LIGHT-FOOTED RIDGWAY'S (=CLAPPER) RAIL

(*Rallus obsoletus* (=*longirostris*) *levipes*)

5-YEAR REVIEW:

Summary and Evaluation

Photo: USFWS, San Diego National Wildlife Refuge

U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
Carlsbad, California

July 7, 2020

5-YEAR REVIEW

Light-footed Ridgway's (=clapper) rail
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I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

We, the U.S. Fish and Wildlife Service (Service or USFWS), are required by section 4(c)(2) of the Endangered Species Act of 1973 (Act), as amended, to conduct a review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species (delisted), be changed in status from endangered to threatened (downlisted), or be changed in status from threatened to endangered (uplisted). Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

The light-footed Ridgway's rail (*Rallus obsoletus levipes*; formerly the light-footed clapper rail, *R. longirostris levipes*; see Appendix A) is a medium sized, tawny, and gray-brown colored marsh bird that generally inhabits coastal marshes, lagoons, and some freshwater habitats in Southern California, United States, and northern Baja California, Mexico. In their estuarine environments during low tide, rails take advantage of the foraging opportunity provided in the lower marsh and mudflat edges (Meanley 1985, p. 8). During high tide, rails seek refuge in the upper marsh vegetation, which provides further foraging opportunity and protection from predation (Zembal *et al.* 1989, p. 42). At the time of listing (1969), a statewide abundance estimate was not available for the rail; however, annual estimates began in 1980 and have shown fluctuating but increasing trend from 203 pairs to 308 pairs in 2019. The light-footed Ridgway's rail was listed as federally endangered on March 8, 1969 (USFWS 1969, p. 5034) and State endangered in California on June 27, 1971. The species was also listed on the official list of at-risk species in Mexico on March 6, 2002 (SEMARNAT 2002).

Methodology Used to Complete This Review:

This review was prepared by Sandra Hamilton, Gjon Hazard, and past staff member Andrea Currylow, at the Carlsbad Fish and Wildlife Office (CFWO), following the Region 8 guidance issued in March 2008. We used information from the 1985 final revised recovery plan (USFWS 1985b), the addendum to the recovery plan (USFWS 2019c), the 2009 5-year review (USFWS 2009), and the 2018 Light-footed Ridgway's rail Species Report (USFWS 2018b). We also reviewed studies and reports available in the scientific literature, census information from experts who have been monitoring the species, and data from the California Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Wildlife. The 1985 final revised recovery plan, census reports, and personal communications with experts were our primary sources of information used to update the species' status and threats. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing or since the last 5-year review. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all this information to evaluate the listing status of the species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

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Recommended Citation:

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Federal Register (FR) Notice Citation Announcing Initiation of This Review:

A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the *Federal Register* on July 26, 2019 (USFWS 2019a, pp. 36116–36118). We received one response from the public or outside agencies.

Listing History:

Original Listing

FR Notice: 34 FR 5034 (USFWS 1969, p. 5034)

Date of Final Listing Rule: March 8, 1969

Entity Listed: Light-footed clapper [= Ridgway's] rail (*Rallus longirostris* [= *obsoletus*] *levipes*), a bird subspecies (see Appendix A).

Classification: Endangered

State Listing

The light-footed clapper [Ridgway's] rail (*Rallus longirostris* [*obsoletus*] *levipes*) was listed by the State of California under the California Endangered Species Act as endangered on June 27, 1971 (CDFW 2019).

Associated Rulemakings:

None

Review History:

The USFWS initiated a 5-year review of light-footed Ridgway's rail on July 22, 1985 (USFWS 1985a). The results of the review were published on July 7, 1987 (USFWS 1987). No change was proposed in that notice. Threats and recovery criteria were updated in the 1985 final revised recovery plan (USFWS 1985b). The USFWS initiated a 5-year review of this taxon on March 5, 2008 (USFWS 2008) and the results were published on May 21, 2010 (USFWS 2009). Again, no change in status was proposed.

Species' Recovery Priority Number at Start of 5-Year Review:

The recovery priority number for light-footed Ridgway's rail is "6" according to the USFWS's Threatened and Endangered Species System database. This value is based on a 1–18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (USFWS 1983, pp. 43098–43105). This recovery priority number indicates that the taxon is a subspecies facing a high degree of threat and has a low recovery potential.

Recovery Plan or Outline:

Name of Recovery Plan Addendum: Recovery Plan Amendment for the Light-footed Ridgway's Rail

Date Issued: October 4, 2019

Name of Recovery Plan: Light-Footed Clapper Rail Recovery Plan

Date Issued: June 24, 1985 (revised)

Dates of Previous Revisions: July 1979

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Endangered Species Act defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. The 1996 Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Act (USFWS 1996, pp. 4722–4725) clarifies the interpretation of the phrase "distinct population segment" for the purposes of listing, delisting, and reclassifying species under the Act. The light-footed Ridgway's rail is not listed as a DPS. There is no new relevant information that would lead to the consideration of listing this taxon as a DPS in accordance with the 1996 policy.

Information of the Species and its Status

Changes in Taxonomic Classification or Nomenclature

Originally listed in 1969 as the light-footed clapper rail (*Rallus longirostris levipes*), we follow the best available scientific information and now recognize this taxon as the light-footed Ridgway's rail (*Rallus obsoletus levipes*) (Maley and Brumfield 2013, p. 326; Chesser *et al.* 2014, p. 5; Eddleman and Conway 2018, unpaginated). This name change in the scientific literature does not, in itself, affect the listed entity for the purposes of the Act. At the time this 5-year review was conducted (2020), the list of threatened and endangered animals (50 CFR 17.11[h]) did not reflect this name change. For more details about the taxonomic and nomenclatural history and its interaction with interpretation of the historical and current range of the subspecies, please refer to Appendix A.

Species Description

The light-footed Ridgway's rail (*Rallus obsoletus levipes*) is a reclusive hen-sized marsh bird with compact body; slightly down-curved, heavy bill that is longer than its head; and a short upturned tail (Jorgensen and Baron 1994, p. 161). Adults are 32–41 centimeters (12–16 inches) long with a mass of 160–400 grams (5.6-14 ounces). Males are slightly larger than females but otherwise identical in plumage (Eddleman and Conway 1998, p. 2). The back is dull gray-brown with dark streaking and pale barring on the flanks. The chest and neck are cinnamon in color and the head mostly gray except for a light buff patch on the chin and a pale supraloral stripe from the base of the bill to the top of the eye (USFWS 2009, p. 3). The legs and toes are dull yellow-gray and long relative to body size (Eddleman and Conway 1998, p. 2). Juveniles are downy and range in coloration from dull to dark gray, with black flanks and sides and paler bill (Eddleman and Conway 1998, p. 2).

Species Biology and Life History

The light-footed Ridgway's rail (*Rallus obsoletus levipes*) is a reclusive bird that resides in marsh habitats of coastal Southern California and northern Baja California, Mexico (USFWS 2009, pp. 3–4). Rails are predominantly crepuscular, resting throughout the middle of the day with activity peaking during the mornings and evenings (Zembal *et al.* 1989, pp. 40–41; Taylor 1996, p. 121). The rail is an omnivorous and opportunistic forager with a broad diet, living hidden among dense vegetation (Zembal and Fancher 1988, p. 962). Typical foraging behavior includes hunting by sight, scavenging, shallowly probing water and mud, diving, and gleaning the marsh surface (USFWS 1985b, p. 9; Zembal and Fancher 1988, p. 959). The birds forage throughout the estuary and surrounding habitats, with considerable foraging occurring among the higher marsh dominated by *Salicornia* spp., *Limonium californicum*, and *Triglochin* spp. (USFWS 1985b, p. 8; Zembal *et al.* 1989, p. 41). Rails are known to feed at vegetated marsh edge-mudflat ecotones, along muddy creek banks, in freshwater vegetation, in ditches and ponded water, and more rarely in upland areas and in open mudflats (USFWS 1985b, p. 8; Zembal and Fancher 1988, p. 960; Zembal *et al.* 1989, p. 41). The diet comprises upland and marsh fauna such as tadpoles (*Hyla* sp.), California killifish (*Fundulus parvipinnis*), California voles (*Microtus californicus*), beetles (*Coleoptera*), various snails (including *Helix* spp., *Cerithidea californica,* and *Melampus olivaceus*), fiddler and hermit crabs (including *Pachygrapsus crassipes*, *Hemigrapsus oregonensis*, and *Uca crenulata*), crayfish, isopods, other decapods, and some plant material (Jorgensen 1975, p. 32; Wilburn *et al.* 1979, p. 251; USFWS 1985b, p. 9).

Light-footed Ridgway's rails may fly, dive underwater, or swim across channels if harassed, but prefer to walk or run amid dense marsh vegetation, moving in irregular paths with neck outstretched and tail erect (Jorgensen 1975, pp. 5–6; Eddleman and Conway 1998, p. 12). It is presumed that rails maintain small home ranges once a territory is established (Zembal *et al.* 1989, p. 41). One study recorded distances travelled within-marshes to be generally less than 400 m (0.2 mile), with a mean home range size of 0.8 ha (2.0 acres; Zembal *et al.* 1989, p. 40). However, records of several young birds have shown that they may disperse long distances across the species' range, including a maximum recorded distance of 257 kilometers (km) (160 miles (mi); Zembal *et al.* 1985, p. 169; Zembal *et al.* 2010, p. 18; Zembal *et al.* 2017, p. 3637). Records also exists for inter-marsh movements, including among inland patches of marshes (Zembal *et al.* 1985, p. 169).

Rails released as part of a zoological breeding program in one marsh have been re-sighted in other marshes (Zembal *et al.* 2010, p. 18). In 1982, a banded male was found to be 22 km (14 miles) from its previously known location (Zembal *et al.* 1985, p. 169). In another case, a captive-bred female released in 2004 was photographed 106 days later in another marsh 145 km (90 miles) away (Zembal *et al.* 2010, p. 18); and one captive-raised male was found deceased 161 km (100 miles) up the coast 2 weeks after his release in 2015 (Zembal *et al.* 2017, p. 37).

The longest recorded distance was in 2009 by a captive-raised female (aka "Amelia") which was released and subsequently recaptured at the facility where she was hatched and reared, 258 km (160 miles) from the release site (Zembal *et al.* 2017, p. 36). These long-distance movements may be attributed to the dispersal of young to find suitable and unoccupied habitat, and may be important for the species to avoid inbreeding depression and maintain adaptive capabilities through representation (Zembal *et al.* 1985, p. 170; Grant *et al.* 2007, p. 434).

Breeding and nesting begins in March when males start to construct nests in the low marsh out of dead *Spartina* stems placed approximately 10–46 centimeters above the ground (Eddleman and Conway 1998, p. 14; Zedler 1993, p. 128; Massey *et al.* 1984, p. 78). Nesting site selection involves balancing flood avoidance and predator avoidance; sites at higher elevations within a marsh have a lower risk of flooding but typically have less dense plant cover, while sites at lower elevations have a higher risk of flooding but denser cover (Eddleman and Conway 1998, p. 14). The ideal nesting site is located within tall (> 60 cm) cordgrass (*Spartina foliosa*) so that the blades may be folded over the nest, creating a camouflaging dome canopy that is high enough to allow the nest to float up during higher tides (Zedler 1993, p. 123; Figure 1). To ensure the nest does not float away in the tide, the outer edges of the nest are typically woven into the surrounding vegetation. Nests also commonly have one or two ramps of dead cordgrass connecting the nest platform to the ground (Massey *et al.* 1984, p. 71). Although cordgrass is often an important habitat feature for light-footed Ridgway's rails, the species also nests in other vegetation types, including pickleweed, tumbleweeds, and other debris, especially when tall, dense cordgrass is unavailable (Zedler 1993, p. 124).

Though the details of courtship are greatly unknown, it is believed to begin with males' *kek*-calling to entice females to the nest (Eddleman and Conway 1998, p. 13). Once paired, rails are monogamous throughout the breeding season likely due to the demands of incubation and rearing chicks (Eddleman and Conway 1998, p. 13; USFWS 2009, p. 4). Egg laying occurs from April to May, clutches comprise 4–8 eggs, and incubation lasts 18–27 days (USFWS 1985b; USFWS 2009, pp. 5–6). Both parents participate in incubation and rearing of chicks; one forages while the other broods. Rail chicks are semi-precocial and unable to move from the nest at first (Eddleman and Conway 1998, p. 17). Chicks are continually brooded for the first few days but once the young are mobile, a second, brooding nest is constructed and the birds move between them. Chicks are pure black, camouflaged against the mudflat and vegetative shadows of the habitat. Young rails remain under parental care for 5–10 weeks (Eddleman and Conway 1998, p. 17). Fledging occurs at 10 weeks after which juveniles leave the nest (Eddleman and Conway 1998, p. 18). Though adult rails are territorial during the breeding season, they later become less defensive when young rails begin searching for their own territories (Zembal *et al.* 1989, p. 42).

Records on the longevity of the light-footed Ridgway's rail are scarce, and there have been no directed studies on the topic. Rails are generally thought to live only a few years; however, several anecdotal re-sightings of banded rails suggest otherwise. There have been several re-sightings of banded rails around 3 years since their releases (Zembal *et al.* 2006, p. 29; Zembal *et al.* 2017, p 37), one sighted 5.5 years after its release (Zembal *et al.* 2006, p. 3, 29); and another ("Amelia") hatched in 2009 and re-sighted in 2015 (Zembal *et al.* 2017, p 37). Similarly, there is a record of a closely related clapper rail (*Rallus crepitans*) in New Jersey that was banded on May 1971 and shot December 1977, for a minimum age of 6.5 years (Rush *et al.* 2018, web).

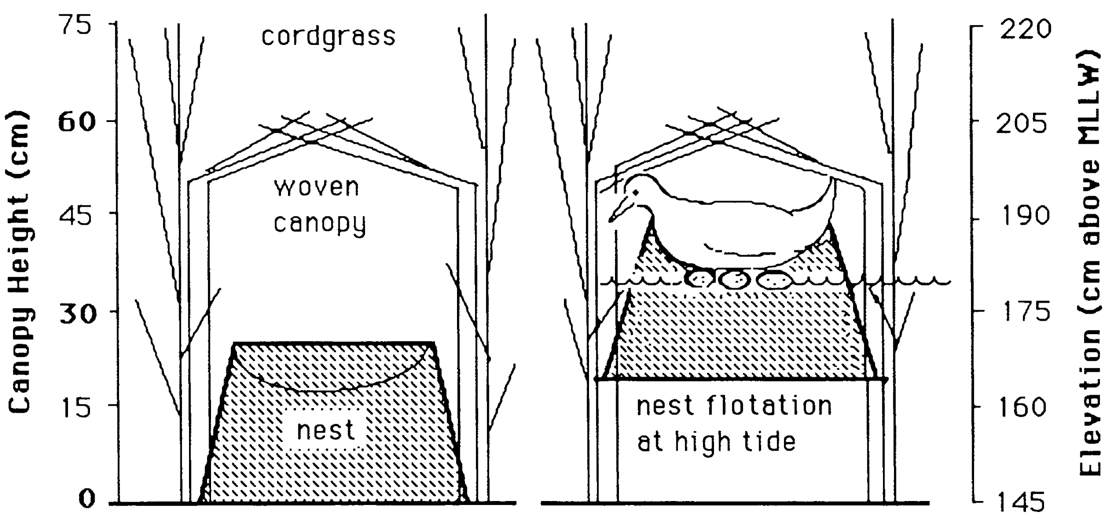

Figure 1. *Diagram of light-footed Ridgway's rail nest at low tide (left) and high tide (right). Ideal cordgrass height is 60–90 cm for the construction of a dome canopy that camouflages and protects the nest. Image from Zedler 1993; used with permission.*

Habitat or Ecosystem

The light-footed Ridgway's rail generally resides in coastal marshes (estuaries) of Southern California and northern Baja California, Mexico (Jorgensen and Baron 1994, p. 161; USFWS 2009, pp. 3–4) (see also Appendix A). Occasionally, observers have seen the subspecies in small numbers at freshwater marshes within about 32 km (20 mi) of the coast (Willett 1906, p. 151; Zembal *et al.* 2007, p. 20; Konecny Biological Services 2008, p. 3; eBird 2019). Coastal marshes occur at the interface between two hydrologic systems, where inland freshwater meets and mixes with marine saltwater. These estuaries are dynamic habitats that change daily with the tides, seasonally with the weather, and interannually with the climate. Under natural conditions, many west coast estuaries are typically subject to seasonal mouth closure (Jacobs *et al.* 2011, p. 1). The frequency and duration of the closure is highly dependent on the unique geomorphic processes, episodic streamflow and sedimentation of the local area (Jacobs *et al.* 2011, pp. 5–7). However, anthropogenic changes to the hydrology, such as ditching and tidal restriction, of many Southern California estuaries has resulted in an alteration of this pattern (see 'Changes in Hydrology' under the 'Factor A' threats analysis, below; Gedan *et al.* 2009, p. 127).

