Stege Marsh California Ridgway's Rail 2020 Viability Study Results

FOR

UC Berkeley

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CONTENTS

1 INTRODUCTION

The University of California, Berkeley (UC Berkeley) is evaluating areas within Western Stege Marsh, which is a portion of the Richmond Field Station property owned by UC Berkeley. A component of the evaluation includes an interagency (USFWS, CDFW, BCDC, ACOE, RWQCB, DTSC) request to perform a viability study of the federally endangered California Ridgway's Rail (*Rallus obsoletus obsoletus*) [CRR] at Western Stege Marsh. CRR is known to occur at the site, however the agencies have requested a study to try to gather more details about the rail population within the marsh.

In a preliminary effort to inform a viability study, BioMaAS, Inc. (BioMaAS) and Avocet Research Associates, LLC (ARA) conducted protocol-level field surveys of CRR in the western portion of Stege Marsh (Figs 1, 2) in 2020. These surveys were authorized and field methods were prescribed by the U.S. Fish and Wildlife Service (Appendix A).

This report addresses Task 1 (Rail Viability Study Preparation) as described in the original proposal for the study as modified after consultation with USFWS[1].

2 BACKGROUND

A number of studies provided by UC Berkeley were used to inform this report and research past, present, and future activities in Stege Marsh. These documents include:

- State of California Environmental Protection Agency Department of Toxic Substance Control, Docket No USE-RAO 06107-004. Richmond Field Station, Site Investigation and Remediation Order. September 15, 2006.
- Phase V Sampling Results Technical Memorandum. Western Stege Marsh Richmond Field Station Site. TETRA TECH, INC. October 15, 2018.
- Year 5 Monitoring Report for the Western Stege Marsh Restoration Project University of California, Berkeley Richmond Field Station, Richmond, California. TETRA TECH, INC. September 30, 2010.
- Richmond Field Station Remediation Project. Biological Assessment Report. University of California Berkeley Richmond Field Station, July 2003.

2.1 Study Site Background

The following background description of Stege Marsh was taken from the Year 5 Monitoring Report for the Western Stege Marsh Restoration Project University of California, Berkeley Richmond Field Station, Richmond, California. TETRA TECH, INC. September 30, 2010:

[1] Email correspondence in December 2019 and January 2020 with Angela Galarreta - Fish and Wildlife Biologist, Section 10 Permit Coordinator; U.S. Fish and Wildlife Service; Bay-Delta Fish and Wildlife Office.

The Richmond Field Station (RFS) is located at 1301 South 46th Street in Richmond, California. The RFS is bordered by Meade Street off Interstate 580 to the north, by South 46th Street to the east, by the East Bay Regional Park District Bay Trail (Bay Trail) to the south, and by Meeker Slough and Regatta Boulevard to the west. The California Cap Company owned the property and used it for industrial manufacturing of explosives from the late 1800s until 1948. In 1950, UC purchased the property, primarily for research facilities for the College of Engineering; later, other campus departments used portions of the RFS.

The RFS consists of (1) the Upland Area, containing areas developed for academic teaching and research and a remnant coastal terrace prairie; (2) a tidal salt marsh known as Western Stege Marsh; and (3) a Transition Area between the Upland Area and Western Stege Marsh. Western Stege Marsh extends across the southern portion of the RFS and the adjacent properties between the Transition Area and the Bay Trail (a former railroad spur). Most of the inboard (north of the Bay Trail) portion of Western Stege Marsh is located within the RFS property boundary. The eastern portion of the marsh, Eastern Stege Marsh, is located on the adjacent property, formerly owned by Zeneca Inc., (and referred to as the former Zeneca site). The Connector Trail to the Bay Trail prevents tidal interaction between the Western and Eastern Stege Marshes.

The Western Stege Marsh occupies approximately 9 acres and is bounded by the Transition Area to the north, the Connector Trail and Eastern Stege Marsh to the east, the Bay Trail to the south, and Meeker Slough and Marina Bay (a residential community) to the west. The portions of the marsh subject to the WSMRP Monitoring Plan are the 5-acre marsh and ecotone area created during 2002 to 2004 remediation activities (areas formerly designated 2A, M3, and M1a).

The marsh habitat in the project area consists of tidal sloughs, low marsh, middle to high marsh, and an ecotone transition from marsh to upland coastal prairie and coastal scrub. Low marsh is typically dominated by Pacific cordgrass (*Spartina foliosa*), which grows from above the mean tide line (0.43 feet National Geodetic Vertical Datum 1929 [NGVD]) to slightly above the mean high tide line (2.6 feet NGVD). Middle marsh is typically dominated by pickleweed (*Salicornia virginica*), which grows between the mean high tide line (2.6 feet NGVD) and the mean high-high tide line (3.2 feet NGVD). High marsh is typically dominated by salt grass (*Distichlis spicata*), marsh gum plant (*Grindelia stricta angustifolia*), jaumea (*Jaumea carnosa*), and alkali bulrush (*Scirpus robustus*) at an elevation ranging from 3.2 to 5.0 feet NGVD. The ecotone is a vegetated strip about 10 to 30 feet wide between the edge of the marsh (5.0 feet NGVD) and the uplands that provides cover habitat for the California clapper rail during high tides. The surrounding uplands are mostly ruderal except for the island, which was restored in 2005 and 2006, and a 100-foot-wide section in the Transition Area that was planted with native vegetation in 2006 and 2007, and was expanded in 2008. The upper marsh edge is defined as the 5-foot contour in the project area.

Historical industrial operations conducted at the RFS site prior to UC ownership, and historical industrial operations conducted at adjacent properties, caused contamination of sediments in the Western Stege Marsh. As a result, UC Berkeley implemented and completed remediation activities at the Western Stege Marsh. These activities were performed in three phases beginning in 2002 in response to the Water Board Order (No. 01-102) issued to UC Berkeley and Zeneca in October 2001 (Water Board 2001). The construction schedule was designed to avoid disturbing the site during the breeding season (February 1 to August 31) of the California clapper rail. Remediation within Western Stege Marsh included Phase 1, completed in 2002; Phase 2, completed in 2003 and 2004; and Phase 3, completed in 2004.

