

APPENDIX G-6
Bird Survey Report

**Bird surveys for the
Hercules Ferry Terminal Project
2007**

Prepared by

Hildie Spautz
Wetland Wildlife Associates
PO Box 2330
El Cerrito, CA 94530

Prepared for
Josh Phillips
Pacific Biology
1212 Colusa Avenue
Berkeley, CA 94707

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1.0 INTRODUCTION

This report summarizes the results of bird surveys conducted at the Hercules Ferry Terminal project site during the spring and early summer of 2007 by the author Hildie Spautz with the assistance of leading regional rail expert Jules Evens. These surveys concentrated on existing tidal marsh habitat due to the possible presence of special status species including the California clapper rail (*Rallus longirostris obsoletus*), a federal and state of California endangered species; the California black rail (*Laterallus jamaicensis coturniculus*), a state of California threatened species; and the San Pablo song sparrow (*Melospiza melodia samuelis*), a state of California species of special concern. There are no previous records of bird surveys in this area, so its value to special status birds was entirely unknown. Short-term project construction activities and long-term ferry terminal operations have the potential to cause disturbance to the tidal marsh habitat, and information about the presence of these species will allow project planners to minimize any potential impacts.

2.0 STUDY AREA

The project area is within the City of Hercules and encompasses the area under consideration for a ferry terminal and associated structures. A Union Pacific rail line runs along the southern edge of the site, and separates it from a new residential development to the south. There was an explosives plant in the center of the site, and only the concrete foundations remain. Three separate tidal marsh areas remain on the bayfront edge of the property: a 2.1 ha linear marsh along the southwestern edge (marsh area 1), a 0.8 ha square marsh area on the northwestern point (marsh area 2), and a 0.8 ha linear marsh on the eastern side (marsh area 3; Figure 1). These marshes are relatively young (< 100 years old), having formed on the outboard side of rip-rapped shoreline (SFEI 1998). Bird surveys were focused on these marsh areas but also included all habitats adjacent to the survey stations.

3.0 METHODS

3.1 FIELD SURVEY METHODS

Several types of bird surveys were conducted at the project site, focusing on the tidal marsh area but including all birds detected in adjacent habitat. Stations for rail surveys and point counts were established 100 - 200 meters (m) apart, where appropriate, so that the likelihood of detecting special status species in the tidal marsh was maximized (Figure 1). Additional stations for black rail surveys were added in the northeastern marsh (marsh area 3), to maximize detection probabilities, because it is closest to the ferry pier as currently planned and is likely to be the most strongly effected by construction activities. All birds were recorded with reference to the survey station from which they were detected (if recorded during a timed survey) and with reference to designated habitat areas: tidal marsh areas 1, 2 and 3; mudflat adjacent to these marsh

areas (areas included either or both exposed mudflat or bay water, depending on the tide); and adjacent uplands. Upland areas in the central portion of the site were divided into smaller segments to aid in mapping (areas A – J; Figure 1).

The geographic coordinates of survey stations are included in Appendix 5.

3.1.1 California Clapper Rail Breeding Season Call Count Surveys

We used the standard "walking transect" survey protocol written by United States Fish and Wildlife Service (USFWS) biologists and used by researchers throughout the San Francisco Estuary to document California clapper rail presence during the breeding season and to calculate rail relative abundance and/or density (Appendix 1). The site is visited four times during the season with at least seven days between visits. During the first three rounds the observer stands at each point silently for 10 minutes (referred to as a "passive" survey), recording all rails detected visually or aurally. Pre-recorded clapper rail vocalizations are used on the final, fourth visit to elicit a response from rails if no rails were detected during the three previous passive surveys within 200 m of the survey station; this is referred to as an "active" survey. For each bird or pair of birds detected, the observer records the number of birds, call type, distance and angle on a pre-printed datasheet and plots the approximate location on an aerial photo.

Clapper rail surveys were conducted from survey stations 1 through 5 (Figure 1). The full protocol is included in Appendix 1. An example of a survey datasheets is included in Appendix 2.

3.1.2. California Black Rail Breeding Season Call Count Surveys

We used the widely-accepted protocol for California black rail surveys developed and used by regional researchers (Evens *et al* 1991; Nur *et al* 1997; Spautz *et al* 2006) to document black rail presence during the breeding season and to calculate relative abundance and/or density. The site is visited three times during the season with at least seven days between visits. Prerecorded black rail vocalizations are played at each station to elicit responses from rails in the marsh; typically rails within 30 - 50 m of the station will respond but often rails farther away will hear the vocalizations and respond. For each bird or pair of birds detected, the observer records the number of birds, call type, distance and angle on a pre-printed datasheet and plots the approximate location of the bird on an aerial photo.

Black rail surveys were conducted from survey stations 1 through 7 (Figure 1). The full protocol is included in Appendix 3.

3.1.3. Variable circular plot point count surveys for all bird species

Standardized point count surveys were conducted for all species simultaneously with the rail surveys during 5 of the 6 visits (Table 1). At each station, the observer records the following on a preprinted datasheet for each bird detected: the species, number of birds, distance (to the nearest 10 m), observation type (call type or visual), habitat type (marsh, mudflat, upland or pond), and habitat area (marsh or mudflat 1 – 3, upland A – J; Figure 1; Nur *et al* 1997). Birds flying over were also recorded. Each bird was recorded only

once, and birds detected from more than one station were included only in one station's data. Birds beyond 200 m on the mudflats or open water or beyond 200 m in the upland area outside the project site were not recorded. The survey timing included the entire 6 to 10 minute survey period associated with the rail survey being conducted (6 minutes for black rails, 10 minutes for clapper rails). The first 3 surveys included 10 minutes of observations at each station and the final 3 surveys included 6 minutes at each station. Thus the variability in bird detection rates may vary among surveys due to the survey length. Please see Appendix 4 for a more detailed description of the point count survey protocol.

Birds detected outside the designated survey time, or when walking between stations, were also recorded on the survey datasheets but were coded as non-survey detections in the database so they could be excluded during analysis, if necessary.

Point counts were conducted from survey stations 1 through 7 (Figure 1). The complete protocol is included in Appendix 4.

