Chapter 3

AN ORNITHOLOGICAL STUDY OF THE HOFFMAN MARSH

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Introduction

Caltrans has proposed to restore the southern end of the Hoffman Marsh in Albany to mitigate the impact on wetland areas of a planned expansion of Highway 17 (see map, p. viii). The 40-acre Hoffman Marsh is divided into two sections (Figure 1). A 15-foot wide channel connects the main section of the marsh to the San Francisco Bay. The channel ensures abundant tidal exchange, which maintains a healthy section. However, the southern end of the marsh doesn't receive an equal amount of tidal exchange. A levee separates the two sections and prevents tidal flow from the main section. The restoration proposed by Caltrans focuses on increasing tidal flow in the southern section. Originally I intended to study the effects of the mitigation on the birds that use the southern section. I planned to evaluate the mitigation with respect to the number and diversity of species, by monitoring the bird

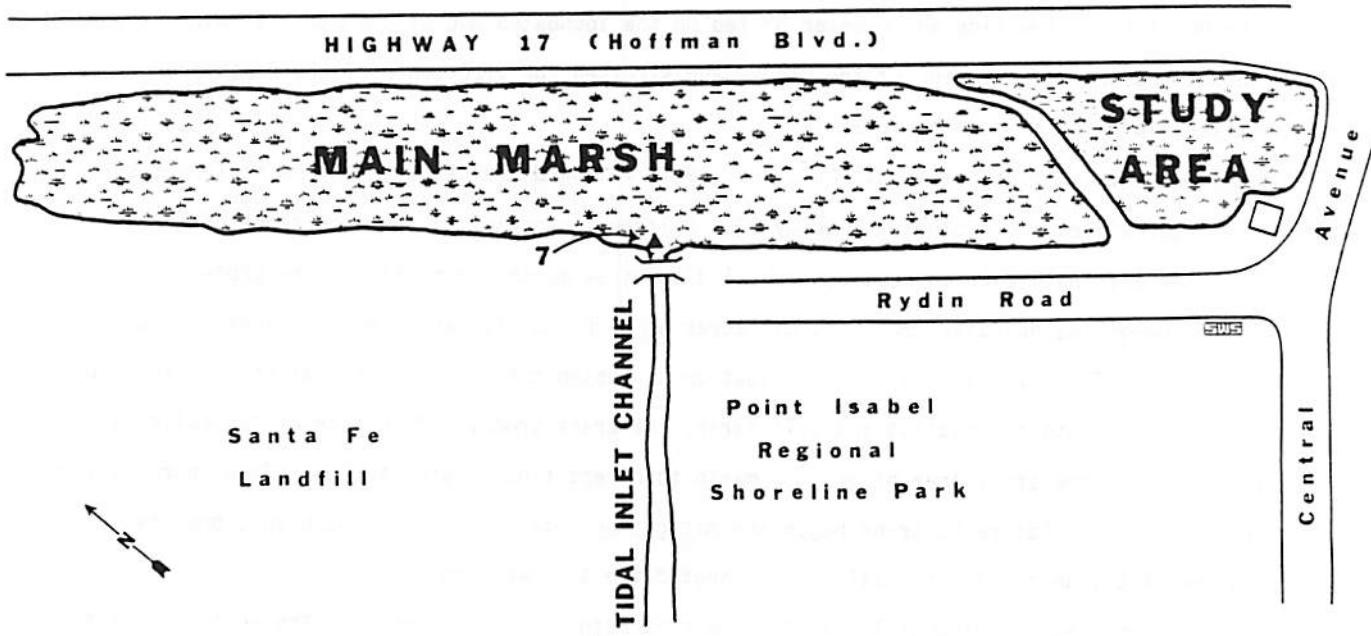

Figure 1. Hoffman Marsh, showing Study Area.

population before and after the mitigation. However, the contractor never completed the mitigation. After dredging one channel it was discovered that the sewer pipe in the levee was old and faulty. Since disturbance of the pipe potentially could leak raw sewage into the marsh, the work ceased; the contractor left the mitigation unfinished and the southern section (the study area) disrupted.

My revised study evaluates how the change of environment affects the birds, and their process of adaptation to the changed habitat. In my study I focus on the extent of change in number, use patterns and species diversity. I am interested in which locations the birds use, and how their activities changed. The number of birds in the study area is far below the number in the main section. I examine whether the disruption of the study area changed the habitat sufficiently to satisfy the needs to which the birds respond and therefore attracted them to the study area. I also explore the possible changes that may draw the birds to the study area, and make the area more habitable.