The nine-acre Western Stege Marsh was the focus of this rail study. The Bay Trail which bisects the marsh at this location gets heavy use by the public: joggers, cyclists and dog walkers utilize this trail in abundance. A feral cat feeding station was also observed along Meeker Slough.

2.2 Ridgway's Rail Background

Many organisms persist in populations that are spatially structured by human-induced loss and fragmentation of their native habitats (Pasinelli et al. 2011). California Ridgway's Rail (CRR) is one such species. CRR is a federally and state listed endangered species with a distribution limited to a narrow niche of tidal marshlands bordering the greater San Francisco Bay (SFB) estuary with disjunct subpopulations extending southward to San Blas, Mexico (Eddleman and Conway 2020). SFB supports a significant proportion of the population. The history of habitat modification of the SFB into an "urbanized estuary" is widely documented (Nichols et al. 1986, Goals Project 1999, Eddleman and Conway 2020). Further changes to the low-lying tidal wetlands due to climate change, sea-level rise, and subsidence is likely to further fragmentize and reduce the extent of these habitats in the future (Shirzaei and Burgmann 2018, Stralberg et al. 2011). Because of its precarious existence, conservation of this species in extant habitats is a primary responsibility of land managers and government agencies.

2.3 Population Viability Analysis (PVA) Background

PVA can be a valuable tool as long as one embraces the uncertainty in parameter estimates, dynamic processes, and functional relationships. The first goal of a PVA, assessment, involves defining the current state of a population, predicting its future, and identifying any threats to its persistence. An assessment may involve estimating the number of individuals in a population, predicting future numbers, and evaluating the role of habitat loss and fragmentation in the population's current status and its predicted future (Lande 1988). The second goal, management, involves identifying and implementing solutions to ensure persistence (e.g., by determining where and how to establish a protected area) (Diamond 1976). Assessment and management are complementary goals essential for effective conservation.

Even when the data and our understanding of the system are excellent, our ability to make accurate predictions into the future will always be limited by uncertainty about future conditions. However, uncertainty does not mean that PVA predictions are futile but rather serve to emphasize the importance of acknowledging limitations, exploring plausible scenarios, and being cautious in our conclusions and interpretations.

Data necessary to incorporate important processes (e.g., density dependence, stochasticity, spatial structure) are generally not available for threatened or endangered species. The consequences of making assumptions about these processes can be important (Ginzburg et al. 1982, Sabo et al. 2004). The principal problems of PVAs are summarized by Taylor & Ralls (1997):

1. PVAs are single species techniques,
2. PVAs omit risk sources that are difficult to estimate or detect, and
3. PVAs project long into the future when conditions are difficult to predict.

In natural populations, large changes in abundance of organisms can occur in a short period of time. Such catastrophes can be caused by extreme weather events, epidemics, invasion by a competitor or predator, or human alterations of the habitat (Mangel and Tier 1994).

2.4 Definitions and Underlying Concepts

A "source" is a subpopulation in which births exceed deaths and emigration exceeds immigration, i.e. a net exporter of individuals. A "sink" is the opposite, a subpopulation in which deaths exceed births and immigration exceeds emigration (Pulliam 1996).

Habitat quality is an important determination in identifying source and sink populations. Species may be present in suboptimal habitat (sinks) because it is the best habitat available within the dispersal range of the species.

2.5 Assumptions and Confounding Variables

1) Factors driving community dynamics exist at broader scales/levels than the local habitat.

2) Local subpopulation may be an artifact of neighboring habitats and have little to do with the resources and conditions at the study site.

3) Exchange of individuals between the study site and adjacent habitats (immigration and emigration) is difficult to determine with a furtive species such as CRR.

4) Density (or occupancy) is not necessarily and indicator of habitat viability.

3 LIFE HISTORY AND DEMOGRAPHY OF CRR

- Monogamous.
- Skewed sex ratios (males dominant) suggested (Eddleman and Conway 2020).
- Pair bond typically lasts for duration of breeding season.
- 1st nesting period March—May; 2nd (reduced) nesting period late June-early July.
- About 50% of pairs in San Francisco Bay, California, re-nest following nest failure.
- Nests are placed to avoid flooding by tides.
- Nests are usually placed near edges of tidal sloughs.
- Mean clutch size for *obsoletus* (SFB): 8.3 ± 1.7 SD, range 4–14, n = 179.
- Incubation period: extremes of 23 and 29 days.
- Incubation by both sexes.
- Male incubates at night, sporadically during day; female does most diurnal incubation, and relieves male after sunrise.
- Young are semi-precocial, covered with dense black down.
- Juvenile plumage is acquired in first 6–8 wk.
- Parental care usually extends until fifth or sixth week after hatching.
- Juveniles become independent at about 5–6 wk.
- Similar-sized home ranges across seasons suggests territoriality may occur year-round in marshes in San Francisco Bay.
- Home range in San Francisco Bay marshes ranged from 0.86—6.18 ha (2.1—15.3 ac.) (n = 70).
- Density was 0.9–1.6/ha (2.2—4.0 ac.) in San Francisco Bay.
- Mercury levels in *obsoletus* eggs from SFB were within the range associated with developmental abnormalities in other birds (Lonzarich 1992).
- Contamination appears to impact CRR reproductive success negatively-derpessed rate of egg hatchability, embryo deformities, hemorrhaging, and malpositions (Schwarzbach et al. 2006)
- Estimates of genetically effective population size based on mitochondrial DNA microsatellites for *levipes* (Ne = 174–283) and *yumanensis* (Ne = 824) (38) lend credence to call-survey estimates.
- Predator control (feral cats) also resulted in increased number of levipes at Seal Beach National Wildlife Refuge, California.
- Contaminants accumulate in most habitats used by CRRs (123).