3.1.4. Territory-mapping San Pablo song sparrows

Locations of breeding San Pablo song sparrows were mapped on aerial photos during 5 of the 6 visits. We watched singing males and their mates and observed their movements across the marsh, also watching for indications of breeding behavior such as carrying nesting material or food for young. We observed interactions within and among neighboring pairs to determine how many pairs were in each marsh segment, and where the approximate territory boundaries lay. These approximate territory boundaries were digitized in ArcView 3.2.

3.2 DATA COLLECTION AND MANAGEMENT

Station locations were established in the field and recorded with a Garmin 76 hand-held GPS unit with WAAS satellite reception enabled and an accuracy of ≤ 10 m. These coordinates were converted to a GIS shapefile in ArcView GIS 3.2. All points were navigated to during surveys using the Garmin GPS 76 unit.

All survey data were entered in the field on pre-printed datasheets. Maps were created using imagery provided by Pacific Biology and Vollmar Consulting. Locations of song sparrows and other special-status birds were recorded on these maps in the field.

We entered survey detection data and associated habitat and location data into an Access database, portions of which had been previously developed by the author and colleagues for similar surveys by PRBO Conservation Science and the Invasive *Spartina* Project.

Data were entered and proofed against original datasheets for accuracy. We examined all fields for obvious outliers and checked these against the original data.

To create tables for this report, data were summarized in Access by species, survey date and by habitat type.

4.0 RESULTS

Bird surveys were conducted on March 8, March 30, April 6, April 16, June 2, and June 10, 2007. Clapper rail surveys were conducted on the first four dates, black rail surveys were conducted on the final three dates. Point counts and territory mapping were conducted during each visit except April 14 (Table 1).

4.1 CALIFORNIA CLAPPER RAIL CALL COUNT SURVEY RESULTS

No California clapper rails were detected at the project site during formal clapper rail surveys or during other site visits for bird surveys (Table 2, Table 3).

4.2 CALIFORNIA BLACK RAIL CALL COUNT SURVEY RESULTS

No California black rails were detected at the project site during formal black rail surveys or during other site visits for bird surveys (Table 2, Table 3).

4.3. SAN PABLO SONG SPARROW SURVEY RESULTS

Ten to fourteen San Pablo song sparrows were detected during each point count survey, averaging 12 birds (Table 2). All of these birds appeared to be on breeding territories, and females in most territories were behaving as though they had active nests or young throughout the season. Based on territory maps created on June 2 and June 10 site visits, there were 7 to 9 territories mapped: thus there were probably 14 to 18 birds (Figure 2). Most of these birds were detected in the tidal marsh habitat, but at least one pair appeared to have a territory that primarily encompassed upland habitat. Two pairs used the northeaster marsh area 3, near the probable ferry pier.

Song sparrows were detected with nesting material in marsh area 1 on June 10 (in a small tule patch) and with food for nestlings or young on April 6 in marsh areas 1 and 3. At least one fledged young was detected in marsh area 1 on June 2.

Song sparrows at this site were associated with stands of gumplant (*Grindelia stricta*), alkali bulrush (*Bolboschoenus maritimus*), tule (*Schoenoplectus californica*), pepperweed, (*Lepidium latifolium*) and pickleweed (*Sarcocornia pacifica*). As found in published studies (Spautz *et al* 2006; Spautz & Nur in press), song sparrows tend to be associated with higher elevation portions of the marsh, taller marsh vegetation including shrubs, and upland edges.

4.4. OTHER BIRD SPECIES

We detected a total of 38 species during surveys in spring 2007 (Table 1, Table 3). Of these, 13 were detected in tidal marsh habitat, in the vegetation, on pilings or flying over the habitat (Table 2). Of these, the birds likely breeding in the marsh or immediately adjacent to it were San Pablo song sparrow, killdeer (likely nesting on open ground or gravel near the marsh), and mallard (possibly breeding in dense vegetation in the upper marsh or on the marsh edge). Birds roosting or foraging in *Spartina foliosa* in the low marsh included black-bellied plover, mallard, marbled godwit, willet, and snowy egret (Table 2). None of these species was likely to be breeding on the site. Species detected

using the mudflats and open water adjacent to the site included black-bellied plover, California gull, Canada goose, double-crested cormorant, Forster's tern, Caspian tern, greater scaup, mallard, marbled godwit, short-billed dowitcher, snowy egret, surf scoter and willet (Table 1, Table 3). Of these, the species likely to be breeding in the general area but not in the project site included: California gull, Canada goose, double-crested cormorant, Forster's tern, Caspian tern, and snowy egret. Birds using the mudflats in the vicinity are most likely to be impacted by ferry activity, including direct loss of mudflat and increased wave action.

Special status species we identified were San Pablo song sparrow and white-tailed kite. One white-tailed kite was observed at the site during the March 8 survey. This bird did not appear to be breeding on the site.

5.0 DISCUSSION & RECOMMENDATIONS

During a preliminary site visit, we documented that the marshes at Hercules had many habitat elements required by tidal marsh-obligate breeding birds in the region, indicating the potential for their occurrence at the site. These initial observations were as follows:

- A. The marshes are dominated by pickleweed (*Sarcicornia pacifica*), which is typical for marshes in southern San Pablo Bay. Pickleweed is a critical habitat component for most tidal marsh species typically found in San Pablo Bay (Trulio & Evens 2000; Spautz *et al* 2006).
- B. Each of the marshes has an internal high marsh zone, which in a typical marsh is associated with tidal channels and the marsh/upland ecotone. Here there are apparently few tidal channels, which is a potential constraint to the habitat value. The internal berms, which were the result of human activities and likely associated with docks or boardwalks, support healthy stands of gumplant (*Grindelia stricta*) and other high marsh plant species including *Lepidium latifolium*. These internal high elevation areas support the plant species and associated vegetation structure required for nesting birds and salt marsh harvest mice (Trulio & Evens 2000; Spautz & Nur 2004; Spautz *et al* 2006).
- C. Each of the marshes has a zone of brackish influence which supports apparently healthy stands of alkali bulrush (*Bolboschoenus maritimus*). This species also provides good bird nesting habitat (Spautz *et al* 2006).
- D. The upper marsh/upland ecotone is vegetated over much of its length, and in some places dense pickleweed merges into coyote brush (*Baccharis pilularis*). The marsh/ upland ecotone is extremely important to virtually all tidal marsh animals, particularly during high tide when they are vulnerable to predation. Marshes with poorly vegetated upper edges are considered of lesser value than those with a wider zone (Trulio & Evens 2000; Spautz *et al* 2006).