Past Work

The mudflat south of Hoffman marsh has been the site of many surveys designed to census shorebird activity. However, the Hoffman marsh was not included in these studies (URS, 1973). The earliest analysis of the birds at Hoffman marsh is a study prepared by URS Research Company (1973). This study addressed the environmental elements that would be affected by widening Highways 80 and 17. It noted that the Hoffman marsh and mudflat comprised the only large pieces of wetlands for five miles along the East Bay shoreline, and that many birds used the two areas. According to the study, the shorebirds fed on the mudflats at low tide and roosted or fed on the inundated mud of the marsh at high tide. The report documented the use patterns of the birds, and stressed the importance of the marsh and its interrelationship with the mudflat (URS, 1973).

An Environmental Impact Statement (Caltrans, 1981) followed the URS study. The statement scrutinized five alternatives for expanding Highway 17. Caltrans acknowledged the importance of wetlands by choosing the alternative which destroys only 1.3 acres of marsh and mudflat. The project will take 0.8 acres of low-grade, non-tidal marshes, 0.1 acres of high quality marsh, and 0.4 acres of mudflats (Caltrans, 1981). The FEIS also outlined mitigation to lessen the environmental effects of the project's encroachment into the mudflat and salt marsh. Caltrans proposed to construct two culverts to open the diked 7.5 acre study area of Hoffman marsh to direct tidal action and therefore increase flushing (Caltrans, 1981). Before Caltrans began the mitigation intended for the south end, one channel ran along the east side and a large salt pan dominated the southwestern border.

The work commenced on November 12, 1984. The contractor dug one channel in the west side of the southern section. However, all work ceased when a problem developed with the old sewage pipe in the levee. The risk of breaking the pipe, and spilling its contents was too great to permit the work to continue. In the process of the construction, the contractor destroyed the large salt pan in the southern end of the study area. The contractor cleaned out an existing culvert between the two sections

and established a small amount of tidal flow. However, to this date, the work has not been finished.

Study Methods

To monitor the birds at Hoffman marsh I used a pair of 7x22 binoculars and attempted to view them at a 40-foot range. I used three reference books to compile the birdlist, Field Guide to the Birds of North America (Scott, 1983), The Audubon Society Master Guide to Birding (Farrand, 1983), and Birds of Northern California (McCaskie, 1979). To complete the birdlist I recorded the number of each species and their type of activity. In addition to the information collected for the birdlist, I considered three other variables: the tidal cycle, weather, and the microgeographical location. The latter three variables define the patterns of bird use in the marsh and separate the birds into groups by lifestyles and foraging guilds.

The marsh is subject to a diurnal tide, and I observed the birds throughout the tidal cycle. The tidal cycle plays a central role in my study, for the number of birds present in the marsh depends on the state of the tide. The birds tend to roost or feed in the marsh at high tide and are absent during the low tide. When the water on the surrounding mudflat recedes, the birds fly out to feed on the abundant food supply and then return to the marsh during the high tide to conserve energy or continue feeding (Stephen F. Bailey, 1984, personal communication).

Weather and microgeographical location are important variables in my study, for they also define the use patterns of the birds. On rainy days some birds seek the sanctuary of the marsh, whereas others, such as gulls, move to other sites, such as athletic fields (Stephen F. Bailey, 1984, personal communication). The microgeographical location defines what part of the marsh the birds use. A large number of birds congregate in the main section of the marsh rather than the study area. Other birds roost in the pickleweed of the study area or forage in the two salt pans. Therefore, to analyze the bird use patterns, one must compile the baseline data, and a birdlist, and then look at them with respect to the variables of tidal cycle, weather, and microgeographical location. Through evaluation of the different types of data in relation to each other, the different types of birds can be distinguished by location, foraging guilds and activities.

The methods for monitoring a bird population were provided by Stephen F. Bailey, an ornithologist at the California Academy of Science; without his assistance my project could not have been completed.