Hatching success in SFB, where nests have successfully hatched at least one egg, has been reported as 45 percent (Schwarzbach et al. 2006). In SFB, depredation by Norway Rats (*Rattus norvegicus*) has been documented as a primary cause of failure (Harvey 1988). In addition to rats, major predators in SFB are probably raccoons, barn owls, and domestic and feral house cats (authors, pers. obs., Eddleman and Conway 2020). About 50% of pairs re-nest following failure (Eddleman and Conway 2020). The non-native Red Fox (*Vulpes vulpes*), a former significant predator of CRR had been effectively eliminated from the local environment (Albertson and Evens 2000), however, the red fox has been regularly observed recently at the Richmond Field Station, and in the upland areas adjacent to the marsh. The most recent confirmed sighting of the red fox was Nov. 2018, with many sightings throughout 2019 by facility staff (G. Haet, pers. comm.).

4 METHODS

Survey methods are fully described in Appendix B. BioMaAS and ARA biologists conducted three "active" surveys to document rail use of the site following the prescriptions of the 2017 "site-specific surveys" as recommended by USFWS (Wood et al. 2017). The surveys were completed within the prescribed survey period (January 15-March 31) at the prescribed intervals. Prior to the field work, biologists conducted a reconnaissance "passive" survey to evaluate the site and to position survey points (listening stations) that would allow for full aural coverage of the site. GPS coordinates of the survey points are provided in Table 1. Following the protocol-level surveys, biologists visited the site in an attempt to observe fledglings on three dates: April 21, June 16, and July 10.

Survey points ("listening stations") occupied in 2020 are plotted in Figure 3, below, and coordinates are provided in Table 1.

Table 1. Coordinates of survey points occupied in 2020.

STATION CODE	LATITUDE	LONGITUDE
BLUE-04	37°54’43.04”N	122°20’15.65”W
WHITE-02	37°54’41.63”N	122°20’11.86”W
WHITE-04	37°54’41.78”N	122°22’15.216”W
MEEK-03	37°54’38.70”N	122°20’13.04”W
MEEK-04	37°54’37.08”N	122°20’05.15”W
MEEK-05	37°54’33.06”N	122°20’17.21”W
MEEK-06	37°54’34.37”N	122°19’53.27”W
MEEK-07	37°54’31.64”N	122°19’40.72”W
STAG-08	37°54’41.20”N	122°20’04.05”W

Vocalizations are coded as follows on the data sheets (Appendix C) and Table 2: C (clapper/clatter); D (duet); K (kek); B (kek-burr); KH (kek-hurrah); SK (squawk); and, V (visual sighting). Clusters of calling locations were plotted post-hoc and considered separate core-use areas.

5 RESULTS

A summary of detections (2006-2020) is provided in Table 3. Detections recorded in 2020 are plotted in Figures 3 and 4. Of 107 detections, 38 (35.5%) were considered redundant (representing the same bird or birds) in the field by comparing detections among observers and determining which were duplicative based on time and location. Duplicative detections were eliminated from the summary data (Table 3). CRR vocalizations types are represented in Table 2. All detections are listed in Appendix 3.

Table 2. Distribution of call types.

Call Code	Description	%	Presumption
C	Clapper/clatter	55.9	Single territorial bird
V	Visual	15.3	Single territorial bird
K	Kek	13.6	Single territorial bird
D	Duet	11.9	Territorial pair
KH	Kek-hurrah	1.7	Single advertising female
SQ	Squawk	1.7	Single alarm call

We estimated two territories within the marsh segment north of the Bay Trail. Assuming even distribution within this marsh parcel, each pair had a home range of approximately 1.84 ha (4.5 acres), within the range of values known for San Francisco Bay marshes (0.86—6.18 ha). Additionally, the outboard marsh (south of the Bay Trail) supported two presumptive territories, but whether these individuals were paired or unmated is unknown. The distribution of home ranges for each pair (or individual) is represented in Figure 4.

Skewed sex ratios in CRR with males dominant (Eddleman and Conway 2020) suggest that unmated males may be present within the population, a possible explanation for the relatively small number of detections in the outboard marsh parcels, south of the Bay Trail (Figs. 3 & 4).

6 DISCUSSION

Telemetry studies indicate that the CRR occupies a small core-use area (x = 0.87 ha) with very little movement between seasons. Core-use areas are defined as highly defended portion of the territory, containing a nest site (Albertson and Evens 2000). A study of the *yumanensis* subspecies, found that species vocalized only from core-use areas (Todd 1987 in Albertson and Evens 2000). Home range in San Francisco Bay marshes ranged from 0.86 to 6.18 ha (n = 70) (Albertson 1995 *in* Eddleman and Conway 2020). Studies of other subspecies and sibling species suggest minimum distance between nests is 23m to >45m (Taylor 1998).

It is apparent from the high numbers of detections on these protocol-level surveys that Western Stege marsh support densities of CRRs (est. 1.1/ha) within the range of densities reported from the San Francisco Bay estuary as a whole (0.9-1.6/ha). Local marsh parcels (Meeker, Stege, Hoffman-Figure 1) are rather discrete, that is, not contiguous with larger more extensive marshlands, so higher densities are unlikely here.

<u>History of detections of CRR (formerly Clapper Rail) at Western Stege Marsh</u>

Clapper Rails were present in Western Stege Marsh during earlier years of coverage (2006-2010) however, although detection levels were relatively high in 2007, subsequent detections were relatively low (Table 3).

Table 3. Detections of CRR from protocol-level surveys in Western Stege Marsh, 2007-2020.