Initially, we made recommendations that the habitat be evaluated for following special status birds and mammals, all of which could potentially occur on the site based on existing habitat. Here we provide an updated assessment of their presence or potential presence, and make recommendations for additional surveys prior to project construction, where applicable.

- 1) **California clapper rail (*Rallus longirostris obsoletus*)**, an endangered species at the federal and state level (USFWS 1984), requires the following habitat elements in tidal marshes to establish a breeding territory: a well-developed tidal channel system with full tidal influence, cordgrass (*Spartina* spp.), and a vegetated upper marsh/upland ecotone (Albertson & Evens 2000; Spautz & McBroom 2006). The latter two elements are present at the site, but a well-developed channel system is lacking. The minimum marsh patch size likely to be used by breeding clapper rails is estimated to be approximately 1 ha (2.47 acres; Albertson & Evens 2000; J. Evens *pers. comm.*), although smaller areas with high *Spartina alterniflora x foliosa* hybrid cover support rails (Spautz & McBroom 2006); however, there does not appear to be any invasive *Spartina* at the site. The site is large enough to support only one pair of rails at the most. There are no records in the California Natural Diversity database for the project area and I am not aware of any surveys that have been previously done. The closest marsh where rails have been documented is Whittel marsh north of Pt Pinole, 5 km to the south (Evens *et al* 1992) but no rails were present there in 2006 (PRBO unpublished data). The maximum dispersal distance recorded in radio telemetry studies was 3 km (Albertson & Evens 2000), however a bird was recently documented to have flown from San Mateo to San Rafael, a distance of more than 30 miles (J. McBroom, *pers. comm.*). Because the site is so isolated from other marshes with established rail populations, it is not likely to be colonized except after years of exceptionally high recruitment when other higher quality marshes are at carrying capacity. The probability of clapper rails using the site is low (J. Evens *pers. comm.*; *pers. obs.*). I recommended doing protocol-level surveys for clapper rails during the breeding season (January 15 to April 15). We detected no clapper rails during the 2007 surveys described in this report. However, because there is some potential for the site to be occupied in some years, we recommend that surveys be conducted again prior to project construction, particularly if construction will be carried out during the breeding season, February 1 to August 31.
- 2) **California black rail (*Laterallus jamaicensis coturniculus*)** is a state of California threatened species found in saline to brackish marshes with

mutated to full tidal action. The species is associated with high overall vegetation cover, high cover of small tidal channels, and low cover of saltgrass (*Distichlis spicata*) and *Schoenoplectus* spp. (*S. acutus* and *S. californicus*); they are more likely to be present in larger marshes with higher proportions of adjacent natural upland or agriculture, and are less likely in more isolated marshes (Spautz *et al* 2006). Particularly where the marsh vegetation is low, the black rails require access to vegetated upper marsh as refuge from predation during high tides (Evens *et al* 1991). Black rails nest commonly in pickleweed and alkali bulrush, both found at the site (Spautz *et al* 2005). Although marsh within the project area is of a relatively small acreage and isolated, other habitat elements are present, and black rails are moderately likely (J. Evens pers. comm.). Black rails have been documented less than 1 km south of the project site (CNDDDB) and at Pt Pinole (CNNDDB and personal observation). We detected no black rails during the 2007 surveys described in this report. However, because there is some potential for the site to be occupied in some years, we recommend that surveys be conducted again prior to project construction, particularly if construction will be carried out during the breeding season, February 1 to August 31.

- 3) **San Pablo (Samuel's) song sparrow (*Melospiza melodia samuelis*)** is a state of California bird species of special concern (Spautz & Nur in press). Song sparrows were documented breeding at the site during surveys described in this report (Table 2 – 4). Between 7 and 9 pairs were mapped (Figure 2). Tidal marsh song sparrows are found in a range of tidal marshes throughout the estuary and are typically absent only where there is 100% *Spartina alterniflora* hybrid cover or the site is exceptionally disturbed or small (personal observations). Song sparrows tend to be associated with higher gumplant and coyote brush cover, lower *Spartina* cover, larger marsh area, and marshes with higher proportion of natural uplands, and lower proportion of ponds or panes (Spautz *et al* 2006). The species tends to be associated with upper marsh rather than lower marsh and territories are typically arranged along tidal channels. Nests are built most commonly in pickleweed, gumplant and alkali bulrush. All these habitat components are present, except large area. Because song sparrows

have now been documented at the site, even if rails or salt marsh harvest mice are not found, I would recommend that project construction over or adjacent to the marsh be confined to the non-breeding season. If construction is undertaken during the breeding season, I would recommend that we map territory locations and monitor nesting locations, so that an appropriate construction buffer can be maintained.

- 4) **Salt marsh common yellowthroat (*Geothlypis trichas sinuosa*)** is a state of California bird species of special concern. This species is more commonly associated with fresh and brackish marshes than with saline marshes, except in winter. It is more often found in tidal marshes with cattails (*Typha*) and alkali bulrush, and overall taller vegetation (Spautz *et al* 2006). Because alkali bulrush is present, there is a moderate chance of finding yellowthroats. None were detected during 2007 surveys detailed in this report, but it's possible that they may colonize the site some years. I recommend that additional surveys be conducted prior to construction. If yellowthroats are breeding at the site and if construction is undertaken during the breeding season, I would recommend that we map territory locations and monitor nesting locations, so that an appropriate construction buffer can be established.
- 5) **Northern harrier (*Circus cyaneus*)** is state of California species of special concern. This species uses open marsh and grassland areas and the nest is built on the ground, preferably near water or in wet areas. Nests have been documented in tidal marshes in San Pablo Bay. The site is not likely to support nesting harriers, but is likely to be used for foraging. No harriers were documented during the 2007 surveys described here. However, prior to construction the area should be surveyed for nesting harriers so that an appropriate buffer can be maintained during construction.
- 6) **White-tailed kite (*Elanus leucurus*)** is a state of California species of special concern. Kites nest in shrubs and trees, and suitable habitat is available within and adjacent to the project site. We observed a pair of kites foraging over marshes 1 and 2 at the project site during several site visits, but they did not appear to be nesting within the project area. Prior to

construction, the area should be again surveyed for nesting kites so that an appropriate buffer can be maintained during construction.