In addition to seasonal changes, tidal influence creates daily variation in the coastal marsh habitat light-footed Ridgway's rails reside in. The occurrence of salt water tidal flooding and small variations in marsh elevation generally create ecologically distinct zones referred to as low marsh, mid marsh and high marsh. The variations in flooding and elevation create a difference in the abiotic factors of each zone, in turn determining the plants and organisms that occupy those areas (Grewell *et al.* 2007, p. 137). Light-footed Ridgway's rails adjust their behavior within these dynamics. For example, during low tide, rails take advantage of the foraging opportunity provided in the shallower water of the lower marsh and mudflat edges (Meanley 1985, p. 8). During high tide, rails seek refuge in the upper marsh vegetation, which provides further foraging opportunity and protection from predation (Zembal *et al.* 1989, p. 42).

The high marsh habitat includes sufficient cover, generally of prevalent *Salicornia pacifica* (pickleweed), *Limonium californicum* (California sea lavender), *Juncus acutus leopoldii* (southwestern spiny rush), and *Triglochin maritima* (arrowgrass). Though *S. pacifica* has historically been widely used for nesting by the rail (Bent 1926, pp. 273–274; Massey *et al.* 1984, p. 78) and still dominates upland habitats, *J. a. leopoldii* is now also recognized to be very important for high-marsh nest placement (Zembal *et al.* 2017, p. 11).

In the low marsh zone, rails use vegetated mudflat areas to take cover, forage, and nest; at low tide, rails will venture out into the exposed unvegetated areas for additional foraging opportunities. Low marsh vegetation generally consists of dense *Spartina foliosa* (cordgrass), the preferred nesting habitat of the rail. Suitable cover and nesting *S. foliosa* is defined as having a density of at least 100 stems/m^2 with at least 90 percent of stems $\geq$ 60 cm in height and 30 percent $\geq$ 90 cm in height (Zedler 1993, p. 123). Evidence suggests that freshwater influence is needed to allow the *Spartina* to grow to this height and density (Phleger 1971, entire; Parrondo *et al.* 1978, pp. 104–105). Though little is known of the light-footed Ridgway's rail habits in freshwater systems, rails may take cover and nest in *Schoenoplectus acutus* (tule; hardstem bulrush) stalks and reeds (Willett 1906, p. 151), and more recently nests have been found in *Typha* spp. (cattails), *Shoenoplectus* spp. (bulrush) and *J. acutus* (spiny rush; Zembal *et al.* 2007, p. 21; Konecny Biological Services 2008, p. 1; Zembal, Hoffman, Gailband, and Konecny 2016, pp. 24, 32).

While the majority of rails occur in coastal estuaries, light-footed Ridgway's rails have been increasingly found in freshwater marshes away from the immediate coast (See 'Spatial Distribution' below). Additional research is needed to better understand how and to what extent the subspecies uses freshwater marshes; therefore, our focus is on coastal estuaries in the following discussion.

Spatial Distribution

Historically, the range of the light-footed Ridgway's rail extended along the Pacific coast from Santa Barbara, California, United States in the north to (according to most authors) Bahía de San Quintín, Baja California, Mexico in the south (Cooke 1914, p. 18; Grinnell *et al.* 1918, p. 290) (see Appendix A). Because the rail is primarily restricted to coastal estuaries, which occur (now and historically) in discrete locations along the coast, the subspecies' historical distribution was naturally discontinuous. In the early 1900s, ornithologists began to notice a decrease in the abundance and distribution of rails (Willett 1912, p. 32; Grinnell 1915, p. 46), primarily because of the loss of habitat from development or modification. In California, it is estimated that 91 percent of all wetlands and 75 percent of estuarine habitat has been lost or altered (Stein *et al.* 2014, p. 25; Yuhas 2016). Additionally, two-thirds of 28 larger estuaries in Southern California have been dredged or filled (CCZCC 1975, p. 39). This past loss of habitat resulted in a reduction of the number of occupied estuaries, which in turn has resulted in an even more discontinuous distribution of the light-footed Ridgway's rail.

Currently, the U.S. range of light-footed Ridgway's rails in California extends from southern Ventura County in the north to the Mexican border in the south (Figure 3). This represents a contraction in the range from its historical maximum and since the subspecies was listed in 1969. Even in 1985, when the recovery plan was written, light-footed Ridgway's rails were found as far north as Carpinteria Marsh in southern Santa Barbara County (USFWS 1985b, p. 12). In the most recent decades, rails have been reliably detected in only four marsh habitats across the range, all of which are located in the two southernmost coastal counties (Orange and San Diego; Figure 3). At most of the remaining marshes, rails are found intermittently year-on-year, with populations "blinking" on and off over time (Zembal *et al.* 2017, p. 16). Though smaller, these marsh habitats serve not only as stopover habitat for dispersal, but also as life-long territories for a smaller number of pairs, improving the species' representation and redundancy. In total, rails are extant or presumed extant in various numbers at 20 surveyed marshes along the California coast.

The locations where the majority of rails are found are areas that can support cordgrass habitat with unrestricted tidal flows, natural channelization, and freshwater inputs that help support tall cordgrass growth, resulting in abundant nesting and refugia habitat (USFWS 2013, p. ix). Areas with these characteristics are decreasing in many places due to tidal inundation, competition from invasive plants, and drought. This is illustrated by the uneven distribution of rails, with more than half of the estimated population concentrated in just four marshes (Upper Newport Bay, Batiquitos Lagoon, San Elijo Lagoon, and Tijuana Marsh NWR; Figure 2). Additionally, light-footed Ridgway's rails have been discovered at inland freshwater marshes, such as Walnut Canyon Reservoir in Orange County (22 km [14 mi] from the coast); Whittier Narrows Recreation Area in Los Angeles County (31 km [19 mi] from the coast); and Guajome Lake (12 km [7 mi] from the coast), Kumeyaay Lake (23 km [15 mi] from the coast), and Otay Lake (16 km [10 mi] from the coast) in San Diego County (Zembal *et al.* 1985, p. 169; eBird 2019).

The status of the Ridgway's rail in Mexico is not well documented. Surveys of two major marshes in Baja California, Mexico (El Estero de Ensenada [= Estero de Punta Banda] and Bahía de San Quintín) were conducted in 1981 and 1986 that suggest a large population of light-footed Ridgway's rails existed at the time (Zembal and Massey 1986, pp. 6–13). Since then, limited surveys conducted in the 2000s by Mexican biologists indicated a reduction in the population at Bahía de San Quintín (See "Abundance" section, below) (Gonzàlez Bernal 2009). Additionally, spring (breeding season) surveys at various other points along the Pacific coast of Baja California resulted in detections of small numbers of light-footed Ridgway's rails. This included Lagunita El Ciprés (between Ensenada and Estero de Punta Banda), in the Valle San Telmo (at about 30° 58' north latitude and about 10 km (6.2 mi) inland in freshwater), and along the lower Río del Rosario (at about 30° 03' north latitude and about 6 km (3.7 mi) inland in freshwater) (Hamilton *et al.* 2002, p. 361; see also eBird). The detections along the Río del Rosario extend the southern limit of the subspecies' range about 42 km (26 mi) south of its traditionally accepted southern-most area of Bahía de San Quintín. Further investigation into the status of light-footed Ridgway's rails in Mexico would help us in future reviews.

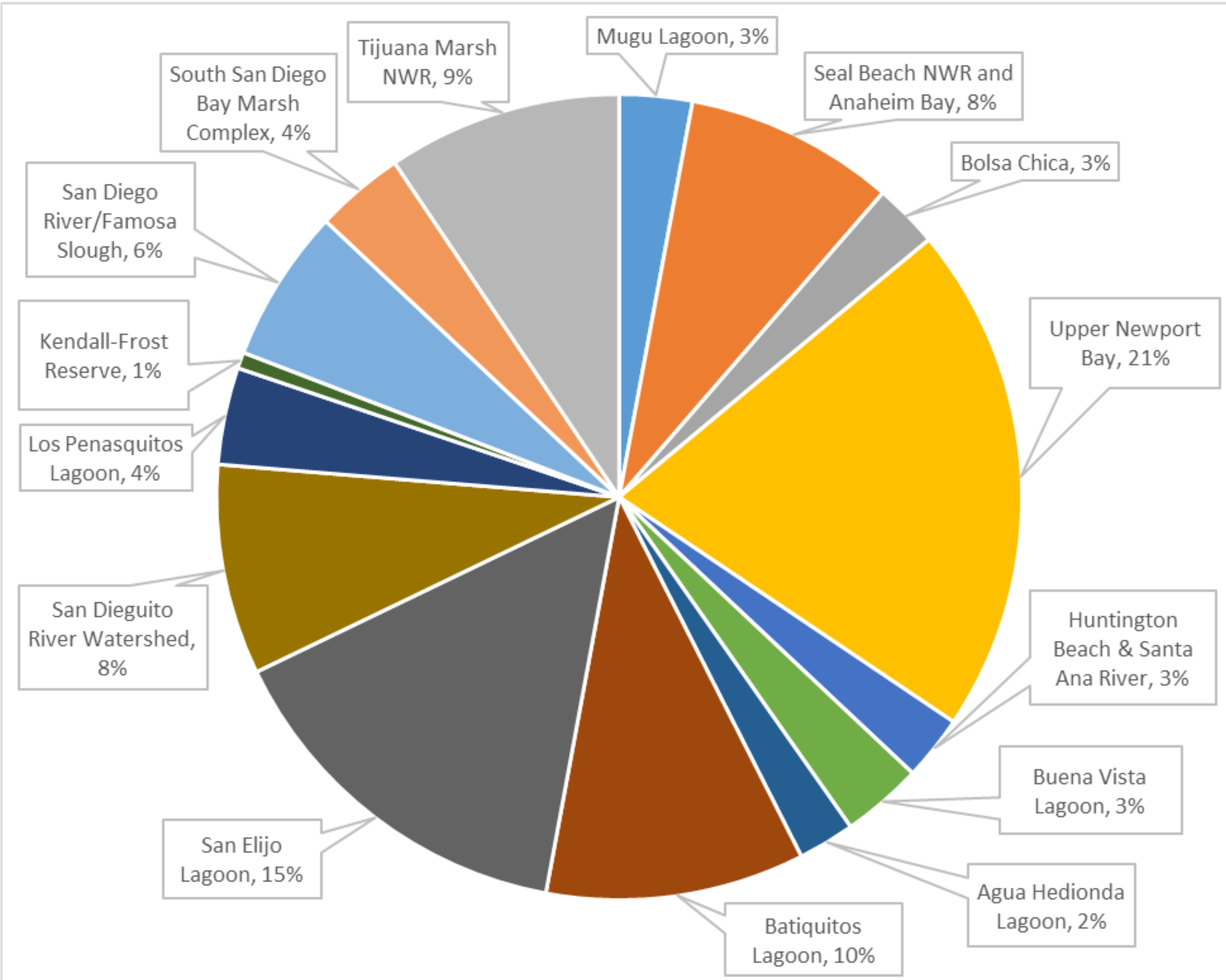

Figure 2. *Clockwise starting at the top: light-footed Ridgway's rail-occupied marshes in California from north to south with the percent of the total estimated rail population remaining in 2019. Data from Zembal et al. 2020.*

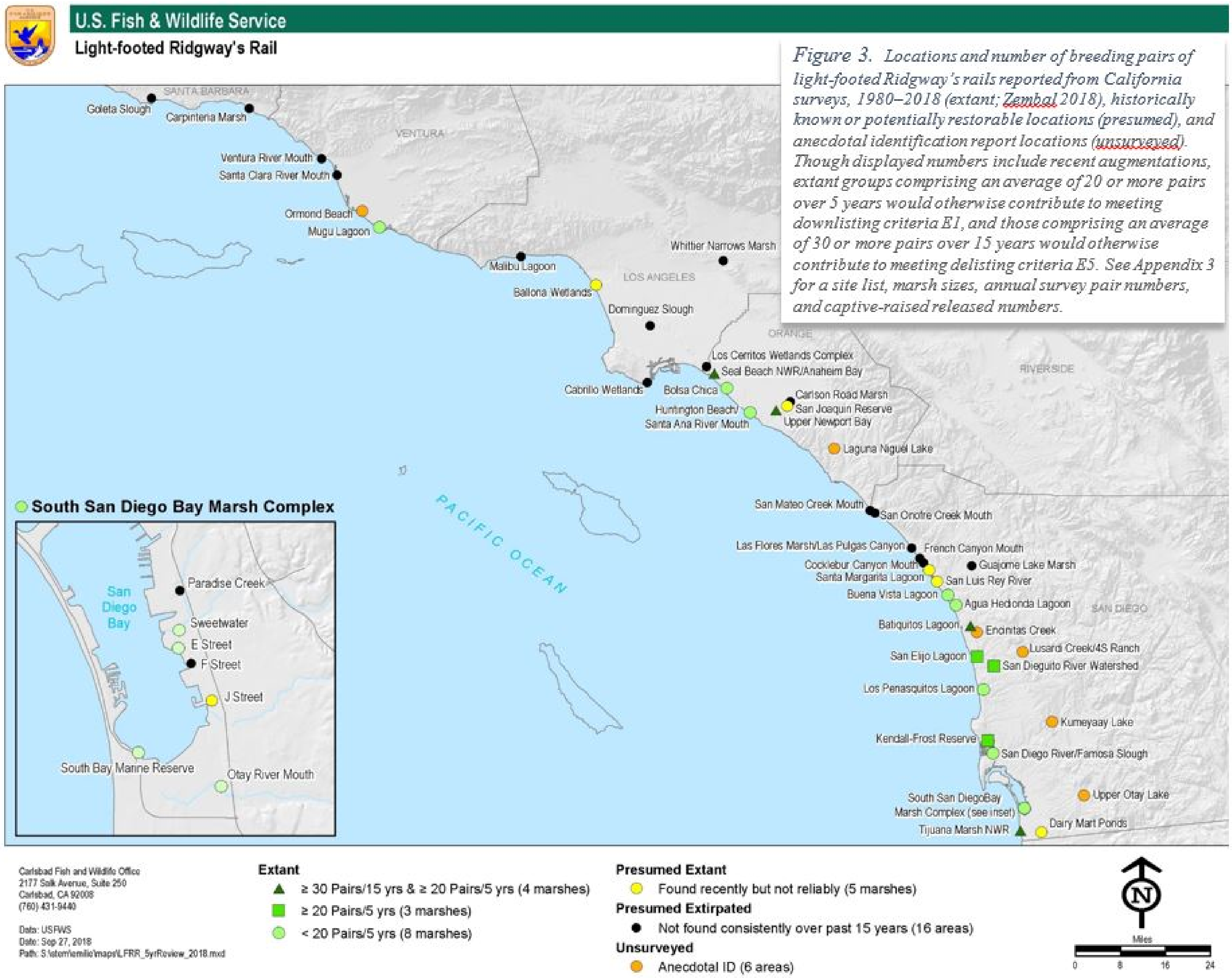

Figure 3. *Locations and number of breeding pairs of light-footed Ridgway's rails reported from California surveys, 1980–2018.*

Abundance

Upon listing of the light-footed Ridgway's rail in 1969 there was no statewide abundance estimate available. In 1980, annual surveys of up to 39 sites using a call-response technique began (Figure 4; Appendix B). One study regarding the efficacy of call-response survey techniques has suggested that it could underestimate rail numbers by as much as 60 percent; however, the study also noted the need for a broader investigation across more sites to determine if survey adjustments are needed (Bui *et al.* 2015, pp. 232–234). Further, the study noted the usefulness of call-response to gather an index of population trends, thus we used this survey data as the basis for the following information.

The initial survey in 1980 estimated 203 pairs across 11 marsh sites. Since then the population has fluctuated between a low of 142 pairs in 1985 to a high of 656 pairs in 2016 (Figure 4; Zembal *et al.* 2017, p. 13; Appendix B). However, the high count in 2016 was not evenly distributed, as two marshes, Upper Newport Bay and Tijuana Slough NWR, accounted for 50.2 percent of the total population (Zembal, Hoffman, and Konecny 2016, p. 8). Since 2016, the numbers of light-footed Ridgway's rail pairs have been in decline, dropping from 656 pairs to 308 in 2019 (Zembal *et al*. 2020, p. 13), with a majority of losses occurring from the populations residing at those two marshes. In addition, the 2019 survey reports that only three of the marsh areas surveyed contained more than 30 pairs each (a minimum number over time for delisting; see section III), as opposed to five in 2018 and six in 2015 (Zembal *et al.* 2020, p. 13; Appendix B). The recent population decline is thought to result from a combination of stochastic factors across occupied areas.