Year	# of detections	Ob. hrs	Detect/hr	Source
2007	23	4.5	5.1	ARA 2007
2008	3-4	5.8	052-.69	ARA 2008
2009	2	5.6	0.15	ARA 2009
2010	2-3	5.6	0.36-0.54	ARA 2010
2020	65	6.0	10.9	This study

The interannual discrepancies in the number of detections, especially for years 2008, 2009, 2010 is likely an artifact of the methods prescribed by USFWS protocol that was in effect at the time (USFWS 2000). That protocol required an initial use of “passive” surveys (no broadcasting of vocalizations to elicit responses) and did not allow “active” surveys (using broadcast vocalizations to elicit response) after rails had been detected initially. The rational for this methodology was to avoid undue disturbance to nesting rails. Therefore, because rails were detected on the initial passive surveys, active surveys were not conducted in those three years. (This was essentially a presence/absence approach and did not inform density estimates.) The protocols have since been modified (USFWS 2015, Wood et al. 2017); those currently approved by USFWS permit active surveys, thus increasing detections and allowing population estimates (extrapolation of densities) in an effort to document region-wide population trends.

Comments regarding the future of CRR at Western Stege Marsh.

Short term

Feral cats: The presence of an active feeding station adjacent to the site along the public path in the northwest corner (Next to Station #4, Figure 2), which subsidizes feral cats poses the most immediate threat to the local population of this endangered marsh bird. Removal of this station should be a primary focus of management, a responsibility of Contra Costa County Animal Services (Animal Ordinance 416-4.402).[2] Efforts to trap and translocate the local cat population would provide critical protection to the rail.

Red fox: Recent sightings of red fox in and around the project area may indicate a significant threat to the resident rails. California Department of Fish and Game has had some success in the past removing red foxes from areas occupied by CRR (Albertson and Evens 2000) and should be informed of the circumstances at Western Stege Marsh. CDFW has a "wildlife incident reporting" (WIR) link on their website to report such a situation.[3]

Mid-term

Disturbance to intertidal habitat: Any physical disturbance of the existing tidal marsh habitat is likely to displace or result in the depredation and take of resident rails.

Long term

Sea-level rise has been identified as an imminent threat to tidal marsh fauna in general (USFWS 2010, Stralberg et al. 2011, Kirwan and Megonigal 2013) and to CRR in particular (Overton et al. 2015). The ability of tidal marshes to aggrade landward is restricted in the urbanized estuary of SFB to due human-made infrastructure surrounding the Bayshore. The Richmond Field Station property has some open "upland" habitat adjacent to the tidal marsh that could be graded to appropriate elevations (above current MHHW) to allow expansion of the marsh plain over time. (See the 200' "buffer zone" delimited in Figure 1.) Incorporating dedication of this open area to future marsh expansion into this project would provide a degree of long-term protection as sea-level rise proceeds and perhaps mitigate some of the proximate disturbance to tidal marsh habitat.

2
https://library.municode.com/ca/contra_costa_county/codes/ordinance_code?nodeId=TIT4HESA_DIV416AN_CH416-4GEPR#TIT4HESA_DIV416AN_CH416-4GEPR_416-4.402ANLA

3
https://apps.wildlife.ca.gov/wir

Figure 1. Location of Western Stege Marsh (aka Meeker Slough) and adjacent habitat occupied by CRR.