- 7) **Osprey (*Pandion haliaetus*)** is a state of California species of special concern. The species forages for fish over open water and nests on trees or platforms. It was observed during the initial site visit in early fall 2006, but not during spring 2007 surveys. It's possible they use the site during the non-breeding season or only some years. Although the area is not likely to be used by breeding osprey, prior to construction, the area should be surveyed for ospreys and their nests so that an appropriate buffer can be maintained during construction.
- 8) **Short-eared owl (*Asio flammeus*)** is a state of California species of special concern. This species does not commonly nest in the region, but is found in San Pablo Bay during the winter. We did not document any owls during spring 2007 surveys.
- 9) **Western burrowing owl (*Athene cunicularia*)** is a state of California species of special concern. The species is not a common breeder in the project area, but was found during the winter. Surveys for burrowing owls are described elsewhere.
- 10) **Tricolored blackbird (*Agelaius tricolor*)** is a state of California species of special concern. The species is a colonial nester and requires large areas of cattails for nesting. There is no suitable habitat for this species on the project site. None were detected on the site during spring 2007 surveys.

Although not previously identified as an issue, I would like to recommend additional consideration of potential impacts to the mudflats within and adjacent to the project site due to construction activities and regular ferry operations. As mentioned above, birds using the mudflats may be impacted if mudflat area is reduced due to ferry construction and increased wave action. The relative value of these mudflats to resident, migrating, and wintering shorebirds and waterbirds is not currently known. I recommend that surveys of birds using the mudflats be conducted this fall and winter to determine spatial and temporal patterns of use for foraging and roosting.

6.0 ACKNOWLEDGEMENTS

Jules Evens conducted clapper rail and black rail surveys on April 16. Josh Phillips provided technical support.

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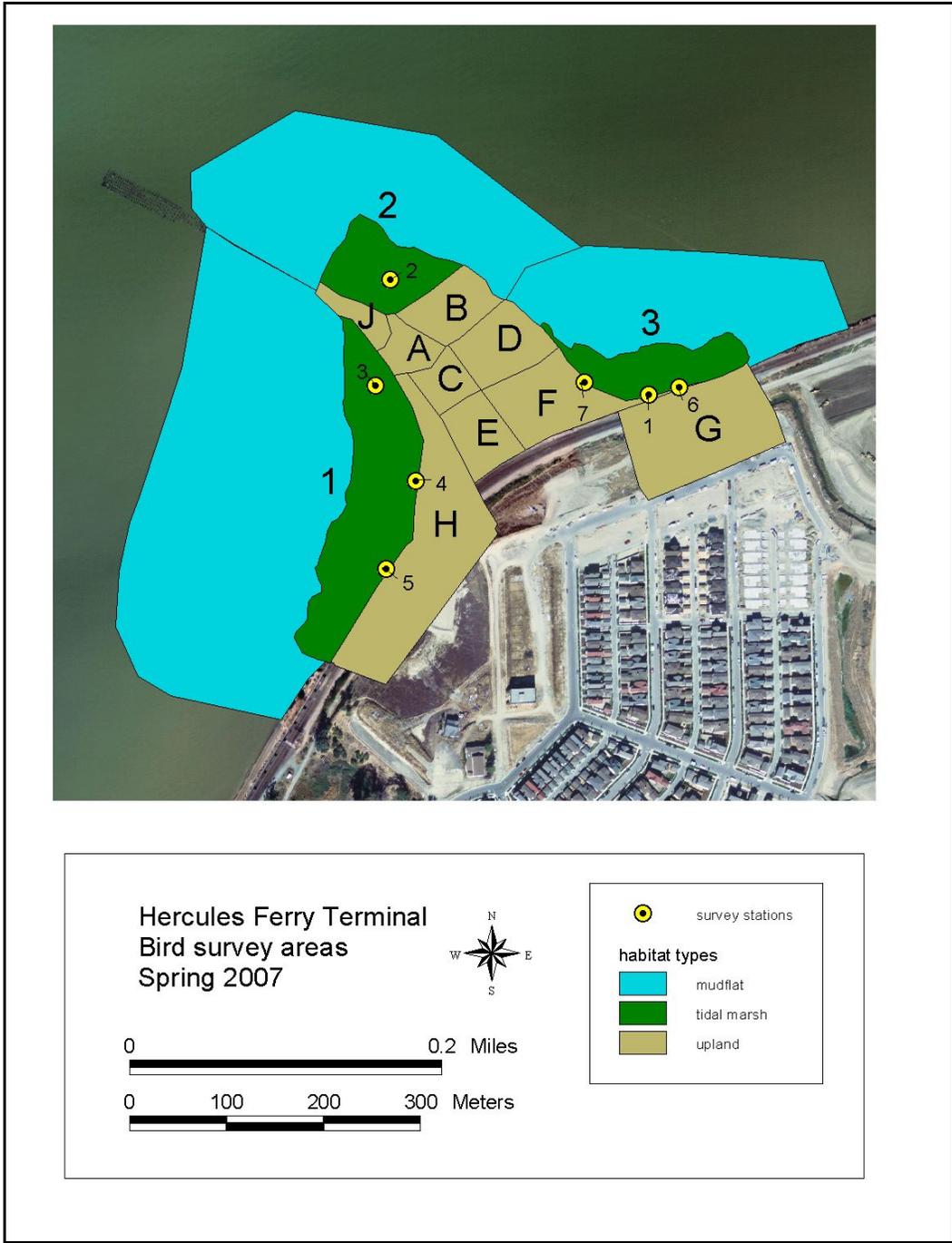


Figure 1. Map of the Hercules ferry terminal study area indicating the location of survey stations and habitat areas surveyed.



