. land ownership and pursue protective measures	2241	3	1	1	SE	CDFG*		TBD		
M3	Improve/restore tidal action	2242	3	1			CDFG*		TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
	Mugu Lagoon										
M2	Assess potential for rails	225	3	2			USN*		1.5	1.5	If good potential, continue with following actions.
M3	Develop fringing freshwater marsh	2261	3	3			USN*	10	10	10	
M3	Create nest hummocks	2262	3	2			USN*		TBD		
	Malibu Lagoon										
M2	Assess potential for rails	231	3	2	1	SE*			1.5	1.5	If good potential, continue with other actions.
A7	I.D. land ownership and pursue protective measures	2321	3	1	1	SE	CDFG*		TBD		
M3	Improve/restore tidal action	2322	3	1	1	SE	CDFG*				Underway.
	Ballona Wetlands										
M2	Assess potential for rails	233	3	2			CDFG*	1.5	1.5		If good potential undertake following actions.

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
A7	I.D. land ownership and pursue protective measures	2341	3	1			CDFG*		TBD		
M3	Improve/restore tidal action	2342	3	3			CDFG*	25	25	25	
M3	Develop fringing freshwater marsh	2343	3	3			CDFG*	15	10	10	
M3	Create nest hummocks	2344	3	2			CDFG*		TBD X		
M3	Develop low marsh	2345	3	3			CDFG*	10	10	10	
M3	Enhance Spartina	2346	3	3			CDFG*		TBD X		
	Cabrillo Wetlands										
M2	Assess potential for rails	235	3	2			CDFG*		1.5	1.5	
A7	If good potential I.D. land ownership and pursue protective measures	236	3	1	1	SE	CDFG*		TBD		
	Cerritos Wetlands										
M2	Assess potential for rails	237	3	2			CDFG*			1.5	To be completed FY-4. If good potential, undertake following actions.

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
A7	I.D. land ownership and pursue protective measures	2381	3	1	1	SE	CDFG*		TBD		
M3	Create nest hummocks	2382	3	2			CDFG*		TBD		
M3	Create low marsh	2383	3	3			CDFG*		TBD X		
M3	Enhance Spartina	2384	3	3	1	SE	CDFG*		TBD X		
	Bolsa Chica										
M2	Assess potential for rails	241	3	2			CDFG*		TBD		
A7	I.D. land ownership and pursue protective measures	2421	3	1			CDFG*			1.5	If good potential, undertake additional actions.
M3	Improve/restore tidal action	2422	3	1			CDFG*		X TBD		
M3	Develop fringing freshwater marsh, high marsh, and low marsh	2423	3	3			CDFG*		TBD	X	
M3	Create nest hummocks	2424	3	2			CDFG*		TBD X		
M3	Enhance Spartina	2425	3	3			CDFG*		TBD X		
M3	Improve tidal channel network	2426	3	2	1	SE	CDFG*		X TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Control human disturbance	2427	3	continuous			CDFG*		TBD	X	
M3	Identify and resolve water quality problems	2428	3	1			CDFG*			15	
M6	Coordinate with vector control	2429	3	continuous	1	ES	CDFG*, MAD		TBD		
	Santa Ana River Mouth										
M2	Assess potential for rails	243	3	2			CDFG*			1.5	If good potential, undertake following actions.
A7	I.D. land ownership and pursue protective measures	2441	3	1	1	SE	CDFG		TBD		
M3	Improve/restore tidal action	2442	3	1			CDFG*			10	
M3	Develop fringing freshwater marsh	2443	3	3			CDFG*			5	
M3	Develop low marsh including planting of Spartina	2444	3	3			CDFG*			5	
M3	Improve tidal channel network	2445	3	1			CDFG*			5	
M3	Control sedimentation	2446	3	continuous			CDFG*		TBD X		
M3	Identify and resolve water quality problems.	2447	3	1			CDFG*		TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
	Buena Vista Lagoon										
M2	Assess potential for rails	251	3	2			CDFG*		1.5	1.5	If good potential, undertake following actions.
A7	I.D. land ownership and pursue protective measures	2521	3	1	1	SE	CDFG*		TBD		
M3	Develop high marsh	2522	3	2	1	SE	CDFG*	5 10		5 10	
	Batiquitos Lagoon										
M2	Assess potential for rails	253	3	2			CDFG*	1.5			If good potential, undertake following actions.
A7	I.D. land ownership and protective measures	2541	3	1			CDFG*		TBD		
M3	Improve/restore tidal action	2542	3	1	1	SE	CDFG*		TBD	X	
M3	Develop fringing freshwater marsh	2543	3	3	1	SE	CDFG*		TBD	X	
M3	Develop low marsh including planting Spartina	2544	3	3	1	SE	CDFG*		TBD	X	