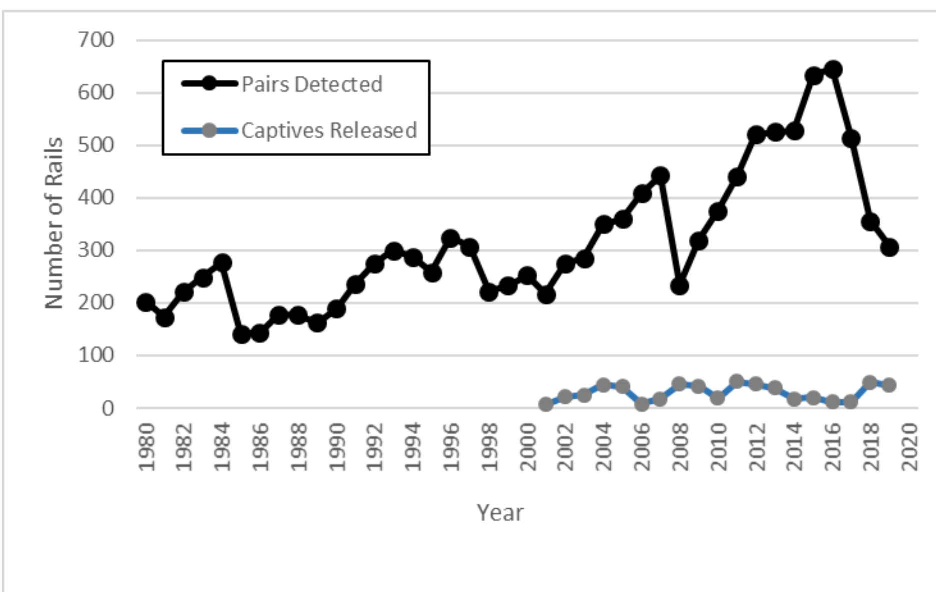

Figure 4. *Number of light-footed Ridgway's rail pairs exhibiting breeding behavior in California as detected by annual censuses conducted from 1980 through 2019 (black line) and number of captive-raised released rails each year from 2001-2019 (blue and grey line; data from Zembal et al. 2020, pp. 10–13, p. 34).*

Though the carrying capacity for rails in marsh habitats is unknown and likely to be influenced by many factors (e.g., cover, environmental conditions, freshwater input, predators, etc.), the highest density recorded during annual surveys was at Upper Newport Bay in 2015 when 234 rail pairs were detected in 105 ha (260 acres; Zembal *et al.* 2015, p. 12).

Limited information regarding the abundance of light-footed Ridgway's rails in Mexico exists but it is believed that a large population of light-footed Ridgway's rails resides there. Suitable habitat was surveyed at El Estero de Ensenada (= Estero de Punta Banda) and Bahía de San Quintín resulting in detection of 175 breeding pairs in 1981 and 243 in 1986 (Zembal and Massey 1986, p. 6). This suggests that a large population of light-footed Ridgway's rails likely existed in the wetlands in Baja California, Mexico. In 2002, breeding season surveys throughout Baja California detected small numbers of rails in various wetlands from Cantamar to Ensenada de La Paz including three previously unknown breeding locations (Lagunita El Ciprés, 9 pairs; Valle San Telmo, 2 pairs; Lower Río del Rosario, 2 pairs; Hamilton *et al.* 2002, p. 161). In the previously surveyed wetlands, El Estero de Ensenada (=Estero de Punta Banda) 28 pairs were observed and in Bahía de San Quintín 63 pairs observed (Hamilton *et al.* 2002, p. 161). Additional marsh areas further south than the traditionally thought of southern limit of the species range (Bahía de San Quintín) where rail pairs were detected include: 9 pairs in Laguna Guerrero Negro, 14 pairs in Estero Bocana, 3+ pairs in Estero el Coyote, 4 pairs in Bahía Almejas, 6 pairs in Canal Santo Domingo, and 1 pair in El Conchalito (Hamilton *et al.* 2002, p. 161). Additionally, limited surveys conducted between 2003 and 2008 by Mexican biologists suggest a further drop in the population at Bahía de San Quintín, potentially due to impacts on rail habitat related to livestock grazing, desalination plants, and development and changing land uses (Gonzàlez Bernal 2009, pp. iv–v). These results indicate a decline in the Mexican rail population since the 1980s and demonstrate the need for range-wide survey data. Such information is necessary to assess the importance of this population to the long-term survival of the subspecies and for the development of appropriate management strategies.

Genetics

The light-footed Ridgway's rail exhibits low levels of genetic variability as determined by randomly amplified polymorphic DNA (RAPD) analysis and microsatellite DNA comparison (Nusser *et al.* 1996, p. 469; Fleischer *et al.* 1995, p. 1240). According to Fleischer *et al.* (1995, p. 1240), the lack of variation exhibited in the rail population matches or nearly matches those of highly inbred species such as the Guam rail (*Rallus owstoni*) and the captive Nene (*Branta sandvicensis*). In comparison, the genetic variation of the Yuma Ridgway's rail is more typical of other taxa. When comparing the individual populations of the rail, Nusser *et al.* (1996, p. 470) found that the population of rails in the Tijuana Slough NWR had relatively higher heterozygosity. This may suggest that light-footed Ridgway's rails dispersing from populations in Mexico are contributing to the genetic pool in that population. If so, translocating birds from larger Mexican populations to the smaller U.S. populations may be considered as a management strategy (Nusser *et al.* 1996, p. 470). The lack of genetic variability suggests that historically low population size, habitat instability, a prehistoric bottleneck, and recent population declines may have been experienced within the population of light-footed Ridgway's rails (Nusser *et al.* 1996, p. 469).

Species-specific Research and/or Grant-supported Activities

Population Surveys

Annual statewide censuses of the light-footed Ridgway's rail began in 1980 and continue today. The resulting information has been important for estimating population abundance and monitoring the success of site-specific management techniques. Understanding the abundance and distribution of the species year-on-year gives managers insights into the resiliency and redundancy of the species facing ongoing threats. Annual surveys should continue into the future to inform an index of population trends to help ensure the effectiveness of recovery efforts.

Artificial Nesting Sites

Since 1987, artificial nest rafts have been built and deployed in marshes where appropriate nesting and refugia habitat is inadequate. These rafts have also been deployed in marshes that experienced loss of habitat from inundation, and were essential in rebuilding the rail population at Seal Beach NWR in the early 1990s (Zembal *et al.* 2017, pp. 31–32). More than 150 rafts are currently installed across seven marshes in Southern California and have become important rail nesting habitat in four marshes (Point Mugu, Seal Beach NWR, Kendall-Frost Reserve, and Sweetwater Marsh NWR) (Zembal *et al.* 2017, p. 8). In addition, rafts have been deployed at Carpentaria Marsh, located in the northernmost extent of the range in Santa Barbara County. Although it is currently not occupied, five rafts have been deployed to be used in conjunction with habitat restoration.

During the 2017 season, 56 clutches of eggs were laid on 40 rafts and had a nesting success of 96 percent (Zembal *et al.* 2017, p. 32). Artificial nesting platforms within the marshes also provide safe, dry year-round cover during higher high tides. Raft availability may become increasingly important as sea levels continue to rise and drown habitats circumscribed by urbanization. Therefore continued use, maintenance, and improvements of rafts are likely to be important for rails as protection from the deleterious effects of tides and predators. However, there is some evidence that there may be an effect of raccoon predation on the rafts (Zembal *et al.* 2017, p. 32), and the rafts may have to be deployed in conjunction with other management strategies to be fully successful.

Captive Breeding

The need for zoological propagation and release of light-footed Ridgway's rails was formally recognized in 1995 in a Memorandum of Understanding between the Service and the Chula Vista Bayfront Conservancy. In 1998, a captive breeding program was developed through a partnership between the Service, California Department of Fish and Wildlife, Chula Vista Nature Center (now the Living Coast Discovery Center, LCDC), San Diego Zoo, and SeaWorld San Diego. Successful breeding began in 2001, and as of early January 2019, 556 rails have been banded and released to the wild by the capture and rearing program (Figure 4, blue and grey line; see Appendix B for years, marsh locations, and numbers). Continuation of the captive breeding program will be important to augment the smaller communities of rails. Further, if additional information can be gathered on the rails post-release this can provide additional insight into the causes of mortality and survival of rails.

Radio telemetry was used to track some released rails to examine short-term post-release movements (USFWS 2017c, pp. 27, 51). Many of the radio-tagged birds disappeared or were taken by raptors, but many survived in areas with adequate winter cover. More insights into the ecology of these elusive birds is yet to be discovered, and the propagation program in conjunction with further telemetry studies is needed to better implement conservation management practices. Satellite telemetry has been successfully used in Yuma Ridgway's rails (Harrity and Conway 2018, entire), suggesting that this may be a potential future technique to get additional data on light-footed Ridgway's rail movements.

Sediment Augmentation

At one of the larger rail sites, Seal beach NWR, subsidence is occurring at an estimated rate of -4.13 mm/year (0.16 inches), and as a result, the rail habitat is experiencing a relative sea level rise (SLR) rate three times higher (6.23mm/year; 0.25 inches/year) than that of similar Southern California marshes (Takekawa *et al.* 2013, p. 6). At this site, managers have implemented a sediment augmentation pilot project to help offset the loss of suitable rail habitat. The aims of the project are to achieve a minimum of 7.6-centimeter (3 inches) marsh plain elevation, improve cordgrass growth, expand invertebrate abundance, and increase nesting and foraging habitat of rails and other migratory birds within 2 years (USFWS 2017b, p. 14). If successful, the project will not only improve rail habitat but has the potential to be implemented as a region-wide strategy to mitigate the effects of SLR. Currently, the project is in the monitoring stage and it will be a few years before full results are realized; however, there has been observations of plants sprouting – including cordgrass, and an increase in the abundance, species richness, and diversity of infaunal invertebrates (USFWS 2018a, pp. 14–15).

Five-Factor Analysis

The final listing rule for light-footed Ridgway's [clapper] rail was published in the *Federal Register* on March 8, 1969 (USFWS 1969, p. 5034). This predates the Act, and the notice in the *Federal Register* consisted of a list of native fish and wildlife considered to be threatened with extinction. No supporting information was given regarding the threats to the rail or its habitat at that time. The final revised recovery plan (USFWS 1985b), 2009 5-year review (USFWS 2009), and 2018 Species Report (USFWS 2018b) described threats facing the rail and was used as the basis of information for the analysis. The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The final revised recovery plan (USFWS 1985b) identified anthropogenic destruction of suitable habitat as the major threat to the light-footed Ridgway's rail. The habitat of the species continues to be impacted from a combination of development, alteration of hydrology and sediment transport, contamination, sea level rise, and nonnative species (Stedman and Dahl 2008, p. 7; Gedan *et al.* 2009, p. 119). These pressures have led to fragmentation and reduction of rail habitat that exacerbates the species' vulnerability during both stochastic and catastrophic events, such as high tide predation or severe storm events (USFWS 2013, p. 113).

Development

Development is responsible for much of the past loss of habitat in the historical range of the light-footed Ridgway's rail. However, relatively soon after listing, the direct loss of coastal wetlands and salt marshes was largely eliminated because of current laws and regulations protecting coastal habitats. Although development will continue to impact the rail, State and Federal laws, such as the Act, the California Coastal Act and the Clean Water Act, have effectively protected remaining habitat and lowered the magnitude of these impacts. Ongoing construction projects in a few of the occupied sites may have temporary impacts on the rail population; however, efforts such as noise reduction techniques, habitat restoration, invasive plant removal and predator controls are being implemented during the projects to reduce impacts to rails (USFWS 2017a, pp. 7–15).

Changes in hydrology

Vegetated estuarine habitats like those marshes used by the rail, have precipitously declined (approx. 75–91 percent) in California since 1850 (Powell 2006, p. 198; Stein *et al.* 2014, p. 25). These marshes are characterized by their hydrology, with sediment and nutrient delivery, freshwater supply, and fluctuating oxygen and salinity regimes (Gedan *et al.* 2009, p. 126). Anthropogenic changes to coastal marshes, such as ditching and tidal restrictions, that change the natural hydrology of the local area can have many effects on the ecology of the marsh (Gedan *et al.* 2009, p. 126; Silliman *et al.* 2009, p. 394). This can result in detrimental effects to the habitat of the light-footed Ridgway's rail. Activities that alter the hydrology can affect the timing of natural salinity regimes, resulting in changes to the plant and animal community and impact cordgrass growth (Zedler *et al.* 1986, p. 78; Silliman *et al.* 2009, p. 394). For instance, increased freshwater inputs (decreased salinity) in early spring stimulates taller cordgrass growth, which improves rail nesting habitat, whereas increased inputs later in the season stimulates vegetative growth, which results in increased grass density that is not as good for rail nesting (Zedler *et al.* 1986, pp. 78–79). Water diversions, discharges, or changes to tidal influx can therefore have a direct impact on the habitat of the rail.

In their unaltered state, many estuaries in Southern California exhibited seasonal mouth closure due to geomorphic processes, stream flow, sedimentation, and longshore currents (Jacobs *et* *al.* 2011, pp. 5–7). However, this estuary closure pattern is not necessarily beneficial for *Spartina*-based light-footed Ridgway's rail habitat, especially under modern (human-influenced) hydrology and water quality conditions. For example, loss of tidal influence due to inlet closure can occur due to downstream sediment transport (siltation), loss of freshwater input (lack of flow to maintain an open channel), extraction of ground water, or long-shore currents and sand movement, with extended closure leading to *Spartina* cordgrass loss. Inlet closure is a regular issue at some of the occupied marshlands, causing historical and recent rail declines (Zembal *et al.* 2017, pp. 17–18). For example, the 8-month-long inlet closure of 1984 at the Tijuana estuary that resulted in the decimation of large areas of cordgrass and led to the loss of the resident rails (Zedler and Powell 1993, p. 21). The closure occurred following a drought event when brackish water was impounded in the estuary and gradually increased the salinity levels to over 60 percent as water evaporated (Zedler *et al.* 1986, p. 78). In cases like this, mechanical opening of inlets and continued management to prevent siltation and loss of tidal influence can reduce the impacts to the rail and its habitat from closures.

On the other hand, lack of siltation (causing ground subsidence) or the modification of seasonally closed systems to perennially open, tidally influenced mudflats or deeper water areas (at the expense of vegetated marsh) can also result in a reduction in the quality of habitat for the light-footed Ridgway's rail (Jacobs *et al.* 2011, pp. 51–52; USFWS 2017b, p. 10). Subsidence puts cordgrass habitat at risk of drowning in normal tides. This combined with SLR threatens entire estuarine systems. As mentioned previously, at Seal Beach estuary, one of the larger rail sites, subsidence is occurring at an estimated rate of -4.13 mm/year (0.16 inches), and as a result, the rail habitat is experiencing a relative SLR rate three times higher (6.23mm/year; 0.25 inches/year) than that of similar Southern California marshes (Takekawa *et al.* 2013, p. 6). This particular site is already one of the few occupied marshes that experiences complete tidal inundation, forcing rails into areas with little cover and onto adjacent busy roads, where they are subject to increased predation and vehicle strikes (Zembal *et al.* 2017, p. 19). Coastal marshes are dynamic in nature, the balance between seasonal opening and closing will be dependent on the local area, and therefore management of these areas should be adaptive in order to achieve protection that is more effective.

Contaminants

The impacts to rails from contaminants is a potential range-wide risk but similar to a stochastic event, major impacts would likely be localized and affect only a few occurrences at a time. The habitat light-footed Ridgway's rails reside in are located at the edge of urban interfaces with two hydrologic systems; because of this rails may be exposed to contaminants from urban runoff, off-shore spills, and oil or chemical spills from vehicles. The habitat includes river and creek drainages, which are influenced by ongoing and historical urban, industrial, and agricultural uses. These drainages often carry contaminants such as pesticides, metals, polybrominated diphenyl ethers (PBDEs), pyrethroids, and other contaminants of emerging concern, having both known and unknown potential adverse effects. Contaminants have the potential to attach to sediment and impact rail food sources leading to biomagnification that affects reproductive success

(Goodbred *et al.* 1996, p. 2). In one study, organochlorine contamination was a likely factor in reduced reproductive success of rails at Mugu Lagoon (Goodbred *et al.* 1996, pp. 22–23).

Urban drainages can introduce contaminants through stormwater and sewage overflows from non-point sources or equipment malfunctions. Sewage spills have been an ongoing issue in the Tijuana River Estuary, which houses one of the largest populations of rails. A 2016 spill occurred concurrently with an inlet closure and resulted in eutrophic conditions that killed many of the benthic organisms and fish, leading to a decrease in rails. Other areas that may be impacted by oil and chemical spills where rails reside include Seal Beach NWR, which houses an oil production facility; Point Mugu, which is part of Naval Air Station Ventura County and has been subject to jet fuel spills; and Bolsa Chica, which is bordered by oil production facilities.