Figure 2. San Pablo song sparrow breeding territory locations, spring 2007.



Figure 3. Overlooking marsh area 3; stations 1, 6 and 7



Figure 4. View of marsh area 2 from station 2, facing west.

A small marsh pond is at the western end of marsh.



Figure 5. View of marsh area 3 from station 3, facing south



Figure 6. View of marsh area 3 from station 4, facing west



Figure 7. View of marsh area 3 overlooking stations 3 and 4, facing west



Figure 8. View of marsh area 3 from station 5, facing southwest.



Figure 9. View of marsh area 3 overlooking station 5, facing southwest.



Figure 10. View of central area from the southeast corner of the site, facing north.

Table 1. Bird survey dates.

Active surveys involved playing prerecorded vocalizations to elicit responses. Passive surveys included no vocalizations.

Date	Clapper rail survey	Black Rail survey	Point count survey
3/8/2007	Passive	-	passive
3/30/2007	Passive	-	passive
4/6/2007	Passive	-	passive
4/16/2007	Active	Active	informal species list only
6/2/2007	-	Active	passive
6/10/2007	-	Active	passive

Table 2. Point count results, all habitats: counts of bird species by date and the average of these counts.

This table includes birds in all habitat types and birds flying over. See Table 3 for birds detected in tidal marsh only.

Common name	Scientific name	3/8/2007	3/30/2007	4/6/2007	6/2/2007	6/10/2007	Average count
American crow	<i>Corvus brachyrhynchos</i>	2	0	0	0	1	0.6
American goldfinch	<i>Carduelis tristis</i>	0	0	0	0	1	0.2
Anna's hummingbird	<i>Calypte anna</i>	1	0	0	0	0	0.2
band-tailed pigeon	<i>Columba fasciata</i>	0	0	0	2	0	0.4
barn swallow	<i>Hirundo rustica</i>	0	0	0	0	14	2.8
belted kingfisher	<i>Ceryle alcyon</i>	0	1	0	0	0	0.2
black phoebe	<i>Sayornis nigricans</i>	1	0	0	1	1	0.6
black-bellied plover	<i>Pluvialis squatarola</i>	1	1	0	2	0	0.8
brown-headed cowbird	<i>Molothrus ater</i>	0	1	0	0	1	0.4
bushtit	<i>Psaltriparus minimus</i>	0	2	2	2	0	1.2
California black rail	<i>Laterallus jamaicensis coturniculus</i>	0	0	0	0	0	0
California clapper rail	<i>Rallus longirostris obsoletus</i>	0	0	0	0	0	0
California gull	<i>Larus californicus</i>	0	1	0	0	8	1.8

Common name	Scientific name	3/8/2007	3/30/2007	4/6/2007	6/2/2007	6/10/2007	Average count
California towhee	<i>Pipilo fuscus</i>	0	2	0	0	1	0.6
Canada goose	<i>Branta canadensis</i>	0	2	2	0	0	0.8
Caspian tern	<i>Sterna caspia</i>	0	0	0	1	0	0.2
double-crested cormorant	<i>Phalacrocorax auritus</i>	0	0	0	1	0	0.2
Forster's tern	<i>Sterna forsteri</i>	0	0	0	20	100	24
golden-crowned sparrow	<i>Zonotrichia atricapilla</i>	0	1	0	0	0	0.2
great egret	<i>Casmerodius albus</i>	0	0	0	0	1	0.2
greater scaup	<i>Aythya marila</i>	5	0	0	0	0	1
house finch	<i>Carpodacus mexicanus</i>	1	4	0	3	4	2.4
killdeer	<i>Charadrius vociferus</i>	0	1	0	3	0	0.8
mallard	<i>Anas platyrhynchos</i>	0	2	2	5	12	4.2
marbled godwit	<i>Limosa fedoa</i>	1	2	0	0	0	0.6
mourning dove	<i>Zenaida macroura</i>	0	0	0	5	2	1.4
northern mockingbird	<i>Mimus polyglottos</i>	0	2	0	0	2	0.8
red-shouldered hawk	<i>Buteo lineatus</i>	0	0	0	0	1	0.2

Common name	Scientific name	3/8/2007	3/30/2007	4/6/2007	6/2/2007	6/10/2007	Average count
red-winged blackbird	<i>Aegelaius phoeniceus</i>	1	13	0	0	1	3
rock dove	<i>Columba livia</i>	0	0	0	4	0	0.8
San Pablo song sparrow	<i>Melospiza melodia samuelis</i>	11	14	10	12	13	12
savannah sparrow	<i>Passerculus sandwichensis</i>	0	1	0	0	0	0.2
short-billed dowitcher	<i>Limnodromus griseus</i>	0	0	30	0	0	6
snowy egret	<i>Egretta thula</i>	1	0	0	0	1	0.4
surf scoter	<i>Melanitta perspicillata</i>	0	0	0	0	1	0.2
Unknown gull species	<i>Larus sp.</i>	6	0	0	12	0	3.6
white-crowned sparrow	<i>Zonotrichia leucophrys</i>	1	4	0	0	1	1.2
white-tailed kite	<i>Elanus caeruleus</i>	1	0	0	0	0	0.2
Willet	<i>Catoptroforus semipalmatus</i>	651	2	91	0	0	148.8

Table 3. Point count survey results, marsh area: counts of bird species by date and the average of these counts.

This table includes birds detected in tidal marsh only.