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
	San Dieguito Lagoon										
M2	Assess potential for rails	255	3	2			CDFG*	1.5	1.5		If good potential, undertake following actions.
A7	I.D. land ownership and pursue protective measures	2561	3	1	1	SE	CDFG*		TBD		
M3	Improve/restore tidal action	2562	3	1	1	SE	CDFG*		TBD	X	
M3	Develop fringing freshwater marsh	2563	3	3	1	SE	CDFG*		TBD	X	
M3	Create nest hummocks	2564	3	2			CDFG*		TBD	X	
M3	Create low marsh including planting Spartina	2565	3	3	1	SE	CDFG*		TBD	X	
	Los Penasquitos Lagoon										
M2	Assess potential for rails	257	3	2			CDFG*	1.5	1.5		If good potential, undertake additional actions.
A7	I.D. land ownership and pursue protective measures	2581	3	1	1	SE	CDFG*		TBD		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
M3	Improve/restore tidal action	2582	3	1	1	SE	CDFG*		X TBD		
M3	Develop fringing freshwater marsh	2583	3	3	1	SE	CDFG*		TBD	X	
M3	Develop low marsh including planting Spartina	2584	3	3	1	SE	CDFG*		TBD	X	
M3	Control sedimentation	2585	3	continuous	1	SE	CDFG*		TBD	X	
M3	I.D. water quality problems	2586	3	1		EC	CDFG*			5	
M3	Improve tidal channel network	2587	3	1			CDFG*			TBD	
M2	Assess potential for rails at Dairy Mart Pond & control human disturbance.	2591	2	2		CDFG*		.5	.5		
M2	Determine potential for rails at San Mateo Creek Marsh	2592	3	2			USN*		1.5	1.5	
M2	Determine potential for rails at Las Pulgas Creek	2593	3	2			USN*		1.5	1.5	
M2	Determine potential for rails at Los Flores Marsh	2594	3	2			USN*		1.5	1.5	
I3	Determine parameters limiting population at Mugu Lagoon	311	3	3	1	SE*		3	3	3	
							USN	1	1	1	
							CDFG	1	1	1	

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
I3	Determine parameters limiting population at Anaheim Bay	312	1	3	1	RE*		5.0	5.0	5.0	
							CDFG	2.5	2.5	2.5	
I3	Investigate factors limiting rail pop. size in other marshes.	313	1	TBD	1	SE*			TBD		
I2	Investigate Spartina community dynamics	32	1	3	1	SE*		8	8	8	
							CDFG	2	2	2	
I14	Examine rail population dynamics	33	1	3	1	SE*		10	10	10	
							CDFG				
I3	Assess rail habitat requirements	34	1	3	1	SE*		10	10	10	
I3	Analyze rail habitat utilization patterns	35	1	3	1	SE*		5	5	5	
I14	Examine rail breeding biology	36	2	3	1	SE*		5	5	5	
I14	Determine foraging time budgets in different habitats	37	2	3	1	SE*		5	5	5	
I14	Assess growth rate and development	38	3	3	1	SE*				3	

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
I1	Determine numbers, distribution, population trends on annual basis in U.S.	411	1	continuous	1	SE	CDFG*	5 5	5 5	5 5	
I1	Surveys to determine numbers and distribution every third year in Mexico	412	2	continuous	1	SE*		10		10	
I12	Maintain surveillance for pollutants	413	1	continuous	1	SE	CDFG*	X	TBD		
	Establish and monitor permanent vegetation transects										
I2	Upper Newport Bay	4141	1	continuous			CDFG	2.5	2.5	2.5	
I2	Tijuana Marsh	4142	1	continuous	1	RE*		2.5	2.5	2.5	
I2	Anaheim Bay	4143	1	continuous	1	RE*		4	4	4	
I2	Evaluate interrelationships of tidal dynamics and habitat quality	42	2	3			CDFG*	X	TBD		
I2	Determine changes in land use, vegetation distribution, and overall habitat quality	43	3	1			CDFG*	1.5			
I14	Assess spp. composition, density, distribution of invertebrate populations	441	2	3			CDFG*		10	10	

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
I12	Determine pesticide load on invertebrate populations	442	2	3			CDFG*		5	5	To be completed FY-4.
I12	Monitor water quality	45	2	ongoing	1	SE	CDFG*	X	TBD		
I2	Monitor effects of sand removal on vegetation in Tijuana Marsh	46	2	3	1	SE	CDFG*	X	TBD		
I2	Maintain and revise essential habitat maps	5	3	1	1	SE*		.5			
01	Inform public of rail program status and conservation efforts	6	3	ongoing	1	SE	CDFG*		TBD		
02	Enforce existing laws and regulations	71	1	ongoing	1	LE	CDFG*	X	TBD		
02	Evaluate effectiveness of laws	72	3	continuous	1	LE	CDFG		.5 0.5		