Nonnative invasive species

The rail faces continued indirect impacts through habitat modification by nonnative and invasive species. Invasive species have the potential to create broad, transformational impacts to the ecosystem they are introduced to through predation, interspecific competition or habitat alteration. One such example is *Sphaeroma quoyanum,* an invasive burrowing isopod that serves as an ecosystem engineer. This species has been found throughout the Pacific coast from Coos Bay, Oregon to Bahía de San Quintín, Baja California, Mexico (Talley *et al.* 2001, p. 571). When present, *Sphaeroma quoyanum* burrows intensively at the edge emergent vegetation, which exacerbates erosion, potentially twice as rapidly, and leads to substrate instability, causing loss of vegetation and cover for the light-footed Ridgway's rail (Talley *et al.* 2001, p. 570). After introduction in San Francisco Bay, it is estimated that the isopod contributed to the loss of the marsh edge by tens of meters or more and is considered one of the main drivers of shoreline erosion in combination with other, natural and anthropogenic, erosional processes (Talley *et al.* 2001, p. 570). The exacerbated loss of marsh edge is especially detrimental in areas where upland marsh zones have been lost to development (Talley *et al.* 2001, p. 570). This could potentially lead to continued 'coastal squeezing' of light-footed Ridgway's rail habitat.

In San Francisco Bay, outside the range of the light-footed Ridgway's rail, introduction of an exotic species of cordgrass, *Spartina alterniflora*, has produced a hybrid species. *Spartina alterniflora* x *foliosa* quickly spread throughout marsh habitats, including areas where the native (*S. foliosa*) does not grow (Levin *et al.* 2006, p. 420). This has coincided with an increase in the California Ridgway's rail (*R. o. obsoletus*) population likely due to increased cover and foraging habitat provided by the hybrid *Spartina* (Overton *et al.* 2014, p. 1899). The hybrid, however, does not grow tall enough to provide much nesting habitat for the California Ridgway's rail. Although it provided short term benefits to the California Ridgway's rail, long-term invasion of hybrid *Spartina* can lead to reduced channelization of the marsh and eventual conversion of the marshland into meadow, eliminating rail foraging habitat completely (Kerr *et al.* 2016, p. 3). Nevertheless, when the hybrid *Spartina* eradication efforts occurred from 2005 to 2011, California Ridgway's rail populations also declined nearly 50 percent because the habitat the hybrid grass provided was not replaced (Lampert *et al.* 2014, p. 1028). Although *S. alterniflora* or hybrid *Spartina* has not yet been established in Southern California, this example from San

Francisco Bay shows how invasive species can affect Ridgway's rails. Since being unintentionally introduced, *Spartina alterniflora* has spread to other Pacific Coast estuaries (In California: Alameda Island, Hayward Marsh, San Francisco Bay NWR, San Bruno Slough; in Oregon: Siuslaw River estuary; in Washington: Willapa Bay, Grays Harbor, the Copalis river estuary, Padilla Bay, Whidbey and Camano Islands) and thus, is of concern as a potential future threat to light-footed Ridgway's rail habitat.

Nonnative and invasive species continue to be a range-wide threat to the light-footed Ridgway's rail both directly and indirectly. Continued management for removal and prevention of exotic species invasion will be important to the species and its habitat. Degradation of habitat is threatening rails at most of the occupied marshes (Appendix B) and is likely to continue to impact rails in the future without continued management.

Climate Change and Sea Level Rise

Predicted future climate change scenarios are expected to exhibit a range of impacts on the light-footed Ridgway's rail and its habitat. These impacts vary depending on which marsh is being evaluated and what mitigation measures may be implemented. A predicted warming trend in western North America is expected to decrease snowpack in the mountains, hasten spring runoff, and reduce summer stream flows (IPCC 2007; Cayan *et al.* 2008). Also, increased summer heat may increase the frequency and intensity of wildfires (IPCC 2007; Cayan *et al.* 2008). It appears reasonable to assume that the subspecies' habitat will be affected by a changing climate in at least two ways — change in hydrology affecting freshwater input and sea level rise drowning coastal marsh habitat.

The most recent literature on climate change includes predictions of hydrological changes, higher temperatures, and expansion of drought areas, resulting in a northward and/or upward elevation shift in range for many species (IPCC 2007). However, we lack sufficient certainty in the degree and timing of these effects to the species because predictions of climatic conditions for smaller sub-regions of California remain uncertain. While we recognize that climate change is an important issue with potential hydrological effects to the rail's habitat, we lack adequate information to make accurate predictions regarding precise effects at this time.

On the other hand, SLR models have been developing rapidly and are considered reliable and plausible in the shorter-term (e.g., Cayan *et al.* 2008; USGCRP 2014; NASA 2018; SCWRP 2018). The emerging threat of SLR puts rail habitats at risk because of the limited potential for many presently occupied marshes to remain above sea level projections. Wetlands will only persist if there are opportunities for expansion of marsh habitat to inland areas. However, most salt marshes in Southern California abut urban development, leaving little to no potential for inland migration of coastal marsh habitat in many areas (Thorne *et al.* 2018, p. 3). As sea level rise occurs, many marsh habitats will be caught between a proverbial rock and a hard place—the encroaching sea edge on one side and the barrier of urban development on the other—leading to loss of coastal habitat, a phenomenon dubbed coastal squeeze. The Southern California Coastal Wetlands Research Project (SCCWRP) recently evaluated California coastal marshes and estimated their current and projected sizes (SCCWRP 2018). Using the most recent and projected size estimates from SCCWRP (SCCWRP 2018) for the marshes surveyed during annual censuses, we calculated there to be 2,365 ha (5,844 acres) of emergent marsh habitat remaining. By 2050 (after approximately 0.6-meter SLR), there will be a projected 1,835 ha (4,534 acres) left; a reduction of 22.4 percent in just over 30 years (see Appendix B for individual marsh estimates). Additionally, wetlands along the Pacific coast had been dependent on sediment delivery from rivers to sustain marsh elevation, but water diversions such as dams have decreased the rate of sediment delivery and lowered the vertical accretion potential of many marshes (Thorne *et al.* 2018, p. 1). Marshes that are unable to keep up with the pace of SLR will be lost to salt marsh drowning (Gedan *et al.* 2009, p. 132; Thorne *et al.* 2018, p. 1). In Newport Bay, it is projected that all middle and high marsh will be lost by 2050 and complete vegetation loss will occur by 2110 (Thorne *et al.* 2018, p. 6). Therefore, SLR adaptation strategies must be integrated into long-term species survival strategies to ensure the availability of suitable habitat to support the species into the future.

Summary of Factor A

Development is no longer a primary threat to the light-footed Ridgway's rail. Several State and Federal laws have largely eliminated the direct loss of wetland habitat. In areas where the habitat of the rail and development overlap, amelioration efforts have been implemented to ensure a minimal effect on the rail population. However, degradation and modification of rail habitat remains a threat due to anthropogenic hydrology modifications, contaminants, and invasive species. In addition, with little room for habitat migration, sea level rise induced by anthropogenic climate change is expected to greatly affect the remaining habitat of the light-footed Ridgway's rail. Active and adaptive management will be needed to maintain existing and create new habitat.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial purposes was not known to be a factor in the 1985 final revised recovery plan (USFWS 1985b). Overutilization for any purpose does not appear to be a threat at this time, nor do we expect it to be in the future.

Factor C: Disease or Predation

Disease was not known to be a factor at the time of the final listing rule in 1969 (USFWS 1969, pp. 5034). Wildlife diseases have the potential to affect host populations, though no specific diseases have been identified as a threat to the light-footed Ridgway's rail since listing. It is unclear whether West Nile virus and avian influenza will affect the light-footed Ridgway's rail; to date direct mortalities from either of these diseases in California are unknown.

Predation of light-footed Ridgway's rail populations in Southern California is considered a range wide threat. Potential predators of the light-footed Ridgway's rail eggs, nestlings, or adults include raccoons (*Procyon lotor*), California ground squirrels (*Spermophilus beecheyi*), old world rats (*Rattus* spp.), striped skunk (*Mephitis mephitis*), feral house cats (*Felis catus*), dogs (*Canis familiaris*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), Virginia opossum (*Didelphis marsupialis*), and a variety of raptors (USFWS 1985b, pp. 9–10). Mesopredator populations (e.g., raccoons, foxes, and skunks) are often subsidized by human presence and further bolstered from increased urbanization, which has drastically reduced habitat for larger predators (e.g., coyotes [*Canis latrans*], mountain lions [*Puma concolor*]) that would normally keep them in check (Lewis *et al.* 1999, pp. 377–378).

In Upper Newport Bay, raccoons depredated many of the nests found during annual surveys (Zembal *et al.* 2017, p. 17). At Seal Beach NWR, enough habitat exists to support a larger rail population than has been observed, however, high numbers of raptors have been reported in the area and it is suspected depredation is limiting rail survival (Zembal *et al*. 2020, p. 17). In addition, urban edge effects in many of the rails habitat also contribute to threat of predation due to proximity of feral cats and lack of refugia areas during high tide. For example, at Seal Beach high tide causes the marsh to become fully inundated, rendering the rails vulnerable to predation due to reduced cover.

The status of one nonnative mesopredator, the red fox (*Vulpes vulpes*), is worthy of additional discussion. It was originally introduced in the late 1800s at various California locations for hunting and for use in fur farms (Lewis *et al.* 1999, p. 374). The increase in red fox populations has since been linked to the decline of multiple species including the light-footed Ridgway's rail, California least tern (*Sternula antillarum browni*), snowy plover (*Charadrius nivosus nivosis*), and the California Ridgway's rail (*Rallus obsoletus obsoletus*). Following the introduction of red foxes at Seal Beach NWR, the light-footed Ridgway's rail population was decimated to just five pairs within 7 years (CDFG 1994, p. 5). After the implementation of nonnative fox removal, the rail population rebounded to 65 pairs in 1993. Since then, the status of the nonnative red fox is now under control following the reestablishment of a coyote population (USFWS 2012, p. 3-27).

Predation occurs throughout all stages of the light-footed Ridgway's rail life and continues to be a significant range-wide threat. Predator control programs are currently in place at Point Mugu, Seal Beach NWR, Kendall-Frost, and throughout the San Diego National Wildlife Refuge Complex (Tijuana Slough NWR, Sweetwater Marsh Unit, and South San Diego Bay Unit). Continued implementation and management of predator control programs remains important to ensure the persistence of light-footed Ridgway's rail populations.

Factor D: Inadequacy of Existing Regulatory Mechanisms

The following list includes a brief summary of pertinent laws and regulations:

State Protections in California

The State's authority to conserve rare wildlife and plants is comprised of four major pieces of legislation: the California Endangered Species Act, the Native Plant Protection Act, the

California Environmental Quality Act, and the Natural Community Conservation Planning Act. We discuss these and other State laws below.

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA)

The CESA (California Fish and Game Code, section 2080 *et seq*.) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with the California Department of Fish and Game on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities. Additionally, the light-footed Ridgway's rail is a Fully Protected species, the State's initial effort from the 1960s to identify provide additional protection to those animals that were rare or faced possible extinction. Fully protected species have additional restrictions on take permits, which may only be granted in very few specific instances. The State lists most fully protected species, including the light-footed Ridgway's rail, as threatened or endangered under more recent endangered species laws and regulations as well.

California Environmental Quality Act (CEQA)

The CEQA is the principal statute mandating environmental assessment of projects in California. The purpose of CEQA is to evaluate whether a proposed project may have an adverse effect on the environment, and if so, to determine whether that effect can be reduced or eliminated by pursuing an alternative course of action or through mitigation. CEQA applies to projects proposed to be undertaken or requiring approval by State and local public agencies (CDFW 2020, p. 1). CEQA requires disclosure of potential environmental impacts and a determination of significant if a project has the potential to reduce the number or restrict the range of a rare or endangered plant or animal; however, projects may move forward if there is a statement of overriding consideration. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 2100.2). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

Natural Community Conservation Planning Act

The Natural Community Conservation Program is a cooperative effort to protect regional habitats and species. The program helps identify and provide for area wide protection of plants, animals, and their habitats while allowing compatible and appropriate economic activity. Many Natural Community Conservation Plans (NCCPs) are developed in conjunction with Habitat Conservation Plans (HCPs) prepared pursuant to the Act. The light-footed Ridgway's rail is a covered species under the Multiple Species Conservation Program (MSCP) subregional plan, which includes subarea plans (with separate permits) for the County of San Diego, City of San Diego, City of Poway, City of La Mesa, and City of Chula Vista. The subspecies is also a covered species under the Habitat Management Plan for Natural Communities in the City of Carlsbad which is part of the Multiple Habitat Conservation Program (MHCP), and the San Diego Gas and Electric Subregional NCCP plan.

California Lake and Streambed Alteration Program

The Lake and Streambed Alteration Program (California Fish and Game Code sections 1600-1616) may promote the recovery of listed species in some cases. This program provides a permitting process to reduce impacts to fish and wildlife from projects affecting important water resources of the State, including lakes, streams, and rivers. This program also recognizes the importance of riparian habitats to sustaining California's fish and wildlife resources, including listed species, and helps prevent the loss and degradation of riparian habitats.

California Coastal Act: The California Coastal Commission considers the presence of listed species in determining environmentally sensitive habitat lands subject to section 30240 of the California Coastal Act of 1976, which requires their protection. Certain local jurisdictions have developed their own Local Coastal Programs or Land Use Plans that have been approved by the coastal Commission. Some of the major accomplishments of this act include reduction in overall development, the acquisition of prime habitat along the coast, restoration of coastal streams and rivers, and a reduction in the rate of wetland loss.

Ballast Water Management Act of 1999: This act established a multi-agency program to prevent the introduction and spread of nonindigenous aquatic species from the ballast of ships into the State waters of California. This program was designed to control ballast introductions and determine the current level of species invasions while researching alternatives to the present control strategies. Under this program, the California Department of Fish and Game was required to study the extent of nonnative species introductions into the coastal waters of the State. To fulfill this requirement, the California Department of Fish and Game's Office of Spill Prevention and Response initiated several baseline field surveys of ports and bays along the California coast and a literature survey of records of nonindigenous species.

In 2002, State Bill SB 1573 was signed into law and established an Interagency Aquatic Invasive Species Council to provide for the development of a State Aquatic Invasive Species Plan. The plan, prepared by California Department of Fish and Game's Habitat Conservation Planning Branch, will follow Federal guidance and fall under the direction of the State invasive species coordinator.

Federal Protections

National Environmental Policy Act (NEPA)

NEPA (42 U.S.C. 4371 *et seq.*) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the agency to analyze the project for potential impacts to the human environment, including natural resources. NEPA does not impose substantive environmental obligations on Federal agencies; it merely prohibits an uninformed, rather than unwise, agency action, and its public notice provisions provide an opportunity for the USFWS and others to review proposed actions and provide recommendations to the implementing agency. However, if an Environmental Impact Statement is developed for an agency action, the agency must take a "hard look" at the consequences of this action and must consider all potentially significant environmental impacts. In cases where that analysis reveals significant environmental effects, the Federal agency must propose mitigations that could offset those effects (40 CFR 1502.16). These mitigations usually provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, only that impacts be assessed and the analysis disclosed to the public.

Clean Water Act

Under section 404, the U.S. Army Corps of Engineers (Corps) regulates the discharge of dredged or fill material into the waters of the United States, including wetlands (33 U.S.C. 1344). Any action with the potential to impact the waters of the United States must be reviewed under the Clean Water Act, National Environmental Policy Act, and the Act. In general, the term "wetland" refers to areas meeting the Corps' criteria of hydric soils, hydrology (either sufficient annual flooding or water on the soil surface), and hydrophytic vegetation (plants specifically adapted for growing in wetlands). The interpretation of what constitutes "the waters of the United States", and thus what falls under Federal jurisdiction, has ranged in scope over time. When taken broadly, Federal agencies interpret the waters of the United States to include not only traditional navigable waters and wetlands, but also smaller, more isolated streams and wetlands adjacent to or hydrologically connected with traditional navigable waters. Currently, agencies are operating under a more narrow definition that excludes these areas. However, while interpretations of whether or not these smaller, more isolated streams and wetlands are included or not, the majority of rails reside in traditional navigable waters and wetlands, thus any potentially impactful activities would be subject to a Section 404 permit review process. These reviews require consideration of impacts to listed species and their habitats, and recommendations for mitigation of significant impacts.

Endangered Species Act of 1973, as amended (Act)

The Act is the primary Federal law providing protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10 that address take. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project.