Common name	Scientific name	3/8/2007	3/30/2007	4/6/2007	6/2/2007	6/10/2007	Average count
band-tailed pigeon ₁	<i>Columba fasciata</i>	0	0	0	2	0	0.4
barn swallow ₂	<i>Hirundo rustica</i>	0	0	0	0	10	2
black phoebe	<i>Sayornis nigricans</i>	1	0	0	1	1	0.6
black-bellied plover	<i>Pluvialis squatarola</i>	1	0	0	0	0	0.2
brown-headed cowbird	<i>Molothrus ater</i>	0	0	0	0	1	0.2
California black rail ₃	<i>Laterallus jamaicensis coturniculus</i>	0	0	0	0	0	0
California clapper rail ₃	<i>Rallus longirostris obsoletus</i>	0	0	0	0	0	0
Caspian tern ₂	<i>Sterna caspia</i>	0	0	0	1	0	0.2
killdeer	<i>Charadrius vociferus</i>	0	1	0	2	0	0.6
mallard ₃	<i>Anas platyrhynchos</i>	0	0	0	1	0	0.2
Marbled godwit	<i>Limosa fedoa</i>	1	0	0	0	0	0.2
San Pablo song sparrow ₃	<i>Melospiza melodia samuelis</i>	11	13	10	12	13	11.8
snowy egret	<i>Egretta thula</i>	1	0	0	0	0	0.2
white-crowned sparrow	<i>Zonotrichia leucophrys</i>	0	0	0	0	1	0.2

Common name	Scientific name	3/8/2007	3/30/2007	4/6/2007	6/2/2007	6/10/2007	Average count
willet	<i>Catoptroforus semipalmatus</i>	651	0	71	0	0	144.4

1 Two band-tailed pigeons were resting on tall wooden pilings in the marsh. They were unlikely to be breeding in the marsh.

2 Barn swallows and Caspian terns were detected flying over the marsh, but they were not resting in the vegetation, nor are they likely to use the marsh for breeding.

3 These are the only species likely to be breeding in vegetated tidal marsh habitat, and of these only song sparrows and mallard were detected. Song sparrows were documented breeding on the site.

Table 4. Bird species average counts by habitat type.

Average values based on five point count surveys

common name	scientific name	Marsh	Mudflat	Pond ₁	Upland
American crow	<i>Corvus brachyrhynchos</i>	0	0	0	0.6
American goldfinch	<i>Carduelis tristis</i>	0	0	0	0.2
Anna's hummingbird	<i>Calypte anna</i>	0	0	0	0.2
band-tailed pigeon	<i>Columba fasciata</i>	0.4	0	0	0
barn swallow	<i>Hirundo rustica</i>	2	0	0	0.8
belted kingfisher	<i>Ceryle alcyon</i>	0	0	0	0.2
black phoebe	<i>Sayornis nigricans</i>	0.6	0	0	0
black-bellied plover	<i>Pluvialis squatarola</i>	0.2	0.6	0	0
brown-headed cowbird	<i>Molothrus ater</i>	0.2	0	0	0.2
bushtit	<i>Psaltriparus minimus</i>	0	0	0	1.2
California black rail	<i>Laterallus jamaicensis coturniculus</i>	0	0	0	0
California clapper rail	<i>Rallus longirostris obsoletus</i>	0	0	0	0
California gull	<i>Larus californicus</i>	0	1.8	0	0
California towhee	<i>Pipilo fuscus</i>	0	0	0	0.6
Canada goose	<i>Branta canadensis</i>	0	0.4	0.4	0
Caspian tern	<i>Sterna caspia</i>	0.2	0	0	0

common name	scientific name	Marsh	Mudflat	Pond ₁	Upland
double-crested cormorant	<i>Phalacrocorax auritus</i>	0	0.2	0	0
Forster's tern	<i>Sterna forsteri</i>	0	24	0	0
golden-crowned sparrow	<i>Zonotrichia atricapilla</i>	0	0	0	0.2
great egret	<i>Casmerodius albus</i>	0	0	0	0.2
greater scaup	<i>Aythya marila</i>	0	1	0	0
house finch	<i>Carpodacus mexicanus</i>	0	0	0	2.4
killdeer	<i>Charadrius vociferus</i>	0.6	0	0	0.2
mallard	<i>Anas platyrhynchos</i>	0.2	3.2	0.4	0.4
marbled godwit	<i>Limosa fedoa</i>	0.2	0.4	0	0
mourning dove	<i>Zenaida macroura</i>	0	0	0	1.4
northern mockingbird	<i>Mimus polyglottos</i>	0	0	0	0.8
red-shouldered hawk	<i>Buteo lineatus</i>	0	0	0	0.2
red-winged blackbird	<i>Aegelaius phoeniceus</i>	0	0	0	3
rock dove	<i>Columa livia</i>	0	0	0	0.8
San Pablo song sparrow	<i>Melospiza melodia samuelis</i>	11.8	0	0	0.2
savannah sparrow	<i>Passerculus sandwichensis</i>	0	0	0	0.2
short-billed dowitcher	<i>Limnodromus griseus</i>	0	6	0	0

common name	scientific name	Marsh	Mudflat	Pond ₁	Upland
snowy egret	<i>Egretta thula</i>	0	0	0	0
surf scoter	<i>Melanitta perspicillata</i>	0.2	0.2	0	0
unknown gull species	<i>Larus sp.</i>	0	0.2	0	0
white-crowned sparrow	<i>Zonotrichia leucophrys</i>	1	2.6	0	0
white-tailed kite	<i>Elanus caeruleus</i>	0.2	0	0	1
willet	<i>Catoptroforus semipalmatus</i>	0	0	0	0.2

1 Pond: this was a shallow area of ponded water within the upland area B, south of station 2 (Figure 1). The water had evaporated by June.

Table 5. Additional bird species detected at project site.