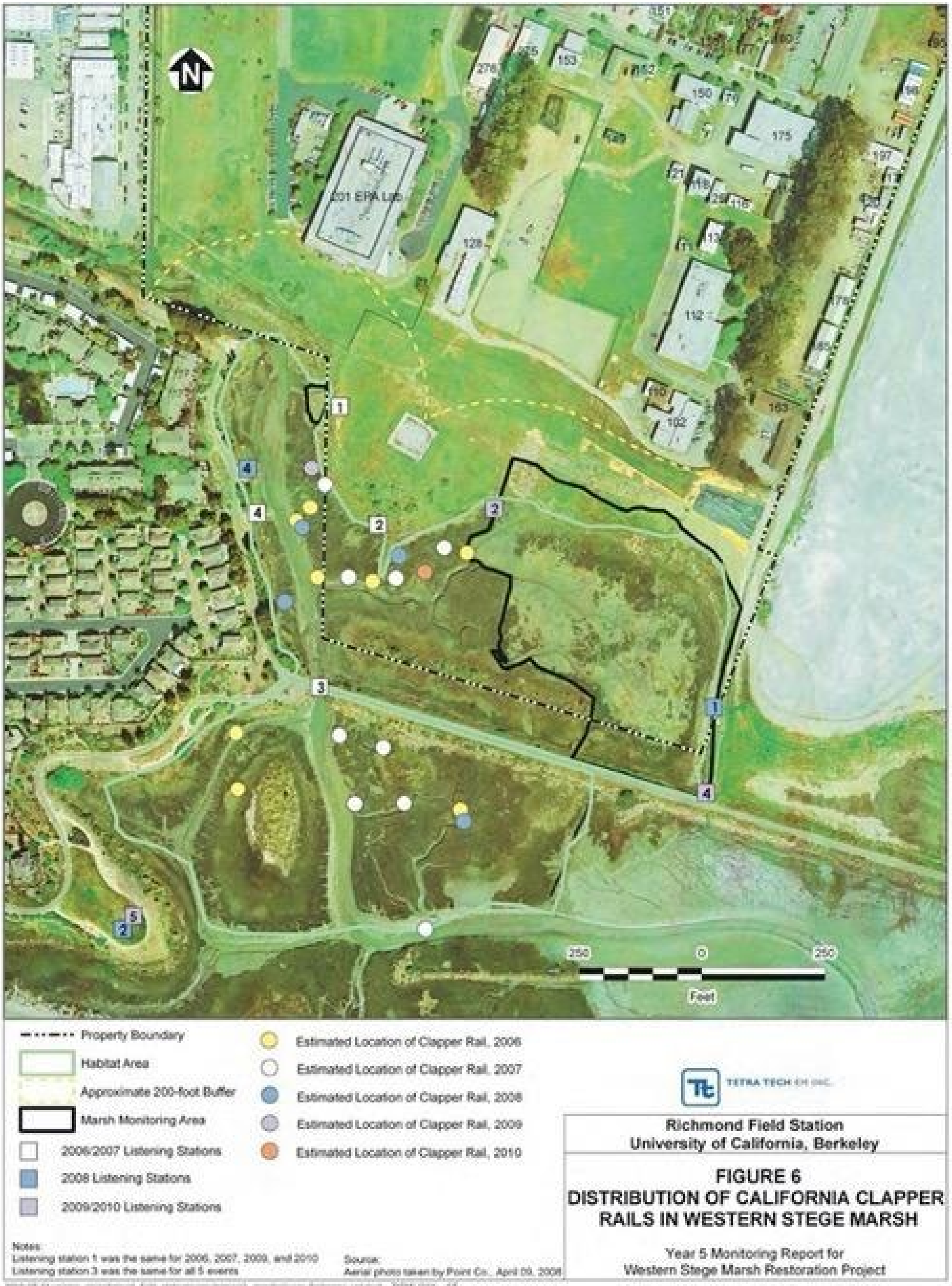

Figure 2. Showing rail detections from the surveys conducted from 2006-2010. The area outlined in black was excavated, backfilled, and restored in the early 2000s. Since then rails have been detected in the restored marsh, beginning in 2010. Figure from the [2010 Year 5 monitoring report]() for Western Stege Marsh.

BioMaAS

SOURCE: USDA (NAIP) 2018

FIGURE **3**

Stege Marsh 2020 California Ridgway's Rail Detections

Stege Marsh 2020 Rail Viability Study, Richmond, CA

BioMaAS

SOURCE: USDA (NAIP) 2018

FIGURE 4. Distribution of Ridgway's Rail detections on three protocol - level surveys conducted by BioMaAS and ARA in 2020 at Western Stege Marsh. The red circles encompass inferred CRR home ranges within the project area. Overlap indicates uncertainty of territorial boundaries. The yellow circles encompass putative use areas based on the distribution of limited detections south of the Bay Trail.

Figure 5. Location of juvenile CRRs (aka RIRA) observed in the project area, July 10, 2020.

Figure 6. Photograph of juvenile CRRs taken July 10, 2020 by BioMaAS biologist Cullen Wilkerson. Location shown in Figure 5. (Location indicated by red arrow.)

7 SUMMARY

During 2020, three protocol-levels surveys for California Ridgway's Rail were conducted by permitted BioMaS and ARA biologists using the "Site Specific Protocol for Secretive Marsh Birds" as approved by USFWS (2017). Locations of 65 independent detections (10.9/observer hour) were estimated in the field by distance and direction from fixed survey points and plotted on field maps. These cumulative locations were transferred to a master map. Clusters of calls were determined post-hoc under the assumption that movement outside of core-use areas was limited during the nesting season. Based on these data, we estimate two occupied territories within the study area during the 2020 nesting period. An additional two occupied habitats were inferred from detections in adjacent marsh parcels south of the Bay Trail.

Subsequent field observations conducted in April-July of 2020 focused on these core areas in an attempt to determine nesting effort and reproductive viability of the resident population CRRs and to inform planned marsh restoration projects. Two juvenile rails were observed within the study area on July 10.

Estimated densities of CRR in Western Stege Marsh found in this study were within the range of values known for San Francisco Bay marshes (0.86—6.18 ha) indicting that currently the site appears to be supporting a viable and healthy population of this endangered species.

Comments and suggestions regarding the short, mid-, and long-term conditions of the site are provided.

8 PERMITS

All protocol-level surveys reported here were conducted under the following federal (USFWS) permits:

Jules Evens TE 786728-5

Mary Anne Flett TE-233373-2

Bill Stagnaro TE-170381-4

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APPENDIX A.

REQUEST FOR AUTHORIZATION AND RESPONSE FROM USFWS

MEMORANDUM

Date: 19 December 2019

To: Angela Galarreta (USFWS) jazmine_galarreta@fws.gov

Esther Burkett (CDFW) Esther.Burkett@wildlife.ca.gov

Cc: Mary Anne Flett (ARA)**,** Bill Stagnaro (BioMaAS), Alicia Bihler (BioMaAS)

From: Jules Evens, Principal, ARA

Re: Viability study of California Ridgway's Rail: Stege Marsh, Alameda Co. CA

The University of California, Berkeley (UC Berkeley) is proposing to remediate areas within Western Stege Marsh, a portion of the Richmond Field Station property owned by UC Berkeley. A component of the mitigation for this remediation was an interagency (USFWS, CDFW, BCDC, ACOE, RWQCB, DTSC) request to perform a rail viability study for Western Stege Marsh. Ridgway's Rails are known to occur at the site (Figure 1), however, the agencies have requested a study to try to gather more details about rail distribution and abundance within the marsh to inform the project.

BioMaAS and Avocet will prepare a Rail Viability Study (Study) for Western Stege Marsh for submission to UC Berkeley, and ultimately to the agencies. Per agency request, the study will be non-invasive. Prior to preparation of the Study, reconnaissance surveys will be required by our team to determine the feasibility of our approach. This memorandum is meant to inform the relevant agencies of our reconnaissance survey plan ("Tier 1").

Tier 1 will consist of field surveys by experienced rail biologists. The surveys are not meant to determine presence/absence (presence is already know) or to be formal population studies, rather the intent is to determine distribution and activity centers within the marsh. To this end, we are proposing a series of "passive" surveys conducted from "floating" stations at various locations on the marsh perimeter (Figure 1). On a preliminary site visit on 5 December 2019, ARA biologists determined that the entire marsh could be covered from four to six stations (Figure 1: purple station 2, 4, 5 and white station 3, perhaps more) covered by two to three observers on each survey. To accomplish this coverage, we propose occupying each station for 30-minute or 45-minute intervals during the two-hour period prescribed by USFWS protocols. In our judgment, this strategy will increase the likelihood of detections and maximize our ability to determine activity centers within the marsh. The surveys will also adhere to other relevant USFWS protocol requirements (census period, weather conditions, tidal levels, etc.).