Section 9 prohibits the taking of any federally listed endangered or threatened species. Section 3(19) defines "take" to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Service regulations (50 CFR 17.3) define "harm" to include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. The Service defines harassment as an intentional or negligent action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering. The Act provides for civil and criminal penalties for the unlawful taking of listed species. Incidental take refers to taking of listed species that result from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). For projects without a Federal nexus that would likely result in incidental take of listed species, the Service may issue incidental take permits to non-Federal applicants pursuant to section 10(a)(1)(B). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to minimize and mitigate the project's adverse impacts to listed species. Regional HCPs in some areas now provide an additional layer of regulatory protection for covered species, and many of these HCPs are coordinated with California's related Natural Community Conservation Planning program.

Migratory Bird Treaty Act (MBTA)

The MBTA and its implementing regulations (50 CFR Parts 20 and 21) directly protect certain bird species, and their eggs and nests, from being killed, taken, captured, or pursued. However, it does not protect habitat except to the extent that habitat alterations would directly kill birds.

The Lacey Act

The Lacey Act (P.L. 97-79), as amended in 16 U.S.C. 3371, makes unlawful the import, export, or transport of any wild animals whether alive or dead taken in violation of any United States or Indian tribal law, treaty, or regulation, as well as the trade of any of these items acquired through violations of foreign law. The Lacey Act further makes unlawful the selling, receiving, acquisition or purchasing of any wild animal, alive or dead. The designation of "wild animal" includes parts, products, eggs, or offspring.

National Wildlife Refuge System Improvement Act of 1997

This act establishes the protection of biodiversity as the primary purpose of the National Wildlife Refuge system. This has led to various management actions to benefit the federally listed species.

Summary of Factor D

Though much of light-footed Ridgway's rail historical habitat has been lost to past development, the remaining habitat currently has some protection. Several State and Federal laws and regulations are pertinent to federally listed species, each of which may contribute in varying degrees to the conservation of the rail. These laws, most of which have been enacted since the subspecies was listed in 1969, have greatly reduced or eliminated the threat of wholesale habitat destruction. The California Coastal Act of 1976 and the Federal Clean Water Act of 1972, among others, have effectively protected supportive habitat for the rail. In addition, restoration projects of California's wetlands and implementation of various regulatory mechanisms have made progress in reversing some historical damage. The Act is also very important. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. Therefore, we continue to believe other laws and regulations have limited ability to protect the species in absence of the Act.

Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence

Fragmentation, connectivity, and small population size

The light-footed Ridgway's rail small, isolated populations continue to influence the species persistence. Many of the occupied marshes are isolated with small and inconsistent rail numbers of pairs detected. Though some rails may disperse longer distances, rails generally exhibit high site fidelity and are therefore susceptible to inbreeding, loss of genetic variation, high variability in age and sex ratios, demographic stochasticity, and deleterious naturally-occurring events (Shaffer 1981, pp. 131–134; Soulé 1987, pp. 1–189; Meffe and Carroll 1997, pp. 159–233). In addition, some of the marshes with larger populations utilize nest augmentation and have active predator control management, without which would not be as resilient. Isolation and small population sizes reduce population resiliency and increases the chance of stochastic events causing extirpation by accidental or natural catastrophes, and can decrease the likelihood of recolonization (USFWS 2009, p. 16). Further, as the effects of coastal squeeze from urbanization and climate change continue to shrink or eliminate available marsh habitats in Southern California, habitat for the species may become more fragmented and isolated over time. A variety of actions have been taken or are underway to restore and enhance salt marsh habitat at several Southern California estuaries to support the recovery of this species. However, there are ongoing impacts from past losses associated with isolation and small population size. The species' increasing use of freshwater habitats has expanded its distribution at the local scale, allowing regional populations to increase slightly and reducing the species' dependence on saltmarsh habitats, thereby reducing slightly the effects of fragmentation. Freshwater marshes should be considered as an option for future restoration and protection to benefit the light-footed Ridgway's rail, even in smaller channels as they appear to be more frequently used and may be important for nesting, refugia, and dispersal. Despite this, the number of rails currently using freshwater is still very small, and these populations should not be considered a substitute for saltmarsh populations.

Cumulative Effects

Few of the threats facing the light-footed Ridgway's rail are independent of one another. Habitat degradation, disturbance, pollution, predation, invasive species, and sea level rise can work cumulatively to exacerbate effects on the species. Rails are at risk of extirpation from individual marshes simply due to the combination of small, isolated populations and annual stochastic events. Insufficient quantities of appropriate marsh habitat is the primary limiting factor for the species. This exacerbates predation vulnerability because the narrow and fragmented remaining habitat patches are often close to urban edges where domestic and subsidized predators occur. Even minimal development (such as levees) can provide artificial access for terrestrial predators, expose vulnerable rails by displacing optimal predator-avoidance cover of high marsh vegetation, and offer access for human activities that diminish habitat quality. Some invasive plants may outcompete native vegetation used by rails, or offer perches for avian predators. At Seal Beach NWR, the combined effects of subsidence, sea level rise, and nonnative eucalyptus trees (used as nesting and hunting perches by raptors) is degrading the quality of the marsh habitat such that rails would not be able to persist there without management. In Upper Newport Bay, the El Niño southern oscillation event in 2016 caused higher than predicted tides that drowned out the decades-old lower marsh cordgrass at one of the larger marshes containing a high proportion of rail pairs. That event transformed most of the habitat into mudflats, leaving only stunted cordgrass on a small island that could not provide adequate cover for rails or their nests (Zembal *et al.* 2017, p. 17). At both of these sites, the lack of cover contributed to an increase in direct predation of resident rails.

Factor E threats associated with a relatively sedentary subspecies and small population sizes (limited number of breeding pairs, low genetic diversity, inbreeding depression, susceptibility to local extirpation during stochastic or catastrophic events, etc.) need to be addressed through maintaining a minimum number of breeding pairs at each site, continued population management (breeding program or nest manipulations), and investigations of expanding the rail's population into freshwater areas. Minimum population sizes need to be large enough to ensure resiliency. Overall, the populations of light-footed Ridgway's rail have exhibited modest increases since listing, largely resulting from management actions that reduce threats or boost rail productivity. Although threats have shifted away from large-scale habitat loss (primarily from development), other threats remain, individually and in combination. Populations of light-footed Ridgway's rail are at risk to local extirpation due to a variety of factors (see Appendix B) that may occur concurrently. Therefore, there needs to be enough suitable habitat dispersed across the range, close enough together, and with sufficient population sizes to allow populations to rebound and recolonize to ensure resiliency and redundancy.

III. RECOVERY CRITERIA

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, overall, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, recovery may be better achieved through new recovery approaches and/or opportunities that were unknown at the time the recovery plan was finalized. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery and the assessment of a species' degree of recovery is a dynamic process requiring adaptive management, which may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, the extent to which threat factors have been reduced or eliminated indicate progress towards fulfilling recovery criteria.

In accordance with the Fish and Wildlife's Agency Priority Performance Goals (APGs) we have identified the need for amended recovery criteria for the light-footed Ridgway's rail (*Rallus obsoletus levipes*). Section 4(f) of the ESA requires that recovery plans include "objective, measurable criteria which, when met, would result in a determination, in accordance with the provision of this section, that the species be removed from the list." These criteria provide targets for identifying and implementing recovery actions to achieve recovery, a means of measuring progress towards recovery, and the ability to recognize when recovery may be achieved. A review of the Recovery Plan for the Light-footed Clapper [Ridgway's] Rail (USFWS 1985b) identified a lack of these measurable, objective criteria and was therefore revised in compliance with the APGs. We have identified the best available information since the recovery plan was completed in 1985 and revised the recovery criteria for the light-footed Ridgway's rail in the Addendum to the Light-footed Ridgway's Rail Recovery Plan (USFWS 2019b). These updated downlisting and delisting criteria now supersede those included in the 1985 recovery plan; these new criteria, and the species progress in meeting the recovery criteria, are as follows:

Downlisting Recovery Criteria

The light-footed Ridgway's rail will be considered for downlisting to threatened when all of the following criteria are met:

Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

A1: *Coastal marsh areas utilized by light-footed Ridgway's rail are conserved and managed to maintain sufficient tidal flushing and freshwater influence to sustain rails' food and habitat resources.*

Criterion A1 has not been sufficiently met. Prolonged inlet closure has reduced tidal influence and resulted in detrimental effects to the cordgrass habitat in several marshes. In areas where freshwater input is decreased, cordgrass growth may be stunted leading to reduced nesting habitat for the rail. Decreased freshwater input also reduces sediment transport which can lead to subsidence, as is occurring in Seal Beach NWR.

A2: *Occupied marsh areas maintain at least 50 percent appropriate marsh vegetation in the low littoral zone and include upper marsh habitats with sufficient cover to support rails year-round. These marsh areas have buffer zones to accommodate at least a century of projected sea level rise and have adjacent and appropriate high-water refugia and foraging habitat. At least 20 separate marsh areas of above-described suitable habitat or suitable freshwater habitats, are conserved, managed, occupied, and compose a total minimum of 4,000 ha (9,884 acres) to provide redundancy and the ability to withstand catastrophic events.*

Criterion A2 has not been met. This criteria intends to address the availability of suitable habitat for rails today and into the future while accounting for changes due to sea level rise. It also calls for a minimum of 4,000 ha (9,884 acres) across at least 20 separate marsh sites. Current habitat acreage within the range of the light-footed Ridgway's rail is estimated at 1,007 ha (2,488 acres) of mudflat and 2,365 ha (5,844 acres) of marsh habitat across 28 marshes. Of those 28 marshes, 20 are extant or presumed extant (see appendix B), eight marshes have been occupied by less than 20 pairs averaged over 5 years, and in five marshes rails have not been detected reliably during yearly surveys (see Figure 3). Currently, the total acreage of suitable habitat estimated (3,372 ha [8,332 ac] of mudflat and marsh habitat combined) and the number of occupied marshes (19 extant or presumed extant, 6 of which have reported 20 or more pairs over 5 years) is below the threshold of the criterion. Additionally, this estimate may be reduced to 1,224 ha (3,024 acres) of mudflat and 1835 ha (4,534 acres) of marsh habitat by 2050 with an estimated 0.6 meters of sea level rise according to estimates by SCCWRP (2018).

A3: *Water is maintained within both occupied and sufficient suitable, unoccupied habitat such that siltation does not significantly change the vegetation community or that contaminants do not measurably affect the benthic community (forage) or health of light-footed Ridgway's rail.*

Criterion A3 has not been met. Siltation and contamination is an ongoing problem at several marshes, including one of the largest populations at Tijuana Slough NWR. Inlet closure from increased siltation has occurred recently at Tijuana Slough NWR and Los Peñasquitos Lagoon. Contamination has also been a recurring issue at Tijuana Slough NWR as sewage spills from across the border have flowed into the area. At times when this has occurred concurrently with inlet closure, eutrophication of the benthic community has contributed to the loss of rails from the population.

A4: The status and distribution of light-footed Ridgway's rails in Mexico is understood and suitable habitat has been sufficiently conserved and protected from land use changes such as agriculture, and desalination plants. These protections include upland habitat to allow for marsh retreat in response to sea level rise.

Criterion A4 has not been met. The status and distribution of the light-footed Ridgway's rail in Mexico remains largely unknown. It is presumed that a large population of rails exists there and the habitat is better suited to adapt to sea level rise. Research to address unknowns regarding the population and habitat quality should be supported to aid in recovery of the species.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

There are no known current threats under this factor; therefore, no criteria are necessary.

Factor C: Disease or Predation

C1: *Impacts from nonnative and/or subsidized predators (e.g., feral cats, raccoons, domestic dogs, avian predators, etc.) are sufficiently minimized or managed through ongoing predator management. Management is funded in perpetuity such that predation no longer poses a threat to the persistence of light-footed Ridgway's rail.*

Criterion C1 has not been met. Predator control programs are currently in place at many of the coastal marshes where the Light-footed Ridgway's rail occurs (i.e. Point Mugu, Seal Beach NWR, Kendall-Frost, and throughout the San Diego National Wildlife Refuge Complex [Tijuana Slough NWR, Sweetwater Marsh Unit, and South San Diego Bay Unit]). However, predation occurs throughout all stages of the light-footed Ridgway's rail life and continues to be a significant range-wide threat.

Factor D: Inadequacy of Existing Regulatory Mechanisms

No known threats exist under this factor; therefore, no criteria are necessary.

Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence

E1: *At least 800 breeding pairs can be detected, range-wide in the United States, for a minimum of 5 years to increase subspecies' resilience (or as indicated through population modeling to support resiliency of the species). At least 10 of the protected marshes comprise a minimum average of 20 breeding pairs (i.e., not including newly augmented populations) over at least 5 years.*

Criterion E1 has not been met. Over the past 5 years the number of pairs detected has ranged from 514 to 646, with the most recent estimate in 2019 consisting of 308 pairs range-wide. In addition, only 6 of the 19 occupied marshes have averaged 20 or more pairs over the same period and not received augmentation from captive bred releases.

E2: *Light-footed Ridgway's rail are distributed across sites in each of the U.S. counties historically occupied (Santa Barbara, Ventura, Los Angeles, Orange, and San Diego) and Baja California, Mexico to provide redundancy and retain representation to be able to adapt to environmental changes and ensure there is sufficient genetic diversity to avoid potential inbreeding depression.*

Criterion E2 has not been met. Though Light-footed Ridgway's rails currently occupy marsh habitat in Ventura, Orange, and San Diego Counties, rails have not been detected in Santa Barbara or Los Angeles Counties in more than 10 years. Additionally, the status and distribution of rails in Mexico remains mostly unknown.

E3: *An outreach program is implemented in coordination with Federal and State agencies, partners and communities to educate the public about the plight of, and conservation efforts for, light-footed Ridgway's rail.*

Criterion E3 has been met. The Service, Living Coast Discovery Center, SeaWorld San Diego, San Diego Zoo Global, and the California Department of Fish and Wildlife have partnered together to implement the captive rearing program for about 20 years. Information is available for the communities through the Living Coast Discovery Center and San Diego Zoo to promote awareness of this endangered subspecies. Publicity surrounding releases often occurs to inform the public about the program and challenges faced by the light-footed Ridgway's rail.

Delisting Recovery Criteria

The light-footed Ridgway's rail will be considered for delisting when the above criteria for downlisting are met in addition to the delisting criteria. Since the light-footed Ridgway's rail has not yet met the criteria for downlisting, we did not discuss the rails recovery status in comparison to the delisting criteria in this review. However, delisting criteria for the light-footed Ridgway's rail are presented below:

Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

A5: *Occupied and sufficient suitable, unoccupied habitat is conserved and managed (including maintaining tidal influence of saltwater marshes, ensuring adequate forage in freshwater marshes, adequate and appropriate vegetation, and adjacent upland habitat refugia) to maintain and increase, where possible, the carrying capacity of marshes to ensure resiliency of the rail and meet demographic goals.*

A6: *Conserve and manage three freshwater systems to support three separate populations of light-footed Ridgway's rail (each with at least 30 actively breeding pairs) within the historical range.*

A7: *Occupied habitat, sufficient suitable unoccupied habitat, and adjacent upland habitat in Mexico is adequately conserved and protected from future land use changes to support resiliency of the rail and increase redundancy.*

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

There are no known threats under this factor; therefore, no criteria are necessary.

Factor C: Disease or Predation

No further threats to the subspecies due to disease or predation are currently known beyond what is stated above. Therefore, no further criteria are necessary.

Factor D: Inadequacy of Existing Regulatory Mechanisms

No known threats exist under this factor; therefore, no criteria are necessary.

Factor E: Other Natural or Manmade Factors Affecting Its Continued Existence

E4: *At least 20 of the protected marshes (from A2 and A5) have a minimum average of 30 breeding pairs over 15 years, with a combined minimum of 100 pairs in each of the 5 counties across light-footed Ridgway's rail's historical range (Santa Barbara, Ventura, Los Angeles, Orange, and San Diego). These figures provide sufficient redundancy to prevent extinction due to catastrophic events and sufficient representation to help promote adaptation to shifting environmental pressures.*

E5: *The overall population is self-sustaining and growing, without augmentation from captive rearing, such that monitoring detects a statistically significant upward trend in adult population numbers over the course of at least 15 years.*

Summary of the Recovery Criteria

The light-footed Ridgway's rail has not met the criteria for downlisting or delisting indicating that the threats facing the subspecies have not been sufficiently reduced. Current estimates of suitable habitat, number of pairs, and marshes occupied are insufficient to ensure appropriate resiliency of the subspecies. The rail continues to remain absent from parts of its historical range (Santa Barbara and Los Angeles Counties) and occupies fewer marshes than is needed to provide sufficient protection from catastrophic events (redundancy) and the adaptive capacity (representation) to ensure viability of the subspecies long term. Lastly, the status and distribution of the rail in Baja California, Mexico remains largely unknown. Recovery efforts are needed to increase the species viability (resiliency, redundancy, and representation) until such time that we can demonstrate that the recovery criteria are met.