General Category	Plan Task	Task No.	Priority	Duration of Task[1] (yrs)	Responsible Agency*[2] FWS Region	FWS Program	Other	Fiscal Year Costs (est.) ($1,000) 1	2	3	Comments/Notes
03	Propose appropriate new laws/regulations	73	3	continuous	1	LE			.5		
							CDFG		.5		
M7	Develop and implement oil containment strategies	74	1	ongoing	1	SE					
							MMS		TBD		

* = Agency with lead responsibility
"x" = Denotes desired start date
[1]Continuous = Continuing once task begun
[2]Ongoing = Currently underway
FWS = U.S. Fish and Wildlife Service (ES = Endangered Species, RE = Refuges, LE = Enforcement, EC = Environmental Contaminant)
CDFG = California Department of Fish and Game
CDPR = California Department of Parks and Recreation
WRCB = Water Resources Control Board
MAD = Mosquito Abatement District
UCSB = Univ. Calif. Santa Barbara
FS = Fauna Silvestre (Mexico)
UC = University of California Regents
USN = U.S. Navy (includes U.S. Marine Corps)
MMS = Minerals Management Service

APPENDIX I

Habitat Descriptions and Factors Involved in Habitat Management/Maintenance

A brief description (taken mainly from Zembal and Massey 1981b) of each of the California marshes in which light-footed clapper rails have been recently observed (i.e., since the late 1970's) and problems associated with individual marsh management follows. All marshes are in San Diego County unless otherwise noted.

Carpinteria Marsh, Santa Barbara County, consists of about 53 ha (133 ac) of Salicornia - dominated salt marsh vegetation (California Department of Fish and Game 1976a). No Spartina is present. The ocean entrance is sufficiently large to provide a good tidal prism. Sand and mudflats compose more than 8 ha (20 ac).

Anaheim Bay in Orange County, contains 226 ha (565 ac) of salt marsh vegetation within the Seal Beach National Wildlife Refuge (managed by the U.S. Fish and Wildlife Service, owned by the U.S. Navy) (California Department of Fish and Game 1976b). Spartina grows vigorously in several portions of the bay; there is very limited freshwater marsh vegetation. The marsh contains all littoral zones with a full tidal prism. The 24 ha (60 ac) of mudflats are fully exposed at low tide.

Upper Newport Bay, Orange County, consists of approximately 100 ha (250 ac) of salt marsh vegetation. Tall, dense stands of Spartina are extensive. Freshwater marsh vegetation is abundant along the bay's perimeter. All littoral zones are present and tidal flow is unrestricted. This is one of the best habitats for light-footed clapper rail.

Santa Margarita Lagoon is a 120 ha (300 ac) salt marsh with an infrequently open ocean connection and is the property of the U.S. Marine Corps (California Department of Fish and Game 1970). The area is dominated by Salicornia and tidal influence mainly from seepage under the barrier beach, although for the past three years the mouth of the lagoon has been open.

Aqua Hediunda consists of a small Salicornia marsh of 6.4 ha (16 ac) in the eastern portion of the lagoon (California Department of Fish and Game 1976c), which intergrades into brackish water habitat. In the later habitat, Typha, Scirpus, and Juncus sp. are prevalent over roughly 2 ha (5 ac).

The Kendall-Frost Reserve in the northern end of Mission Bay contains 8.4 ha (21 ac) of salt marsh, has unrestricted tidal influence, and contains all littoral zones. Stands of healthy, tall, dense Spartina and abundant, vigorous Salicornia are notable components of this last remaining salt marsh in Mission Bay.

The salt marsh at the mouth of Paradise Creek consists of 20 ha (50 ac) and represents one segment of the San Diego Bay marsh complex on the east side of the bay. Limited Spartina is present in contrast to Salicornia which dominates the marsh vegetation.

In Sweetwater Marsh, the approximate 52 ha (129 ac) of salt marsh vegetation is dominated by Salicornia (California Department of Fish and Game 1973). Few dense stands of Spartina are present and there is no freshwater marsh vegetation. Larger channels have full tidal prism. Human trespass is substantial at this site, particularly by fisherman, hikers, and illegal aliens.

The E Street Marsh, part of the San Diego Bay marsh complex, consists of 12 ha (30 ac) of salt marsh (California Department of Fish and Game 1973) dissected by a causeway. Upper salt marsh vegetation dominates; no freshwater vegetation is present. Unrestricted tidal influence provides for a system of small and large tidal channels.