Based on previous fieldwork conducted at this site by ARA biologists, we know that vocal activity by Ridgway's Rail tends to be high (a likely indication of relatively high densities). Therefore, we assume that we will be able to identify and map activity centers based on detections gathered on two or three passive surveys. After this initial effort, if we determine that portions of the marsh are not used by rails, or we are uncertain of distribution in some areas, we propose conducting selective "active" surveys (broadcasting taped vocalizations of "clatter" or "kek" calls) in an effort to determine distribution in these enigmatic sections of the marsh. To avoid disturbance of occupied territories, we will conduct these active surveys a minimum of 200-m from known core activity centers and broadcast at relatively low volumes (decibel levels to be determined in the field based on background noise).

Tier 2 surveys are presented as an option and would consist of placement of cellular cameras within Stege Marsh. We would like feedback from the agencies to decide if this option would be too invasive for this study area, and if approved, we would look to UC Berkeley to decide the cost effectiveness of this additional approach. Cellular cameras are proposed to limit physical entry into the marsh and eliminate the need for biologists to change memory cards or batteries during the rail breeding season. A number of slough channels are proposed based on previous rail detections and the physical nature of the marsh (Figure 3 in attached proposal). It is proposed that cameras be deployed by boat or kayak prior to the rail breeding season. The cameras would be attached to t-posts or long stakes to insure they are not inundated by high tides. The cameras would face the slough channels in the hopes of capturing rail images. Cameras would remain in position the entirety of the breeding season (potentially from December through September). Over the course of the breeding season, the images would be sent to phones or computers in real time. Our team biologists would then be able to collect and process the photos more cost effectively and be able to detect any malfunctioning cameras quickly. Consistent identification of individual birds may not be possible, however, the photographic evidence may indicate sex, breeding pairs, and numbers of chicks.

Additional visual surveys may be conducted on extreme high tides to identify refugial areas within or adjacent to the tidal marsh.

All detections will be documented using standard reporting methods, mapped, and reported to CNDDB.

All fieldwork will be conducted under the guidance of one of these three permittees:

Jules Evens

U.S. Fish and Wildlife Endangered Species Permit: TE 786728-5
California Department of Fish and Game Collecting Permit # 801092-04
Federal Bird Marking and Salvage Permit: # 09316-AN

Mary Anne Flett

Federal Fish and Wildlife Permit # TE-233373-2

California Scientific Collecting Permit & MOU #SC7407

Bill Stagnaro

U.S. Fish and Wildlife Endangered Species Permit: TE-170381-4
California Department of Fish and Game Collecting Permit # SC-006989

Here is a link to the Biological Assessment of the site:

http://rfs-env.berkeley.edu/pdf/Biological%20Assessment%20Report.pdf

To this email, we have also attached a proposal for the entire study submitted to and accepted by the landowners, UC Berkeley.

Thank you for your attention to this request.

Response from USFWS, 21 January 2020

Hello Jules,

After speaking with Alicia Bihler, I can provide authorization for the Tier 1 surveys using the 2017 site-specific protocol but I can not yet comment on the other proposed surveys. I would argue that the 2017 protocol may help with distribution but is more suited to provide population trends which may still provide useful information for the questions posed in your proposal.

To be clear, I am not providing technical assistance and I can not authorize any other activities aside from the 2017 site-specific surveys. If you rely on the results of the surveys to inform technical assistance or a formal consultation, please realize that the data may not be sufficient for section 7 analysis.

In order for me to provide authorization for the protocol level surveys, can you send an image with the proposed survey stations.

Thank you,

Angela Galarreta, M.S.

Fish and Wildlife Biologist, Section 10 Permit Biologist

U.S. Fish and Wildlife Service, Bay-Delta Fish and Wildlife Office

650 Capitol Mall, Sacramento CA 95814
(916) 930-5636

APPENDIX B.

SITE-SPECIFIC PROTOCOL FOR MONITORING MARSH BIRDS, V.1.0

JANUARY 2017.

The survey method consists of 10-minute point count surveys that are repeated three times during the survey season at each survey point. The survey methods incorporate a five-minute passive listening period followed by call playback for two subspecies of conservation concern, the federally listed California Ridgway's rail (*Rallus obsoletus obsoletus*) and state-listed California black rail (*Laterallus jamaicensis coturniculus*). [Play BLRA grr (15 secs) followed by kik-kik-grr (15 secs) then 30 secs silent, then 30 secs of RIRA clatters or keks]

Each transect should have 6-8 points (8 preferred) with a spacing of at least 200-m between adjacent points [See field maps]. Spacing points farther apart (up to 400 m, is desirable but only if 6-8 points can be established and visited within the survey window.

Surveys will take place from 15 January – 15 April when CA Ridgway's rails have established their breeding territories and vocalizations are at their peak. Analysis has revealed that the peak in detection probability is about 20 February (Liu et al. 2012); thus, the period of peak detections is approximately 15 January to 25 March.

As in the prior field methods, or each survey point, there will be three "rounds" of surveys spread out over the survey season, however surveys should be completed by 31 March if possible. If that is not possible, then surveys will be complete as soon as possible after that date. Ideally, round 1 should be completed from 15 January to 6 February, round 2 from 7 February to 28 February, and round 3 from 1 March to 25 March. The period between 25 March and 15 April can be used to finish any remaining surveys if previous visits were cancelled due to weather or other logistics.

Surveys should be conducted when tides are < 4.5 ft (< 137 cm) relative to mean lower low water (MLLW) as measured at the nearest tide station or are not higher than the marsh plain (i.e., not higher than bank full) at the study area. Surveys during the day of a full moon that is visible during the survey should be avoided as birds may possibly be distracted by the broadcast vocalizations and become more vulnerable to predators that are taking advantage of the increase in ambient light. Ambient noise including winds > 10 mph is another source of error.

We recommend the same observer(s) for all points within a site-visit, that is, within one 2-hr session. However, it is preferable to use different observers for different visits within the same year. [Observers should switch stations on each round.] Across years, to the extent possible, it is desirable to retain a similar mixture of observers at an individual study area.

References

Wood, J.K., Nur, N., Salas, L. and O.M.W. Richmond. 2017. Site-specific Protocol for Monitoring Marsh Birds: Don Edwards San Francisco Bay and San Pablo Bay National Wildlife Refuges. Prepared for the U.S. Fish and Wildlife Service, Pacific Southwest Region Refuge Inventory and Monitoring Initiative. Point Blue Conservation Science. Petaluma, CA.