These species were detected on April 16, 2007 but were not documented on other dates during point count surveys, and thus are not listed or quantified in other tables.

common name	scientific name
American coot	<i>Fulica americana</i>
cliff swallow	<i>Hirundo pyrrhonota</i>
dunlin	<i>Calidris alpina</i>
least sandpiper	<i>Calidris minutilla</i>
ring-billed gull	<i>Larus delawarensis</i>
sanderling	<i>Calidris alba</i>
Say's phoebe	<i>Sayornis saya</i>
turkey vulture	<i>Cathartes aura</i>
western meadowlark	<i>Sturnella neglecta</i>
western gull	<i>Larus occidentalis</i>
western sandpiper	<i>Calidris mauri</i>

**APPENDIX 1. CALIFORNIA CLAPPER RAIL OFFICIAL USFWS DRAFT
PROTOCOL, 2000: SURVEY PROTOCOL A.**

United States Department of the Interior

FISH AND WILDLIFE SERVICE
 Sacramento Fish and Wildlife Office
 2800 Cottage Way, Room W-2605
 Sacramento, California 95825-1846

DRAFT SURVEY PROTOCOL

California Clapper Rail (*Rallus longirostris obsoletus*)

January 21, 2000

Below is a description of the standard methodology used to detect presence or absence of clapper rail breeding activity. Surveys should be conducted once a week for a minimum of four weeks. The optimal time to conduct call count surveys is mid-January through March. Once a survey protocol has been developed, it should be sent to the Service for final approval prior to implementation. After the results are compiled and submitted to us, we will make a final decision on the possibility of doing any work as described.

Methodology

1. Surveys should be conducted from January through mid-April, which encompasses the optimum time period of mid-January through March when the frequency of calls is typically highest. Surveys should not be conducted when tides greater than 4.5 feet NGVD as predicted at the Golden Gate occur at the marsh during the survey period or during full moon periods.
2. Listening stations should be established no more than 150 meters apart along transects in or adjacent to marsh areas. Stations should be established so that the entire marsh is covered by 75 to 100-meter radius circular plots. Listening stations should be placed near marsh features, such as sloughs, but not along slough edges to minimize disturbance to rails. Surveys should be conducted from levee crowns or boardwalks to minimize disturbances to marsh areas where possible. A detailed map depicting sloughs and other marsh landmarks or features should be developed.
3. Surveys should be conducted at sunset or sunrise. Surveys conducted at sunrise should begin 45 minutes before sunrise and continuing until 1 1/4 hours after sunrise. Surveys conducted at sunset should begin 1 1/4 hours before sunset and continue until 45 minutes after sunset.
4. An observer should be assigned to each listening station for the duration of each survey. Observers should locate key marsh landmarks or features on a map in relation to each listening station location.
5. All rail vocalizations should be recorded, noting the call type, location, and time on a detailed map of the marsh. The call types are coded as C = clapper, D = duet, K = kek.

B=kek-burr with a V representing a visual sighting. Other unusual calls also should be noted. The calls of one bird or pair should be marked by circling the calls together. If a rail is moving during the survey, several locations may be noted for the same bird(s). Attention should be focused on accurately mapping the birds that are nearby, especially between observers or towards the edge of the marsh if the station is positioned at the marsh's edge.

6. At the end of each survey, observers should compare maps to determine overlap in detections and to create a master map showing all pairs and individuals located during the survey. Another master map should be developed once all surveys are completed, showing the dates and locations of detections.
7. Weather information, including wind velocities and direction, should be recorded. Call count surveys should not be conducted when wind velocities exceed 10 mph or wind gusts exceed 12 mph, or during moderate to heavy rains. Information on disturbances (e.g., dogs or cats in marsh and aircraft flyovers) occurring during the surveys should be recorded.
8. If a survey of a marsh is conducted over more than one night, observers should be assigned to stations adjacent to their previous night's station if at all possible.
9. New observers should be trained by an experienced observer. Trainees should familiarize themselves with various calls and with estimating distances to calls before training in the field. In-field training should include ways to minimize disturbance to rails and marsh vegetation. Trainees should be stationed with an experienced observer during a call count for a minimum of 2 nights to assess the trainee's ability to accurately detect and map calls in the field. The Palo Alto Baylands is a marsh with many rails typically calling in the evening and easy access via a boardwalk, thus providing an excellent training opportunity for new observers and their instructors. A recording of clapper rail calls is available for training purposes at the U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, 2800 Cottage Way, Suite W2605, Sacramento, California 95825.

**APPENDIX 2. CALIFORNIA CLAPPER RAIL CALL COUNT SURVEY
DATASHEET.**

APPENDIX 3. CALIFORNIA BLACK RAIL SURVEY PROTOCOL.

Avocet Research Associates Black Rail census protocol

(after Evens *et al.* 1991, and Nur *et al.* 1997).

Listening stations (aural sampling stations) are located along transects selected to sample elevational change within each marsh and are distributed throughout the length and breadth of the marsh at or above Mean High Water. Census stations are distributed at 100 meter intervals through each marsh parcel and, where possible, each station is located a minimum of 50 m from upland habitat. In smaller wetland parcels, the listening station is placed immediately adjacent to the wetland habitat.

Each listening station should be occupied for six minutes. All censuses are conducted within 2 hours of sunrise or 2 hours before sunset. Census efforts are canceled when wind exceeds approximately 10 knots or when the observer determines that background noise is interfering with his/her ability to detect rail vocalizations. After arriving at listening station the observer waits silently for one minute then broadcasts a tape recording of California Black Rail vocalizations at moderate volume (70 to 90 dB at 1 meter) in each ordinal direction for a total of 1.5 minutes. The tape recording consisted of a repetitive series of "grr" calls followed by 0.5 min of "ki-ki-kerr" calls (Repking & Ohmart 1977). Maximum sound pressure 1-m from the source should not exceed 90 dB.

For each rail response heard within 5 minutes of initiating the broadcast, the observer records the time, call type, and estimated distance and direction of the response from the observer (center of the station). An effective 30-m census radius is used, because field testing has found that the observer's ability to estimate distance accurately, or hear low range vocalizations consistently, declines precipitously beyond that distance. All calls coming from one compass direction during the six minute listening period are considered to represent only one rail unless two calls are heard simultaneously. Calls from different (>30°) directions are considered to represent different rails, however some discretion by the observer is required to distinguish between different birds. In an earlier study it was estimated that Black Rails move toward the source of a broadcast tape an average of 6.2 m (Evens & Page 1985); subsequent studies have increased that estimate to 7.2 m (Legare *et al.* 1999). Therefore, although we counted birds only within 30 m of the observer, we calculated densities using sampling stations with a radius of 36.2 m, covering an area of .4115 ha. Given the lack of precision in estimating position and movement of birds, it is advisable to pool the detections into 5-m bands to calculate densities.