IV. SYNTHESIS

Since 1980 when annual breeding pair census surveys began, the estimated population of light-footed Ridgway's rail pairs in California has fluctuated, but generally increased. The number of pairs detected has ranged from a low of 142 in 1985 to a high of 656 in 2016 (Figure 4). Regulatory mechanisms have generally been successful in stopping destruction and deleterious modification of marshlands inhabited by the rail, and conservation efforts have included habitat improvements, installing artificial nesting platforms, captive breeding and translocation, predator control, and annual range-wide censuses surveys. However, the most recent surveys have detected a sharp decline from 2016 to 2019 in the number of rail pairs detected from 656 to 308 (Figure 4). This is especially concerning considering that the population has increasingly been augmented with captive-raised rails, and may indicate an inability of the species to naturally recover from perturbations.

In 2019 Light-footed Ridgway's rails were reported at 19 locations from Ventura to San Diego Counties. This is a constriction from the historical range, which was previously as far north as Santa Barbara County. Of these 19 occurrences, only 6 have had more than 20 pairs when averaged over 5 years; 2 of which have not received augmentation from the captive breeding program in that time. Additionally, the status and distribution of light-footed Ridgway's rail in Baja California, Mexico remains largely unknown.

Reduced habitat quality, the effects associated with small population sizes, and unnaturally high levels of predation are the predominant factors limiting light-footed Ridgway's rail abundance. Additionally, hydrological changes and the effects of climate change and seal level rise threaten the persistence of this subspecies into the future. We conclude that the light-footed Ridgway's rail continues to be in danger of extinction throughout all of the subspecies' range and therefore continues to meet the Act's definition of an endangered species. We do not recommend a status change at this time.

V. RESULTS

Recommended Listing Action:

- ☐ Downlist to Threatened
- ☐ Uplist to Endangered
- ☐ Delist (indicate reason for delisting according to 50 CFR 424.11):
  - ☐ *Extinction*
  - ☐ *Recovery*
  - ☐ *Original data for classification in error*
- ☒ No Change

New Recovery Priority Number and Brief Rationale: No change. The taxon is a subspecies facing a high degree of threat and has a low recovery potential and the RPN should remain at 6.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1. **Work with partners to help conserve and manage occupied light-footed Ridgway's rail habitat.**

Existing occupied habitat should be managed to maintain and, where possible, increase the carrying capacity of each marsh. Management of habitat may include removing exotic vegetation, improving water quality control, implementing predator control, increasing tidal influences to marshes that have been closed off, preventing siltation, controlling pollutants, maintaining and restoring freshwater inputs, etc.

2. Identify opportunities through the Service's Partners for Fish and Wildlife and Coastal Programs to promote conservation and restoration of light-footed Ridgway's rail coastal and inland freshwater habitats.

Both coastal saltwater and inland freshwater marshes (especially at historical or anecdotal locations) which include potential habitat but are not currently occupied by light-footed Ridgway's rails should be examined to determine if restoration may increase the value of the habitat for the species, and perhaps extend their range.

3. Protection of light-footed Ridgway's rail occupied marshes in Mexico.

It is believed that a large population of light-footed Ridgway's rails reside in marshes in Mexico. Therefore, the survival of these populations will greatly affect the survival of the species as a whole. Working with the Mexican government and local groups, marshes in Mexico should be surveyed to determine the status of the light-footed Ridgway's rail and be protected from development and/or habitat degradation.

4. Continue captive propagation program for the light-footed Ridgway's rail and monitor success.

This effort is believed to be effectively augmenting subpopulations within marshes, increasing resiliency to withstand stochastic events. However, captive propagation should not be considered a long-term management solution and efforts should be taken to look at a long-term plan to ensure that wild populations are self-sustaining. Projects promoting and monitoring the program should be implemented so that it may be modified to meet these goals.

5. Finalize light-footed Ridgway's rail survey protocol and continue monitoring of occupied and potential habitat.

A standardized survey protocol should be developed and finalized so that data can be collected and compared from new and existing areas. Systematic censuses should continue throughout occupied and potentially occupied habitat to track recovery of the light-footed Ridgway's rail. This data should be robust enough to enable estimates of occupancy and relative abundance through time. Monitoring of populations in Mexico should be initiated to gain knowledge of population numbers throughout the species' entire range.

6. Research potential movement and dispersal capabilities of the light-footed Ridgway's rail between populations to gain a better understanding of the population structure and connectivity.

Knowledge gaps regarding the light-footed Ridgway's rails movements and dispersal are still largely unknown. Understanding these population dynamics can help to encourage recolonization of restored habitat, manage for genetic diversity, and provide insight into the geographic limits of the subspecies into Baja California, Mexico. A thorough understanding of these dynamics will assist us in supporting the subspecies resiliency and representation.

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APPENDIX A

[Taxonomy]

The taxon now recognized as the light-footed Ridgway's rail (*Rallus obsoletus levipes*) was first listed in 1969 as the light-footed clapper rail (*Rallus longirostris levipes*) under the Endangered Species Preservation Act of 1966 (USFWS 1969, p. 5034). This taxonomic combination (the trinomial) was the result of a long, convoluted history—and another chapter was added in 2013 after a genetic analysis of the clapper rail-king rail species complex. We refer to the clapper rail-king rail species complex as "large *Rallus*" in the following summary of the taxonomic history of the light-footed Ridgway's rail. While we have omitted some of the complexities for this summary, we have also retained many of the details because they inform both the taxonomic history and the varying geographical limits attributed to this subspecies through time, which in turn has implications in our understanding of the current range of the light-footed Ridgway's rail.

I. FIRST DISCOVERY TO SCIENCE

When Henshaw (1876, p. 273) first found a population of large *Rallus* in Southern California in 1875, he identified them as a king rails (*Rallus elegans*), consistent with the then-accepted identification of the large *Rallus* on the Pacific Coast (Newberry 1857, p. 96; Ridgway 1874, p. 111). Up until Henshaw's discovery in "certain marshy spots close to the sea at Santa Barbara," Santa Barbara County, all previous Pacific coast large *Rallus* specimens reported in the literature were from the greater San Francisco Bay area.

Soon after Henshaw's discovery, the prominent ornithologist Robert Ridgway, Curator of Birds at the United States National Museum (USNM) (part of the Smithsonian Institution), reviewed the large *Rallus* specimens from California. While Ridgway had initially classified the large *Rallus* in California as a subspecies of the king rail, *Rallus elegans obsoletus* (Ridgway 1874, p. 111), he subsequently elevated the taxon to the rank of species, *Rallus obsoletus* (Ridgway 1880, p. 139). The American Ornithologists' Union (AOU), the generally accepted authority on avian taxonomy and nomenclature in North America, recognized and accepted Ridgway's latter combination (AOU 1886, p. 140; AOU 1895, p. 77).

Ridgway (1880, p. 139) also pinned the common name "clapper rail" to the coastal California large *Rallus* taxon because of its affinity with salt water. "Clapper rail" was a term applied at the time to several salt-water-inhabiting large *Rallus* taxa, distinguishing them from the similar-looking, freshwater-inhabiting king rail. Despite the overall resemblance among the members of the clapper rail-king rail complex, the Pacific Coast large *Rallus* have richly colored neck and breast plumage (among other phenotypic characters) and thus appear to some to be more like king rails, whereas "clapper rails" from elsewhere are more dull-colored.

Shortly after Ridgway's publications, Belding discovered several large *Rallus* along the coast of the Baja California Peninsula, Mexico and sent specimens to the USNM. Ridgway diagnosed the birds from the south end of the peninsula as separable (although, as he reports, not without some misgivings), describing these southern birds as a new species, *Rallus beldingi*

(Ridgway 1883, pp. 345–346). The large *Rallus* that Belding collected in Bahía de San Quintín, Baja California, were identified as *Rallus obsoletus* (Belding 1883, p. 529), extending the range of the California species southward to about 30° 30' north latitude.

Subsequently, Bangs (1899, entire) recognized the Southern California large *Rallus* as being separable from the northern California large *Rallus*, describing the Southern California birds as a new species, *Rallus levipes*. This combination was accepted by the AOU (1910, p. 102), which noted the range of *Rallus levipes* was from Santa Barbara to Bahía de San Quintín. In the literature, this species was referred to by the common name light-footed rail or light-footed clapper rail. Grinnell would later reaffirm the range of *R. levipes* as extending along the Pacific Coast from Santa Barbara in the north (Grinnell 1915, p. 46) to Bahía de San Quintín in the south (Grinnell 1928, p. 86). Grinnell (1928, p. 86) also ascribed northernmost limit of *R. beldingi* on the Pacific Coast to 28° north latitude (which is roughly at Laguna Ojo de Liebre, at the border between Baja California and Baja California Sur, Mexico).

II. RECONSIDERATIONS AND REVISIONS

Over time, other similar-looking large *Rallus* had been discovered in North and South America, including along the Pacific Coast of mainland Mexico. During the early twentieth century, various authorities were reconsidering the taxonomic affinities of the many large *Rallus* populations. Van Rossem (1929, entire) concluded that the large *Rallus* of California and the Baja California Peninsula were distinguishable to the subspecies rank, rather than the species rank, but still separable from other large *Rallus* species. Thus, van Rossem (1929, p. 214) described the large *Rallus* of the Pacific coast of Southern California as *Rallus obsoletus levipes*. However, van Rossem (1929, entire) noted the range for this subspecies included only Southern California; he identified the large *Rallus* from Bahía de San Quintín southward as *Rallus obsoletus beldingi* (and he did not mention the Baja California coast between Bahía San Quintín and the U.S. border). The AOU (1931, p. 95) accepted van Rossem's taxonomic treatment but noted the range for *R. o. levipes* as extending "from Santa Barbara . . . south to San Diego and probably Ensenada [Baja California, Mexico]."

Less than a decade later, Oberholser (1937, entire) reassessed the whole clapper rail-king rail complex, encompassing what he identified as 27 "forms" of large *Rallus* rails from across the Americas (Oberholser 1937, p. 314). In accord with most of the preceding taxonomic treatments, he kept the two king rail forms as one species (comprising two subspecies); however, in a sweeping move, he combined the remaining 25 forms into one highly polytypic species, the clapper rail, *Rallus longirostris* (Oberholser 1937, p. 315). Under his structure, the form from the Pacific coast of Southern California and northwestern Baja California became *Rallus longirostris levipes*, the light-footed clapper rail (Oberholser 1937, p. 338). He defined the range of this subspecies as being from Santa Barbara to Bahía de San Quintín (Oberholser 1937, p. 339). The AOU (1957, p. 153) accepted Oberholser's taxonomic treatment.

Then, several decades later, Banks and Tomlinson (1974, entire), using traditional mensural and visual comparisons, reaffirmed and refined the subspecific circumscriptions of the large *Rallus* of western mainland Mexico, fleetingly acknowledging *R. l. levipes* in the process but not addressing the other subspecies of the Baja California Peninsula.

Eventually, new analytical techniques became available, spurring additional inquiries, but even then those efforts were initially more species-level explorations of the king rail-clapper rail complex. Avise and Zink (1988, pp. 516–528), in an analysis of the genetic structure of mitochrondrial DNA (mtDNA) and allozymes, found the king rail and the clapper rail to be closely related species; however, the taxonomic application of their results was ambiguous. Moreover, none of their samples were from western North America; as such, their work did not address Pacific coast large *Rallus* populations at all. Olson (1997, pp. 93–111), using detailed morphometric data and other lines of evidence, suggested king and clapper rails were distinguishable at the species rank, and (like some other authors before him) he suggested that the large *Rallus* taxa from western North America were more closely allied with king rails.

In contrast to these species-level reviews, Fleischer *et al.* (1995, entire) analyzed genetic data to assess (in part) the very geographically narrow question of differentiation between coastal *Rallus longirostris levipes* and the inland-nesting *R. l. yumanensis* (known primarily from the Colorado River and surrounding environs). Fleischer *et al.* (1995, p. 1241; see also Chan *et al.* 2006, p. 60), found that mtDNA data showed virtually no differentiation between *R. l. levipes* and *R. l. yumanensis* (nor several other clapper rail subspecies). However, using minisatellite DNA, they noted there had been little gene exchange between *R. l. levipes* and *R. l. yumanensis* over the recent past, suggesting that they were separate populations. Nusser *et al.* (1996, entire) had similar results when they examined these two subspecies using minisatellite and randomly amplified polymorphic DNA, although their focus was not a between-subspecies comparison. Despite being limited in their geographic and taxonomic scope, these studies showed that more work was needed to clarify the subspecific relationships among all of the large *Rallus* of western North America.

III. MODERN REVIEW

Eventually Maley and Brumfield (2013, entire; see also Maley 2012) brought more advanced genetic techniques to bear on the clapper rail-king rail complex and made the most significant species-level changes since Oberholser (1937, entire). They concluded that there were five taxa of species rank in this complex rather than the previously recognized two; the Pacific coast large *Rallus* (from California to Nayarit, Mexico, and including the lower Colorado River watershed) were not king rails or clapper rails (*sensu stricto*), but instead were members of a distinct and separate species. They resurrected the combination *Rallus obsoletus* for this group and, in recognition of Ridgway's early work on the Pacific coast large *Rallus*, they recommended the common name Ridgway's rail (Maley and Brumfield 2013, p. 326). The AOU subsequently accepted this treatment (Chesser *et al.* 2014, entire).

Maley and Brumfield's (2013, entire) work was at the species-level and did not address subspecies *per se*. After 1957, the AOU (which, in 2016, became the American Ornithological Society) and its associated North American Classification Committee (NACC) "reluctantly excluded treatment of subspecies" for "reasons of expediency," but the NACC "continues to endorse the biological reality and practical utility of subspecies as a taxonomic rank" (NACC 2019, unpaginated). Instead, for information on avian subspecies, the NACC refers readers to (among others) the respective species account in the *Birds of North America* series (in this case, Eddleman and Conway 2018, entire). Eddleman and Conway (2018, unpaginated) recognized the large *Rallus* of Southern California as *Rallus obsoletus levipes*. However, they ascribed its range as extending from Santa Barbara in the north to "at least" Estero de Punta Banda, Baja California in the south (about 31° 42' north latitude; just south of Ensenada and roughly 97 km (60 miles) south of the border); they consider the large *Rallus* in Bahía de San Quintín to be *R. o. beldingi*.

It is unclear how Eddleman and Conway (2018, unpaginated) came to this geographically reduced conclusion. It differs from the range these same authors presented for the subspecies in the earlier edition of the species account (Eddleman and Conway 1998, p. 4), which adopted the traditional Bahía de San Quintín location as the southern limit. Although there are some sources in the literature that also suggest the Ensenada–Punta Banda region as the southern limit, many others identify Bahía de San Quintín as the southern limit for the subspecies (see above). Detections of Ridgway's rails from several other locations along the north Pacific coast of Baja California (Hamilton *et al.* 2002, p. 361; see also the Spatial Distribution section in the 5-year review) suggest that the Ridgway's rail population in Bahía de San Quintín may not be as isolated from the Ridgway's rail population in the Punta Banda region if one were to consider those two locations alone. Indeed, the Ridgway's rails from the Río del Rosario (Hamilton *et al.* 2002, p. 361), which is about 42 km (26 miles) south of Bahía de San Quintín, would be more likely to have affinities with the populations to the north than they would with population of Ridgway's rails in Laguna Ojo de Liebre, some 250 km (155 miles) to the south. At this point, we consider the Río del Rosario to be southern limit of the light-footed Ridgway's rail, *Rallus obsoletus levipes.*

Thus, the range of the light-footed Ridgway's rail as reported in the scientific literature is unclear, as are the range limits of the various other Ridgway rail subspecies. A taxonomic assessment using modern techniques (such as, by conducting a full genomic assessment) from populations at various points throughout the Ridgway's rail's range—from northern California to Nayarit, Mexico, and including the lower Colorado River watershed—would help inform the taxonomic status and geographic range of each of the subspecies currently recognized in the literature.

IV. REGULATORY RECOGNITION

As noted above, the taxon now recognized in the scientific literature as the light-footed Ridgway's rail (*Rallus obsoletus levipes*) was first listed in 1969 as the light-footed clapper rail (*Rallus longirostris levipes*), and it continued to be recognized as such through the subsequent iterations of the list of endangered and threatened wildlife up through the time of this review (2019).