Ancillary notes:

All surveys must be conducted within a two hour (120-minute) period surrounding sunrise/sunset, starting no more than 60 minutes before sunrise or sunset and must terminate within 60 minutes of sunrise and sunset. Ideally, surveys should be conducted in a shorter period surrounding sunrise/sunset (e.g., within 40-45 min of sunrise/sunset).

Alter the direction or time of day (am vs. pm) of your surveys such that the same points are not surveyed during very dark or very light hours on each round. Ideally, each point should be visited close to peak calling time (sunrise/sunset) in at least one round which may involve arriving at the study area earlier to start at the far end of the transect.

If something substantially interferes with your ability to detect birds during the 10-minute count (e.g., a loud airplane or vehicle), stop the count until the disturbance has passed and start over. Cross out the interrupted data and note what happened on your form.

Call-broadcast should be halted in the presence of a potential rail predator within 200 m of the survey point and not resumed until the predator leaves the area. If the predator does not leave the area within 10 minutes, resume the count without employing the broadcast.

Equipment

• Vehicle (truck, boat, or bike) • GPS Unit
• binoculars
• rangefinder

• thermometer (optional)
• anemometer (wind meter)
• compass with adjustable declination
• clipboard (optional: rope sling for carrying)
• rubber bands or clips (for holding forms on clipboard)
• sufficient blank data forms (Appendix C)
• map of the study area and surrounding area with survey points • portable speaker

o Speaker volume should be between 80-90 dB at 1-m in front of the speaker without distortion

• audio player
o USFWS-approved audio file with California Ridgway’s rail and California black rail

vocalizations and minute call-outs <insert link or contact for file> • cell phone or radio (for safety and communication)
• water and snacks
• headlamp
• spare supplies (e.g., batteries, pens)

APPENDIX C.

DETECTIONS OF CALIFORNIA RIDGWAY'S RAILS DURING THE OF 2020 PROTOCOL-LEVEL SURVEYS OF WESTERN STEGE MARSH AND ADJACENT WETLANDS.

Date	Station	Type *	Time	Dir°	Dist (m)	Min	Type	Dupl?	Obs
1/31/20	Blue 4	A	0627	124	80	6	C		BS
1/31/20	Blue 4	A	0627	124	80	6	C		BS
1/31/20	Blue 4	A	0627	100	150	6	C		BS
1/31/20	Blue 4	A	0627	100	150	6	C		BS
1/31/20	Blue 4	A	0627	124	80	8	C	Y	BS
1/31/20	Blue 4	A	0627	124	80	8	C	Y	BS
1/31/20	White 4	A	0638	130	300+	2	C		BS
1/31/20	White 4	A	0638	90	15	6	C		BS
1/31/20	White 4	A	0638	90	15	6	C		BS
1/31/20	White 4	A	0638	115	60	6	K		BS
1/31/20	White 4	A	0638	124	80	6	C	Y	BS
1/31/20	White 4	A	0638	124	80	6	C	Y	BS
1/31/20	White 4	A	0638	100	10	9	C	Y	BS
1/31/20	White 4	A	0638	100	10	9	C	Y	BS
1/31/20	White 4	A	0638	165	250	10	C		BS
1/31/20	White 4	A	0638	165	250	10	C		BS
1/31/20	MEEK 3	A	0651	217	15	1	K		BS
1/31/20	MEEK 3	A	0651	325	80	1	C	Y	BS
1/31/20	MEEK 3	A	0651	325	80	1	C	Y	BS
1/31/20	MEEK 3	A	0651	150	50	1	V		BS
1/31/20	MEEK 3	A	0651	78	300+	4	C		BS
1/31/20	MEEK 3	A	0651	78	300+	4	C		BS
1/31/20	MEEK 3	A	0651	185	20	5	C		BS
1/31/20	MEEK 3	A	0651	185	20	5	C		BS
1/31/20	MEEK 3	A	0651	182	30	6	C	Y	BS
1/31/20	MEEK 3	A	0651	200	10	8	C	Y	BS
1/31/20	MEEK 3	A	0651	200	10	8	C	Y	BS
1/31/20	MEEK 5	A	0705	—	—	—	—	—	BS
1/31/20	MEEK 4	A	0722	40	35	6	C		BS
1/31/20	MEEK 4	A	0722	300	20	6	C	Y	BS
1/31/20	MEEK 4	A	0722	300	200	6	C	Y	BS
1/31/20	STEG 8	A	0737	245	80	7	K		BS