The F Street Marsh is a small [probably less than 4 ha (20 ac)] remmant Salicornia marsh. One main channel has sluggish tidal action. The entire marsh is subject to human intrusion; partly because of its location near several roads and because it is mostly upper marsh, much of the foot-traffic in the area goes through rather than around the marsh.

The South San Diego Marine Reserve is a small [about 5.2 ha (13 ac)], but, apparently healthy salt marsh in which Salicornia predominates.

Although some sparse Spartina does occur, it is not vigorous. A series of creeks are exposed to tidal influence. Recent extensive human intrusion by persons collecting edible shellfish and perhaps bait, threatens the small population of clapper rails in this marsh. The threat primarily arises from harassment.

Tijuana Marsh, much of which was recently acquired by the U.S. Fish and Wildlife Service as part of the National Wildlife Refuge System, lies just north of the Mexican border, and contains 157 ha (392 ac) of salt marsh and 40 ha (100 ac) of tidal creeks and mudflats (Jorgensen 1975). Some of the marsh is owned by the U.S. Navy and State of California. Full tidal prism was provided by an ocean outlet, and all littoral zones were present; however, severe storms since 1980 have significantly reduced the tidal prism. Tall, dense stands of Spartina have provided habitat for one of the largest concentrations of light-footed clapper rails in California.

APPENDIX II

Agencies Requested to Provide Comments During Agency Review -

Commanding Officer
U.S. Navy
Pacific Missile Test Center
Point Mugu, CA 93402

Manager
U.S. Navy-Naval Fac. Engr. Comd.
Natural Resource Management Br.
P.O. Box 727-Code 243
San Bruno, CA 94066

Commanding Officer
U.S. Marine Corps
Camp Pendleton Marine Corps B.
Camp Pendleton, CA 92055

Refuge Manager
U.S. Fish & Wildlife Service
Kern-Pixley NWR
P.O. Box 219
Delano, CA 94216

Executive Director
California Coastal Commission
South Coast Region
245 West Broadway
Long Beach, CA 90802

Chairmen
Water Resource Control Board
1416 Ninth Street
Sacramento, CA 95814

District Manager
Orange County
Vector Control District
P.O. Box 87
Santa Ana, CA 92707

County of San Diego
Planning Department
5201 Ruffin Rd.
San Diego, CA 92123

Commanding Officer
U.S. Navy
Naval Weapon Stat. Seal Beach
Seal Beach, CA 90740

Commanding Officer
U.S. Navy
Naval Air Station North Island
San Diego, CA 92135

Refuge Manager
U.S. Fish & Wildlife Service
Salton Sea NWR
P.O. Box dd
Calipatria, CA 92233

Executive Director
California Coastal Commission
South Central Coast District
925 De LaVina Street
Santa Barbara, CA 93101

Director
California Dept. Fish & Game
1416 Ninth Street
Sacramento, CA 95814

Manager
Mosquito Abatement District
12107 W. Jefferson Bl
Culver City, CA 92302

Director
County of Orange
Environmental Mgmt. Agency
P.O. Box 4048
Santa Ana, CA 92702

Manager
San Diego County
Vector Control
5201 Ruffin Rd.
San Diego, CA 92123

Appendix II Cont'd

Division Manager
Ventura Co. RMA Planning
800 S. Victoria Ave.,
Ventura, CA 93009

Ventura County
Environmental Health Dept.
800 S. Victoria Ave.,
Ventura, CA 93009

Los Angeles City
Planning Department
200 North Spring Street
Los Angeles, CA 90012

City of Newport Beach
3300 Newport Blvd.,
Newport Beach, CA 92663

City of San Diego
Planning Department
202 C Street
San Diego, CA 92101

City of San Diego
Environmental Quality Dept.
202 C Street
San Diego, CA 92101

President
Irvine Company
550 Newport Center Dr.,
Newport Beach, CA 92660

Manager
Univ. of Calif., Santa Barbara
Carpinteria Salt Marsh Reserve
Marine Science Inst.
Santa Barbara, CA 93106

Manager
Univ. of Calif. Scripps Inst.
Kendall-Frost Mission Bay Marsh
San Diego, CA 92093

Director
University of California
Natural Reserve System
2120 University Ave.,
Berkeley, CA 94720

Regents
University of California
2111 Bancroft Way
Berkeley, CA 94720

Univ. of California Santa Barbara
Dept. of Biological Sciences
Santa Barbara, CA 93106

Manager
Univ. of Calif. Irvine
San Joaquin Fresh Water Marsh
Department of Ecology & Environment
Irvine, CA 92717

Director
Los Angeles Co. Dept. Reg. Plan
320 West Temple
Los Angeles, CA 90012