Starting in 2016, we decided to rely, to the extent practicable, on the Integrated Taxonomic Information System (ITIS) to determine a species' scientific name (50 CFR 17(c) [2016]). The current (2019) entry in the list of endangered and threatened wildlife comports with how ITIS recognizes the taxon (ITIS 2019, entire), which is to say that neither ITIS nor the list of endangered and threatened wildlife reflect the recommendations made by Maley and Brumfield (2013, entire) and the subsequent recognitions in the scientific literature (Chesser *et al.* 2014, entire; Eddleman and Conway 2018, unpaginated). Thus, ITIS and the list of endangered and threatened wildlife should be updated to agree with the current scientific literature.

Despite our reliance on ITIS, we are not locked into the nomenclature recognized by that system. We also stated in 2016, "[i]n cases where taxonomy is in dispute or there is a newly described taxa that might not be updated in ITIS, we will use our own best professional judgment and the expertise of the scientific community" (USFWS 2016, p. 51555). Therefore, based on the recommendations of Maley and Brumfield (2013, entire) and the subsequent recognitions in the scientific literature (Chesser *et al.* 2014, entire; Eddleman and Conway 2018, unpaginated), we recognize the taxon as the light-footed Ridgway's rail (*Rallus obsoletus levipes*) for this status review.

APPENDIX B

[Light-footed Ridgway's Rail Marsh Data]

Table B1. Historic, Current and Estimated Future Marsh Habitat Availability and Main Threats to Rail Population by Marsh

Key: - = marsh size not estimated. Marsh sizes are from The Southern California Coastal Wetlands Research Project (SCCWRP 2018).

County	Annual Breeding Census?	Marsh Name	Mudflat / Marsh Historical Size (~ha)	Mudflat / Marsh Current Size (~ha)	Mudflat / Marsh 2050 Size (~ha)	Latest Main Threat/Limiting Factor	Site-specific Land Stewardship and Conservation Efforts
Santa Barbara	Yes	**Goleta Slough**	140/153	6/41	3/45	A: only recently restored	CDFW Goleta Slough Ecological Reserve
Santa Barbara	Yes	**Carpinteria Marsh**	36/82	10/69	37/40	C: red fox and domestic cat predation	Carpinteria Salt Marsh Reserve (UC Santa Barbara, The Land Trust of Santa Barbara Co., others)
Ventura	Yes	**Ventura River Mouth**	16/4	1/1	1/1	A: needs restoration	Seaside Wilderness Park (City of Ventura), Emma Wood State Beach
Ventura	Yes	**Santa Clara River Mouth**	6/13	32/32	21/25	A: needs restoration	McGrath State Beach, Ventura Water Treatment Plant Wildlife Ponds
Ventura	No	**Ormond Beach**	6/38	11/8	8/3	A: needs restoration	The Nature Conservancy, City of Oxnard
Ventura	Yes	**Mugu Lagoon**	291/802	220/513	218/513	A: siltation and invasive vegetation; C: avian predators	Naval Base Ventura County, Point Mugu, Integrated Natural Resources Management Plan (U.S. Navy)
Los Angeles	No	**Malibu Lagoon**	0/15	2/6	3/4		Malibu Lagoon State Beach
Los Angeles	Yes	**Whittier Narrows Marsh**	-	-	-	A: lack of appropriate habitat, no hydrology	Whittier Narrows Natural Area (Los Angeles County Parks and Recreation)
Los Angeles	Yes	**Ballona Wetlands**	33/136	10/56	37/28	A: degradation, inlet closure, invasive plants; E: vegetation clearing for vector control	CDFW Ballona Wetlands Ecological Reserve
Los Angeles	No	**Dominguez Slough**	25/15	<1/1	<1/1	*Historical*	

County	Annual Breeding Census?	Marsh Name	Mudflat / Marsh Historical Size (~ha)	Mudflat / Marsh Current Size (~ha)	Mudflat / Marsh 2050 Size (~ha)	Latest Main Threat/Limiting Factor	Site-specific Land Stewardship and Conservation Efforts
Los Angeles	No	**Cabrillo Wetlands**	0/0	<1/<1	<1/<1	A: lack of appropriate habitat, urbanization	
LA & Orange	No	**Los Cerritos Wetlands**	256/241	15/54	26/39	A: lack of nesting sites, lack of freshwater	Los Cerritos Wetlands Oil Consolidation and Restoration Project (in development)
Orange	Yes	**Seal Beach NWR and Anaheim Bay**	78/405	63/180	201/15	A: subsidence, lack of freshwater; C: red fox and avian predators; E: vehicle strikes at high tide	Seal Beach NWR
Orange	Yes	**Bolsa Chica**	132/319	27/10	13/8	A: lack of nesting habitat, lack of freshwater; E: vehicle strikes	Bolsa Chica Ecological Reserve (CDFW)
Orange	No	**Walnut Canyon Reservoir**	-	-	-	A: lack of appropriate habitat (concrete lined)	
Orange	Yes	**Carlson Avenue Marsh**	-	-	-	A: urbanization, lack of habitat	San Joaquin Marsh Reserve (UC Irvine)
Orange	Yes	**San Joaquin Reserve**	-	-	-	A: lack of appropriate habitat; C: predation	San Joaquin Marsh and Wildlife Sanctuary (Irvine Ranch Water District)
Orange	Yes	**Upper Newport Bay**	158/196	45/135	102/57	A: degradation, lack of freshwater; C: predation	Upper Newport Bay Ecological Reserve (CDFW), Upper Newport Bay Nature Preserve (Orange County Parks)
Orange	Yes	**Huntington Beach & Santa Ana River**	84/221	2/7	3/6	A: dredging; C: domestic dog predators; E: construction noise	Newland, Magnolia, Brookhurst, and Talbert Marshes (Huntington Beach Wetlands Conservancy); Santa Ana River Marsh (Army Corps of Engineers)
Orange	No	**Laguna Niguel**	-	-	-	A: lack of appropriate habitat	Laguna Niguel Regional Park (Orange County Parks)
San Diego	Yes	**San Mateo Creek Mouth**	4/21	3/8	3/7		Marine Corps Base Camp Pendleton, Integrated Natural Resources Management Plan, Estuarine and Beach Ecosystem Conservation Plan (US Marine Corps)
San Diego	Yes	**San Onofre Creek Mouth**	1/1	<1/<1	<1/0		MCB Camp Pendleton INRMP, Estuarine and Beach Ecosystem Conservation Plan (USMC)

County	Annual Breeding Census?	Marsh Name	Mudflat / Marsh Historical Size (~ha)	Mudflat / Marsh Current Size (~ha)	Mudflat / Marsh 2050 Size (~ha)	Latest Main Threat/Limiting Factor	Site-specific Land Stewardship and Conservation Efforts
San Diego	Yes	**Las Flores Marsh/ Las Pulgas Canyon**	<1/1	1/2	<1/0	A: limited nesting sites	MCB Camp Pendleton INRMP, Estuarine and Beach Ecosystem Conservation Plan (USMC)
San Diego	Yes	**French Canyon Mouth**	6/0	1/1	<1/<1	A: limited nesting sites	MCB Camp Pendleton INRMP, Estuarine and Beach Ecosystem Conservation Plan (USMC)
San Diego	Yes	**Cocklebur Canyon Mouth**	0/<1	0/<1	<1/<1	A: limited nesting sites	MCB Camp Pendleton INRMP, Estuarine and Beach Ecosystem Conservation Plan (USMC)
San Diego	Yes	**Guajome Lake Marsh**	-	-	-		Guajome Regional Park (San Diego County Parks)
San Diego	Yes	**Santa Margarita Lagoon**	24/131	52/60	55/35	A: lack of appropriate habitat; C: urban predators	MCB Camp Pendleton INRMP, Estuarine and Beach Ecosystem Conservation Plan (USMC)
San Diego	Yes	**San Luis Rey River**	0/14	3/1	1/<1	A: lack of freshwater, invasive plants	
San Diego	Yes	**Buena Vista Lagoon**	84/29	56/35	34/11	A: invasive plants, lack of appropriate habitat; C: predation	CDFW Buena Vista Lagoon Ecological Reserve
San Diego	Yes	**Agua Hedionda Lagoon**	65/55	4/32	4/33	A: drought; C: domestic dog predators; E: human disturbance	CDFW Agua Hedionda Lagoon Ecological Reserve
San Diego	Yes	**Batiquitos Lagoon**	192/33	26/75	38/60	A: lack of upper marsh refugia; C: raccoon and avian predators; E: vehicle strikes	CDFW Batiquitos Lagoon Ecological Reserve
San Diego	No	**Encinitas Creek**	-	-	-	A: lack of appropriate habitat	Covered species under the City of Carlsbad Subarea Plan, North County Multiple Habitat Conservation Plan
San Diego	No	**Lusardi Creek/4S Ranch**	-	-	-	A: lack of nesting sites, contamination, urbanization; C: urban predators	Lusardi Creek County Preserve (County of San Diego)
San Diego	Yes	**San Elijo Lagoon**	130/84	29/143	53/121	A: ground-disturbing construction, inlet closure, contamination; C: predation; E: construction noise	CDFW San Elijo Lagoon Ecological Reserve
San Diego	Yes	**San Dieguito River Watershed**	20/221	65/81	75/77	A: invasive plants, drought; C: raccoon predators	Covered species under the City of San Diego Subarea Plan, South County Multiple Species Conservation Plan

County	Annual Breeding Census?	Marsh Name	Mudflat / Marsh Historical Size (~ha)	Mudflat / Marsh Current Size (~ha)	Mudflat / Marsh 2050 Size (~ha)	Latest Main Threat/Limiting Factor	Site-specific Land Stewardship and Conservation Efforts
San Diego	Yes	**Los Penasquitos Lagoon**	8/190	14/125	22/116	A: inlet closure, lack of nesting sites, siltation, contamination	Torrey Pines State Reserve
San Diego	No	**Kumeyaay Lake**	-	-	-	A: lack of appropriate habitat	Mission Trails Regional Park
San Diego	Yes	**Kendall-Frost Reserve**	43/61	8/18	18/5	A: high water, urbanization; C: raccoon predation; E: isolation & small population	Kendall-Frost Mission Bay Marsh Reserve (UC San Diego)
San Diego	Yes	**San Diego River/Famosa Slough**	45/158	16/42	28/24	A: ground-disturbing construction, invasive plants; C: cat, squirrel, & rat predators; E: construction noise	Covered species under the City of San Diego Subarea Plan, South County Multiple Species Conservation Plan; Famosa Slough State Marine Conservation Area
San Diego	No	**Upper Otay Lake**	-	-	-	A: lack of appropriate habitat	City of San Diego; Covered species under the City of San Diego Subarea Plan, South County Multiple Species Conservation Plan
San Diego	Yes	**South San Diego Bay Marsh Complex**	1248/1127	257/393	189/326	A: lack of appropriate habitat; C: raccoon predators	San Diego Bay NWR
San Diego	Yes	(Paradise Creek)	-	-	-	A: lack of appropriate habitat, urbanization	
San Diego	Yes	(Sweetwater)	191/246	39/120	68/77	A: lack of appropriate habitat; C: avian predators	
San Diego	Yes	(E Street)	-	-	-	A: lack of appropriate habitat, urbanization	
San Diego	Yes	(F Street)	-	-	-	A: lack of appropriate habitat, urbanization	
San Diego	Yes	(J Street)	-	-	-	A: lack of appropriate habitat, urbanization	
San Diego	Yes	(Otay River Mouth)	258/415	201/252	110/231	A: Limited nesting sites; C: predation	

County	Annual Breeding Census?	Marsh Name	Mudflat / Marsh Historical Size (~ha)	Mudflat / Marsh Current Size (~ha)	Mudflat / Marsh 2050 Size (~ha)	Latest Main Threat/Limiting Factor	Site-specific Land Stewardship and Conservation Efforts
San Diego	Yes	(South Bay Marine Reserve)	-	-	-	E: isolation	
San Diego	Yes	Tijuana Slough NWR	81/265	28/236	31/234	A: inlet closure, sewage spills; C: cat predators	Tijuana Slough NWR
San Diego	Yes	Dairymart Ponds	-	-	-		CDFW Dairy Mart Ecological Reserve
Totals:			**3212/5031**	**1007/2365**	**1224/1835**		

Table B2. Light-footed Ridgway's Rail Survey Results by Marsh 1980–1989

Key: nb = non-breeding season detection; up = unpaired adult detected; - = marsh not surveyed

Marsh Name	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Goleta Slough	0	0	-	0	-	-	-	-	0	0
Carpinteria Marsh	16	14	20	18	26	7	4	5	2	0
Ventura River Mouth	-	-	0	0	-	-	-	-	-	0
Santa Clara River Mouth	-	-	0	-	-	-	-	-	-	0
Ormond Beach	-	-	-	-	-	-	-	-	-	-
Mugu Lagoon	-	0	-	1	3	7	6	7	7	5
Malibu Lagoon										
Whittier Narrows Marsh	-	-	-	nb	0	-	-	-	-	0
Ballona Wetlands	-	-	-	-	-	-	-	-	-	-
Dominguez Slough	-	-	-	-	-	-	-	-	-	-
Cabrillo Wetlands	-	-	-	-	-	-	-	-	-	-
Los Cerritos Wetlands	-	-	-	-	-	-	-	-	-	-
Seal Beach NWR and Anaheim Bay	30	19	28	20	24	11	5	7	14	6
Bolsa Chica	0	0	0	0	-	-	-	nb	0	nb
Walnut Canyon Reservoir	-	-	-	-	-	-	-	-	-	-
Carlson Avenue Marsh	-	-	5	4	2	0	0	1	0	0
San Joaquin Reserve	-	-	5	4	1	2	1	0	0	0
Upper Newport Bay	98	66	103	112	112	87	99	119	116	116
Huntington Beach & Santa Ana River	-	0	-	-	-	-	0	0	0	0
Laguna Niguel	-	-	-	-	-	-	-	-	-	-
San Mateo Creek Mouth	-	-	0	0	-	-	0	-	0	0
San Onofre Creek Mouth	-	-	-	-	-	-	-	-	-	-
Las Flores Marsh/ Las Pulgas Canyon	-	-	0	0	0	-	0	-	0	0
French Canyon Mouth	-	-	-	0	0	-	-	-	-	0
Cocklebur Canyon Mouth	-	-	1	0	0	-	-	0	0	0
Guajome Lake Marsh	-	-	0	1	2	0	0	0	0	0

Marsh Name	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Santa Margarita Lagoon	0	0	2	1	2	1	1	1	1	0
San Luis Rey River	-	-	0	0	-	-	0	0	0	0
Buena Vista Lagoon	0	0	0	nb	0	-	-	-	0	0
Agua Hedionda Lagoon	1	2	1	7	6	1	0	0	0	0
Batiquitos Lagoon	0	0	0	0	0	-	-	-	-	0
Encinitas Creek	-	-	-	-	-	-	-	-	-	-
Lusardi Creek/4S Ranch	-	-	-	-	-	-	-	-	-	-
San Elijo Lagoon	-	5	4	4	10	1	0	2	5	7
San Dieguito River Watershed	-	-	-	-	-	-	-	nb	0	0
Los Penasquitos Lagoon	-	0	-	0	0	-	0	-	1	0
Kumeyaay Lake	-	-	-	-	-	-	-	-	-	-
Kendall-Frost Reserve	18	16	6	20	24	17	12	6	4	4
San Diego River/Famosa Slough	-	3	1	2	2	1	0	0	1	0
Upper Otay Lake	-	-	-	-	-	-	-	-	-	-
South San Diego Bay Marsh Complex	14	17	20	14	25	7	13	7	11	10
(Paradise Creek)	1	2	3	1	1	0	0	0	0	0
(Sweetwater)	4	5	7	6	14	3	9	5	5	5
(E Street)	3	1	3	3	2	2	2	0	1	0
(F Street)	-	1	1	0	1	0	0	0	0	0
(J Street)	-	1	0	0	-	0	0	0	0	0
(Otay River Mouth)	3	4	5	3	5	1	1	0	0	0
(South Bay Marine Reserve)	3	3	1	1	2	1	1	2	5	5
Tijuana Slough NWR	26	31	25	41	38	0	2	23	14	15
Dairymart Ponds	-	-	-	-	-	-	0	nb	1	up
Totals:	**203**	**173**	**221**	**249**	**277**	**142**	**143**	**178**	**177**	**163**

Table B3. Light-footed Ridgway's Rail Survey Results by Marsh 1990–1999

Key: nb = non-breeding season detection; up = unpaired adult detected; - = marsh not surveyed