Date	Station	Type *	Time	Dir°	Dist (m)	Min	Type	Dupl?	Obs
1/31/20	STEG 8	A	0737	245	80	7	K		BS
1/31/20	STEG 8	A	0737	308	200	7	C	Y	BS
1/31/20	STEG 8	A	0737	308	200	7	C	Y	BS
1/31/20	STEG 8	A	0737	262	80	8	C		BS
1/31/20	STEG 8	A	0737	262	80	8	C		BS
1/31/20	STEG 8	A	0737	290	30	9	V		BS
1/31/20	STEG8	A	0749	290	30	—	V		BS
1/31/20	White 2	A	0753	245	10	1	V		BS
1/31/20	White 2	A	0753	90	200	5	C		BS
1/31/20	White 2	A	0753	90	200		C		BS
1/31/20	White 2	A	0753	180	2	8	V	Y	BS
1/31/20	White 2	A	0753	90	200	9	C	Y	BS
2/8/20	MEEK 5	A	1702	360	>200	7	C		MAF
2/8/20	MEEK 5	A	1716	30	75	—	C	Y	MAF
2/8/20	MEEK 3	A	1730	280	100	2	P		MAF
2/8/20	MEEK 3	A	1730	290	35	6	C		MAF
2/8/20	MEEK 3	A	1730	330	>200	6	C	Y	MAF
2/8/20	MEEK 3	A	1730	185	25	8	D		MAF
2/8/20	MEEK 3	A	1730	50	25	8	D	Y	MAF
2/8/20	MEEK 3	A	1740	50	25	10	D	Y	MAF
2/8/20	MEEK 6	A	1800	125	62	1	C		MAF
2/8/20	MEEK 6	A	1800	315	50	8	C		MAF
2/8/20	MEEK 6	A	1800	50	55	9	D		MAF
2/8/20	MEEK 6	A	1808	40	>200	10	C		MAF
2/8/20	MEEK 6-7	A	1811	120	30	—	D		MAF
2/8/20	MEEK 7	A	1820	145	50	1	C		MAF
2/8/20	MEEK 7	A	1820	?	?	7	D		MAF
2/8/20	BLUE 4	P	1700	99	70	6	C		MB
2/8/20	BLUE 4	P	1700	107	70	6	C	Y	MB
2/8/20	BLUE 4	P	1700	?	175	6	C		MB
2/8/20	STAG 8	A	1730	270	125	2	C	Y	MB
2/8/20	STAG 8	A	1730	262	150	2	C	Y	MB
2/8/20	STAG 8	A	1730	220	25	4	C		MB
2/8/20	STAG 8	A	1730	220	25	8	C	Y	MB
2/8/20	STAG 8	A	1730	220	30	4	C		MB
2/8/20	STAG 8	A	1730	220	30	9	C	Y	MB
2/8/20	STAG 8	A	1730	258	170	7	D		MB

Date	Station	Type *	Time	Dir°	Dist (m)	Min	Type	Dupl?	Obs
2/8/20	WHITE 2	A	1750	120	?	7	C		MB
2/8/20	WHITE 2	A	1750	120	?	7	C		MB
2/8/20	WHITE 2	A	1750	120	?	8	K		MB
2/8/20	WHITE 2	A	1750	120	?	10	C		MB
2/8/20	WHITE 2	A	1750	201	5	8	C		MB
2/8/20	WHITE 2	A	1750	201	5	8	K		MB
2/8/20	WHITE 2	A	1750	201	5	9	B		MB
2/8/20	WHITE 2	A	1750	201	5	10	KH		MB
2/8/20	WHITE 2	A	1750	107	8	8	C		MB
2/8/20	WHITE 2	A	1750	107	8	8	K		MB
2/8/20	MEEK 4	A	1808	240	60	7	D		MB
2/8/20	MEEK 4	A	1808	245	85	8	C	Y	MB
2/8/20	MEEK 4	A	1808	316	110	7	C	Y	MB
2/8/20	MEEK 4	A	1808	316	115	7	C	Y	MB
3/1/20	MEEK 7	A	1712	295	150	4	C		MAF,MB
3/1/20	MEEK 7	A	1712	295	150	7	C		MAF,MB
3/1/20	MEEK 7	A	1712	234	200	4	C		MAF,MB
3/1/20	MEEK 6	A	1725	118	170	4	C		MAF,MB
3/1/20	MEEK 6	A	1725	110	100	4	C		MAF,MB
3/1/20	MEEK 6	A	1725	110	100	5	C	Y	MAF,MB
3/1/20	MEEK 6	A	1725	300	35	7	C		MAF,MB
3/1/20	MEEK 6	A	1725	78	200	4	C		MAF,MB
3/1/20	MEEK 6	A	1725	78	200	8	C	Y	MAF,MB
3/1/20	MEEK 6	A	1725	78	200	9	C	Y	MAF,MB
3/1/20	MEEK 4	A	1742	245	95	6	C		MAF,MB
3/1/20	MEEK 4	A	1742	245	95	8	C	Y	MAF,MB
3/1/20	MEEK 4	A	1742	335	50	6	C		MAF,MB
3/1/20	MEEK 4	A	1742	313	75	6	C		MAF,MB
3/1/20	MEEK 4	A	1742	287	85	6	C		MAF,MB
3/1/20	MEEK 4	A	1742	237	130	8	C		MAF,MB
3/1/20	STAG 8	A	1757	196	50	7	C	Y	MAF,MB
3/1/20	STAG 8	A	1757	196	50	7	C	Y	MAF,MB
3/1/20	STAG 8	A	1757	264	100	6	SQ		MAF,MB
3/1/20	STAG 8	A	1757	264	100	7	C		MAF,MB
3/1/20	STAG 8	A	1757	255	145	7	C	Y	MAF,MB
3/1/20	STAG 8	A	1757	255	140	7	C	Y	MAF,MB
3/1/20	WHITE 2	A	1813	120	115	1	C		MAF,MB

Date	Station	Type *	Time	Dir°	Dist (m)	Min	Type	Dupl?	Obs
3/1/20	WHITE 2	A	1813	120	115	2	V	Y	MAF,MB
3/1/20	WHITE 2	A	1813	120	115	4	V	Y	MAF,MB
3/1/20	WHITE 2	A	1813	120	115	7	C	Y	MAF,MB
3/1/20	WHITE 2	A	1813	170	75	3	C		MAF,MB
3/1/20	WHITE 2	A	1813	126	80	7	D		MAF,MB
3/1/20	MEEK 3	A	1836	353	100	6	C		MAF,MB
3/1/20	MEEK 3	A	1836	344	85	6	C		MAF,MB
3/1/20	MEEK 5	A	1850	—	—	—	—		MAF,MB
3/1/20	BlUE 4	P	1848	—	—	—	—		
3/10/20	MEEK 7	P	1815	—	—	—	—		BS
3/10/20	MEEK 6	P:	1820	—	—	—	—		BS
3/10/20	MEEK 5	P	1825	350	100	7	D		BS
3/10/20	MEEK 5	P	1825	50	200+	8	D		BS
3/10/20	MEEK 4	P	1843	—	—	—	—		BS
3/10/20	1	P	1920	—	—	—	—		BS
3/10/20	8	P	1959	—	—	—	—		BS
3/10/20	2	P	1905	95	5	5	K,V		BS