Because the California Black Rail is a threatened taxon (USFWS 1991, CNDDDB 2004), and because estimates rely on extrapolated data, the calculated values should be interpreted as density indices rather than absolute densities. Estimates derived from these data should be considered minimum population values.

Abundance rankings are assigned to each site based on the density index calculated from the 36.2 m radius circular plot as follows: <0.6 rail/ha (low); 0.6-2.1 rails/ha (moderate); >2.1 rails/ha (high). This scale conforms to earlier analyses (Evens *et al.* 1989).

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- Repking, C. F. and R. D. Ohmert. 1977. Distribution and density of Black Rail populations on the Lower Colorado River. *Condor* 79:486-493.

APPENDIX 4. POINT COUNT SURVEY PROTOCOL.

Wetlands Wildlife Associates Point Count Protocol for tidal marshes and associated baylands

Variable Circular Plot/Point Transect method

Adapted from: PRBO Conservation Science Tidal Marsh Project, unpublished point count protocol 2004.

Point placement:

Points are placed 200 meters apart (to avoid counting the same birds from adjacent points) and at least 50 m from the edge of the marsh where possible. In denser habitat where visibility is limited, points can be placed closer together (150 m apart). In the south SF Bay, where access to the habitat is limited, points are all set up along levees. Sites set up in early years of the study may have points 150 meters apart. Points should be flagged conspicuously, where possible, in order to facilitate finding exact spot for subsequent surveys and vegetation measurements, unless you are using a GPS unit. Where possible, points should be placed randomly, rather than along a habitat feature such as a tidal channel, to avoid bias in sampling.

Timing and structure of surveys:

Surveys begin within 15 minutes of sunrise and should be completed within approximately 4 hours (time of maximum bird activity)

Each point is surveyed for 5 minutes.

Seasonality:

Breeding season surveys are conducted between March 20 and May 30. Examination of previous years' data showed a 60-100% increase in SOSP numbers from the first to second round. We assume this increase is due to hatching year birds. Please also try to take careful note of any juveniles! If you have multiple birds in one spot later in the year, please check to see if there are juveniles among them (i.e., it may be a flock of juveniles).

Round 1- March 26 to April 26

Round 2- April 27 to May 30 (the peak of spring migration for Waterbirds is usually mid-April)

Fall surveys are conducted between September 1 and October 30.

Winter surveys are conducted between December 1 and January 31.

Data collection:

Detections of every individual of every bird species are recorded by distance from observer at 10 meter increments up to 100 meters for 5-minutes at each point. We also have added an additional column for detections beyond 100m. This is especially important for species not otherwise counted in the point count. DISTANCE analyses will generally include data only up to 50 or 70 m. Beyond that distance, the estimated distances are unreliable. Record the bird in the distance band in which it was originally detected, even if detection type changes.

For each point, record all individuals of any one species on the same line. Use the AOU 4-letter species code.

Priority is given to target tidal marsh species (SOSP, COYE, MAWR, CLRA and BLRA) and other tidal marsh or wetland species. Birds detected outside the marsh (e.g. in adjacent upland habitat, in the adjacent neighborhood) are marked with the type of non-marsh habitat they are found in (default is T= fully tidal marsh, U = upland non-marsh habitat, R = restoration, S = salt pond, P= other non-marsh pond, M = muted marsh, L= Levee). {added note 5/31/01- If you need to distinguish between 2 different marsh areas of a single type, designate them as 1 and 2 (e.g. M1, M2). Be sure to note what you are referring to. } Use a separate line for different individuals of a species detected within and outside the marsh at a single point. If a bird uses both marsh and non-marsh habitat at that point, record it as within the marsh only, e.g. a SOSP sings at the edge of the marsh, flying between upland and marsh vegetation. This bird is included in the focal marsh detections.

One of the symbols below is used to indicate how the individual bird was detected. Every effort is made to record each individual once only. Flyovers are recorded in the last column, also using the symbol for detection type (usually V). Birds flying around the site foraging, such as raptors and swallows, are not considered flyovers, and are recorded in the distance band first seen. Again, do not count these individuals at more than one point.

If an adult bird is detected, the detection type is recorded in order of priority: Song > Visual > Call (see table below). Thus a bird both heard calling, singing and detected visually is recorded as a circled "S". We will be attempting to calculate bird densities using separate detection functions for visual and auditory detections, so we have added several new detection codes to allow for multiple detection types.

If a juvenile is detected, it is recorded as "J". All other detections are assumed to be adults.

Symbol	Detection type
S	Song: bird heard singing but not detected visually (may have also heard bird calling)
S (circled)	Song and visual: bird both heard singing and detected visually (may have also heard bird calling)
V	Visual: adult bird detected visually but not heard either calling or singing.
C	Call: adult bird call only, not singing and not detected visually (i.e. vocalization other than male territorial song)
C (circled)	Call and visual both, not singing.
J	Juvenile: juvenile bird detected either visually or heard calling (usually begging)

If a detection type changes, (e.g. initially heard calling and later heard singing), cross out the original and write in the new code. If a bird moves during the 5 minute period from one distance band to another, keep the detection in the initial band, even if the detection type changes.

Species not detected during the 5-minute point counts (not individuals of species detected during the survey) should be recorded on the back of the form, especially those of the target tidal marsh species (especially COYE, BLRA & CLRA), predators and rare or endangered species.

Weather conditions:

Record conditions on the bottom of the form at the beginning and end of survey (wind, temperature and precipitation). Surveys should not be conducted when conditions prevent normal bird activity or detectability, such as rain or strong winds. If industrial or traffic noise adjacent to the marsh significantly reduce observer's ability to detect birds, the survey should be conducted on the weekend.

APPENDIX 5. BIRD SURVEY STATION COORDINATES.

Coordinate system: UTM NAD83 Zone 10.

Station ID	Easting – X Coordinate	Northing – Y Coordinate
1	562626	4208380
2	562359	4208499
3	562344	4208390
4	562386	4208291
5	562355	4208200
6	562657	4208388
7	562560	4208393