Marsh Name	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Goleta Slough	0	0	0	0	-	-	0	0	-	-
Carpinteria Marsh	0	0	0	nb	0	2	3	5	3	2
Ventura River Mouth	0	0	0	0	0	0	0	-	0	-
Santa Clara River Mouth	0	0	0	0	0	0	0	-	0	-
Ormond Beach	-	-	-	-	-	-	-	-	-	-
Mugu Lagoon	6	4	5	5	6	5	3	4	4	4
Malibu Lagoon										
Whittier Narrows Marsh	-	-	-	0	0	-	0	0	-	-
Ballona Wetlands	-	-	-	-	-	-	-	-	-	-
Dominguez Slough	-	-	-	-	-	-	-	-	-	-
Cabrillo Wetlands	-	-	-	-	-	-	-	-	-	-
Los Cerritos Wetlands	-	-	-	-	-	-	-	-	-	-
Seal Beach NWR and Anaheim Bay	16	28	36	65	66	51	52	37	16	15
Bolsa Chica	up	nb	up	up	nb	nb	nb	nb	nb	0
Walnut Canyon Reservoir	-	-	-	-	-	-	-	-	-	-
Carlson Avenue Marsh	0	0	0	0	0	0	0	0	-	up
San Joaquin Reserve	0	0	up	0	0	0	0	0	0	0
Upper Newport Bay	131	128	136	142	129	114	158	149	105	104
Huntington Beach & Santa Ana River	0	0	0	0	0	0	0	0	0	-
Laguna Niguel	-	-	-	-	-	-	-	-	-	-
San Mateo Creek Mouth	0	0	0	0	0	0	0	-	-	-
San Onofre Creek Mouth	-	-	-	-	-	-	-	-	-	-
Las Flores Marsh/ Las Pulgas Canyon	0	0	0	0	0	0	0	-	-	-
French Canyon Mouth	-	-	-	-	-	-	-	-	-	-
Cocklebur Canyon Mouth	0	0	0	0	0	0	0	0	0	0
Guajome Lake Marsh	0	0	0	0	-	0	0	0	-	-

Marsh Name	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Santa Margarita Lagoon	0	0	0	up	0	0	0	up	0	0
San Luis Rey River	up	0	1	0	-	0	0	0	0	0
Buena Vista Lagoon	up	2	5	2	3	1	6	7	4	5
Agua Hedionda Lagoon	0	0	0	0	0	0	0	1	1	0
Batiquitos Lagoon	up	up	0	1	1	up	2	2	1	3
Encinitas Creek	-	-	-	-	-	-	-	-	-	-
Lusardi Creek/4S Ranch	-	-	-	-	-	-	-	-	-	-
San Elijo Lagoon	5	5	4	6	1	3	3	8	3	5
San Dieguito River Watershed	0	0	0	0	0	0	0	0	0	-
Los Penasquitos Lagoon	0	up	up	up	1	1	1	2	2	2
Kumeyaay Lake	-	-	-	-	-	-	-	-	-	-
Kendall-Frost Reserve	5	9	11	5	5	4	1	2	2	4
San Diego River/Famosa Slough	2	5	1	5	5	6	5	5	4	3
Upper Otay Lake	-	-	-	-	-	-	-	-	-	-
South San Diego Bay Marsh Complex	7	7	9	5	7	11	14	8	9	6
(Paradise Creek)	0	0	1	0	0	1	2	0	0	0
(Sweetwater)	2	4	4	3	7	7	8	3	4	3
(E Street)	0	1	1	1	up	2	1	1	1	2
(F Street)	0	0	0	0	0	0	0	0	1	0
(J Street)	0	0	0	0	0	0	0	0	0	0
(Otay River Mouth)	0	0	0	0	0	1	3	3	2	1
(South Bay Marine Reserve)	5	2	3	1	0	0	0	1	1	0
Tijuana Slough NWR	17	47	67	63	64	61	77	77	68	80
Dairymart Ponds	up	up	up	1	0	-	-	-	-	-
Totals:	**189**	**235**	**275**	**300**	**288**	**259**	**325**	**307**	**222**	**233**

Table B4. Light-footed Ridgway's Rail Survey Results by Marsh 2000–2009

Key: nb = non-breeding season detection; up = unpaired adult detected; - = marsh not surveyed; (#) = number of captive-bred individuals released per marsh

Marsh Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Goleta Slough	-	0	0	0	-	-	-	-	0	0
Carpinteria Marsh	1	1	2	up	up (2)	0	0	0	0	0
Ventura River Mouth	-	-	0	0	-	-	-	-	0	-
Santa Clara River Mouth	-	-	0	0	-	-	-	-	0	-
Ormond Beach	-	-	-	-	-	-	-	-	-	-
Mugu Lagoon	7	7 (7)	10 (11)	14 (20)	19 (12)	14 (17)	17 (3)	15 (5)	5 (27)	9 (5)
Malibu Lagoon										
Whittier Narrows Marsh	-	-	0	-	-	-	-	0	-	0
Ballona Wetlands	-	-	-	-	-	-	-	-	-	-
Dominguez Slough	-	-	-	-	-	-	-	-	-	-
Cabrillo Wetlands	-	-	-	-	-	-	-	-	-	-
Los Cerritos Wetlands	-	-	-	-	-	-	-	-	-	-
Seal Beach NWR and Anaheim Bay	10	11	24 (6)	23	16 (5)	15	21	24	17 (13)	19 (5)
Bolsa Chica	0	0	nb	0	0	0	nb	nb	nb	nb
Walnut Canyon Reservoir	-	-	-	-	-	-	-	-	-	-
Carlson Avenue Marsh	up	0	0	0	-	0	0	0	0	0
San Joaquin Reserve	0	0	0	0	-	0	0	0	nb	0
Upper Newport Bay	150	124	129	144	165	174	158	165	88	148
Huntington Beach & Santa Ana River	-	0	0	0	0	0	4	4	1	5
Laguna Niguel	-	-	-	-	-	-	-	-	-	-
San Mateo Creek Mouth	0	0	0	0	0	-	-	-	0	-
San Onofre Creek Mouth	-	-	-	-	-	-	-	-	-	-
Las Flores Marsh/ Las Pulgas Canyon	0	0	0	0	0	-	-	-	0	-
French Canyon Mouth	-	-	-	-	-	-	-	-	-	-
Cocklebur Canyon Mouth	0	0	0	0	0	-	-	-	0	-
Guajome Lake Marsh	0	-	-	0	-	-	0	0	0	-

Marsh Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Santa Margarita Lagoon	0	0	1	2	1	2	1	1	1	-
San Luis Rey River	0	0	0	0	0	0	0	0	0	0
Buena Vista Lagoon	5	3	6	5	5	6	8	8	9	9
Agua Hedionda Lagoon	2	2	1	4	5 (5)	4	7	4	7	6
Batiquitos Lagoon	2	3	3	5	11 (8)	16 (8)	19	22	22	26
Encinitas Creek	-	-	-	-	-	-	-	-	-	-
Lusardi Creek/4S Ranch	-	-	-	-	-	-	-	-	-	-
San Elijo Lagoon	1	1	2	7	7(8)	6	15 (5)	12 (4)	5	8 (16)
San Dieguito River Watershed	0	0	0	0	6	12	31	15	21	12
Los Penasquitos Lagoon	1	1	2	1	2 (4)	2	7	12 (4)	2	4 (9)
Kumeyaay Lake	-	-	-	-	-	-	-	-	-	-
Kendall-Frost Reserve	4	4	5	6 (5)	14	14	5	4	2	7 (7)
San Diego River/Famosa Slough	3	4	6	6	8	5 (5)	4	6 (5)	4	3
Upper Otay Lake	-	-	-	-	-	-	-	-	-	-
South San Diego Bay Marsh Complex	6	4	5 (4)	3	3	2 (11)	9	8	3 (6)	7
(Paradise Creek)	0	0	0	0	0	0	0	0	0	0
(Sweetwater)	2	3	3 (4)	1	3	1 (11)	4	4	3 (6)	5
(E Street)	2	0	1	1	0	0	2	1	0	0
(F Street)	0	0	0	0	0	0	0	0	0	0
(J Street)	1	0	0	1	0	0	0	0	0	0
(Otay River Mouth)	1	1	1	0	0	1	2	1	0	1
(South Bay Marine Reserve)	0	0	0	0	0	0	1	2	0	1
Tijuana Slough NWR	61	52	78	64	87	87	102	142	47	57
Dairymart Ponds	-	-	-	2	1	1	0	1	-	0
Totals:	**253**	**217 (7)**	**274 (21)**	**286 (25)**	**350 (44)**	**360 (41)**	**408 (8)**	**443 (18)**	**234 (46)**	**320 (42)**

Table B5. Light-footed Ridgway's Rail Survey Results by Marsh 2010–2018

Key: nb = non-breeding season detection; up = unpaired adult detected; - = marsh not surveyed; (#) = number of captive-bred individuals released per marsh

Marsh Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Goleta Slough	0	-	0	0	0	0	0	0	-	0
Carpinteria Marsh	0	0	0	0	0	0	0	0	0	0
Ventura River Mouth	-	-	0	0	0	0	0	0	0	0
Santa Clara River Mouth	-	-	0	0	0	0	0	0	0	0
Ormond Beach	-	-	-	-	-	-	-	-	-	-
Mugu Lagoon	12	16	22	23	16	12	16	12	7	9
Malibu Lagoon										
Whittier Narrows Marsh	0	-	-	-	-	-	-	-	-	-
Ballona Wetlands	-	-	-	-	-	-	up	-	up	0
Dominguez Slough	-	-	-	-	-	-	-	-	-	-
Cabrillo Wetlands	-	-	-	-	-	-	-	-	-	-
Los Cerritos Wetlands	-	-	-	-	-	-	-	-	-	-
Seal Beach NWR and Anaheim Bay	25	34 (15)	42 (5)	40 (9)	49 (5)	66 (9)	60	60	43 (16)	26 (9)
Bolsa Chica	1	nb	nb	1	2	7	9	7	6	8
Walnut Canyon Reservoir	-	-	-	-	-	-	-	-	-	-
Carlson Avenue Marsh	0	0	0	0	0	0	0	0	0	0
San Joaquin Reserve	up	2	1	2	1	1	up	0	0	0
Upper Newport Bay	131	137	165	191	222	234	202	161	76	63
Huntington Beach & Santa Ana River	6	6	6	7	9	12	12	3	4	8
Laguna Niguel	-	-	-	-	-	-	-	-	-	-
San Mateo Creek Mouth	-	-	-	-	-	-	-	-	-	-
San Onofre Creek Mouth	-	0	-	1	-	0	-	-	-	0
Las Flores Marsh/ Las Pulgas Canyon	-	0	-	0	-	0	-	-	-	-
French Canyon Mouth	-	-	-	-	-	-	-	-	-	-
Cocklebur Canyon Mouth	-	0	-	0	-	0	-	-	-	-
Guajome Lake Marsh	-	-	-	-	-	0	0	0	0	0

Marsh Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Santa Margarita Lagoon	-	2	0	0	-	3	-	-	-	0
San Luis Rey River	2	3	3	4	5	3	0	0	0	0
Buena Vista Lagoon	6	3 (15)	9	2	4	10	4 (5)	7	9	10
Agua Hedionda Lagoon	2	7 (6)	9 (16)	8 (9)	6	8	4	9	4	7
Batiquitos Lagoon	36	43	43	45 (6)	40 (12)	45 (7)	52	41 (5)	16 (15)	32 (6)
Encinitas Creek	-	-	-	-	-	-	-	-	-	-
Lusardi Creek/4S Ranch	-	-	-	-	-	-	-	-	-	-
San Elijo Lagoon	15	15	31 (7)	20	30	60	70	68	54	46
San Dieguito River Watershed	28	12	45	37	23	15	15	26	31	26
Los Penasquitos Lagoon	9	12	11	12	5	5	21	19	5	12
Kumeyaay Lake	-	-	-	-	-	-	-	-	-	-
Kendall-Frost Reserve	10	19	16	8 (14)	23	33	20	18	9 (8)	2 (8)
San Diego River/Famosa Slough	7 (5)	6 (11)	6 (9)	10	9	11	20	17	15	19
Upper Otay Lake	-	-	-	-	-	-	-	-	-	-
South San Diego Bay Marsh Complex	10 (14)	11 (3)	10 (9)	9	9	10 (4)	14 (6)	13 (6)	15 (11)	11 (11)
(Paradise Creek)	0	0	0 (8)	0	0	0	-	0	0	0
(Sweetwater)	6 (14)	7 (3)	4 (1)	4	4	5 (1)	7	7	8	7
(E Street)	2	1	1	1	1	1	1	1	2	2
(F Street)	0	0	0	0	0	0	-	0	0	0
(J Street)	0	1	1	1	1	1	2	0	0	0
(Otay River Mouth)	1	1	1	1	1	1	0	3	2	1
(South Bay Marine Reserve)	1	1	3	2	2	2 (3)	4 (6)	2 (6)	3 (11)	1
Tijuana Slough NWR	76	113	101	105	75	98	127	53	62	29 (9)
Dairymart Ponds	0	-	0	-	0	-	-	0	-	-
Totals:	**376 (19)**	**441 (50)**	**520 (46)**	**525 (38)**	**528 (17)**	**633 (20)**	**646 (11)**	**514 (11)**	**356 (50)**	**308 (43)**

Table B6. Overall Mean Pairs, 5 Year Mean and Number of Rails Released per Marsh

Key: - = marsh not surveyed/no releases

Marsh Name	Overall Mean Pairs (1980–2019)	5 Year Mean Pairs (2015–2019)	# of Captive-bred Individuals Released
Goleta Slough	0.0	0	0
Carpinteria Marsh	3.5	0	2
Ventura River Mouth	0.0	0	0
Santa Clara River Mouth	0.0	0	0
Ormond Beach	-	-	-
Mugu Lagoon	9.1	11.2	107
Malibu Lagoon	-	-	-
Whittier Narrows Marsh	0.0	0	0
Ballona Wetlands	-	-	-
Dominguez Slough	-	-	-
Cabrillo Wetlands	-	-	-
Los Cerritos Wetlands	-	-	-
Seal Beach NWR and Anaheim Bay	29.3	51	88
Bolsa Chica	2.2	7.4	0
Walnut Canyon Reservoir	-	-	-
Carlson Avenue Marsh	0.4	0	0
San Joaquin Reserve	0.6	0.25	0
Upper Newport Bay	133.8	147.2	0
Huntington Beach & Santa Ana River	2.6	7.8	0
Laguna Niguel	-	-	-
San Mateo Creek Mouth	0.0	0	0
San Onofre Creek Mouth	0.3	0	0
Las Flores Marsh/ Las Pulgas Canyon	0.0	0	0
French Canyon Mouth	0.0	0	0
Cocklebur Canyon Mouth	0.0	0	0
Guajome Lake Marsh	0.1	0	0

Marsh Name	**Overall Mean Pairs (1980–2019)**	**5 Year Mean Pairs (2015–2019)**	**# of Captive-bred Individuals Released**
Santa Margarita Lagoon	0.7	1.5	0
San Luis Rey River	0.6	0.6	0
Buena Vista Lagoon	4.7	8.0	20
Agua Hedionda Lagoon	3.2	6.4	36
Batiquitos Lagoon	16.1	37.2	61
Encinitas Creek	-	-	-
Lusardi Creek/4S Ranch	-	-	-
San Elijo Lagoon	14.2	59.6	40
San Dieguito River Watershed	11.5	22.6	11
Los Penasquitos Lagoon	4.7	12.4	17
Kumeyaay Lake	-	-	-
Kendall-Frost Reserve	10.0	16.4	34
San Diego River/Famosa Slough	5.6	16.4	35
Upper Otay Lake	-	-	-
South San Diego Bay Marsh Complex	9.6	12.6	9.5
(Paradise Creek)	*0.3*	*0*	*8*
(Sweetwater)	*4.9*	*6.8*	*40*
(E Street)	*1.2*	*1.4*	*0*
(F Street)	*0.1*	*0*	*0*
(J Street)	*0.3*	*0.6*	*0*
(Otay River Mouth)	*1.3*	*1.4*	*0*
(South Bay Marine Reserve)	*1.6*	*2.4*	*26*
Tijuana Slough NWR	61.3	73.8	0
Dairymart Ponds	0.5	0	0
Totals:	**313.8**	**535.4**	**514**

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Light-footed Ridgway's (=clapper) rail
(Rallus obsoletus (=longirostris) levipes)

Current Classification: Endangered

Recommendation Resulting from the 5-year Review:

- [ ] Downlist to Threatened
- [ ] Uplist to Endangered
- [ ] Delist
- [x] No change needed

Review Conducted By: Carlsbad Fish and Wildlife Office

New Recovery Priority Number and Brief Rationale: No Change

Lead Field Supervisor, Fish and Wildlife Service

- [x] Approve

SCOTT SOBIECH Digitally signed by SCOTT SOBIECH
Date: 2020.07.09 09:34:43 -07'00'

Scott A. Sobiech
Field Supervisor