Data

A total of 90 shorebirds (5 species) and 83 multi-habitat birds (4 species) used the marsh before the disruption. After the disturbance I sighted 85 shorebirds (5 species) and 89 multi-habitat birds (6 species) in the study area. Multi-habitat birds are birds that do not depend on the tidal cycle or weather; rather, these birds reside in the uplands surrounding the marsh. Tables 1 and 2 indicate multi-habitat birds are characteristic of the study area. The European starling was the predominant

DATE	10-19	10-22	10-26	10-27	10-28	10-29	11-04	11-06	11-08	
WEATHER	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	RAINY	RAINY	
TIDE	LOW	LOW	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	LOW	
SPECIES	No Lo Ac*	No Lo Ac	No Lo Ac	No Lo Ac	No Lo Ac	No Lo Ac	No Lo Ac	No Lo Ac	No Lo Ac	Total #
SEMIPALMATED PLOVER			4 sp r				3 sp r		3 p r	11
WILLET	3 sp f	5 p f	6 sp f/r			6 sp r		8 sp f/r	5 sp f	33
GREATER YELLOWLEGS				1 sp f		1 sp f	1 nsp f	3 nsp f		06
DOWITCHER	1 sp f	1 sp f	1 sp f	1 sp f				1 nsp f	4 nsp f	09
DUNLIN										0
WESTERN SANDPIPER								10 p r		10
										89
MULTI-HABITAT BIRDS										
KILLDEER					6 sp f/r		8 sp f/r	5 sp f		33
ROCK DOVE										0
MOURNING DOVE				4 p r		3 p r	3 p r			11
RED-TAILED HAWK										0
EUROPEAN STARLING	30 p r		18 p r				22 p f			70
SONG SPARROW				1 p r	1 p r					02
RED-WINGED BLACKBIRD										0
										104

* No=number, Lo=location, Ac=activity
p=pickleweed r=roosting
sp=south salt pan f=feeding
nsp=north salt pan

Table 1. Observations of the Study Area Before Disruption

DATE	1-24	2-01	2-22	2-27	3-01	3-03	3-04	
WEATHER	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	
TIDE	LOW	HIGH	HIGH	LOW	LOW	LOW	HIGH	
SPECIES	No Lo Ac*	No Lo Ac	No Lo Ac	No Lo Ac	No Lo Ac	No Lo Ac	No Lo Ac	TOTAL #
SEMIPALMATED PLOVER			15 m r				3 m r	18
WILLET								0
GREATER YELLOWLEGS		3 nsp f	1 nsp f					4
DOWITCHER	1 nsp f	1 nsp f				1 p r		3
DUNLIN							10 m r	10
WESTERN SANDPIPER							22 m r	22
MULTI-HABITAT BIRDS								
KILLDEER		9 m f/r	8 m r	1 m r	4 m r		14 m r	36
ROCK DOVE							2 p f	2
MOURNING DOVE						10 p r		10
RED-TAILED HAWK				1 h		1 h		2
EUROPEAN STARLING					24 p f	20 p f	10 p r	54
SONG SPARROW					1 p r			1
RED-WINGED BLACKBIRD					15 p f	5 p f		20
								125

* No=number, Lo=location, Ac=activity
p=pickleweed r=roosting
m=middle f=feeding
nsp=north salt pan h=hovering

Table 2. Observations of the Study Area After Disruption

multi-habitat bird in the study area. Although present in the fall, the starlings were absent in February, and returned in early March. The species consistently grouped in large numbers. The starlings perched on the telephone wires surrounding the marsh or they roosted and fed with the shorebirds on the edges of the salt pans or in the pickleweed. Other multi-habitat birds, such as the mourning dove and song sparrow, inhabit the surrounding trees and shrubbery. Occasionally the doves fed in the pickleweed close to the edges of the marsh, and the song sparrows roosted in the center of the pickleweed. The hawks I observed did not land in the marsh, but circled above.

A small number and diversity of shorebirds use the study area. In the study period I sighted a total of 174 shorebirds of 8 species. To compare the number and diversity of birds, I counted birds in the study area and in the main section of Hoffman marsh. The healthy main section supports a greater number and diversity of shorebirds. I observed the main section to define normal use patterns of the marsh. In the main section the number of multi-habitat birds decreased, and the number of shorebirds and waterfowl increased. At a typical high tide the main section held approximately 100 willets as opposed to the six or seven in the study area. Godwits, egrets, and even a clapper rail (seen on March 3) foraged in the main section. A great diversity of birds used the section to roost at high tide, and in January 10 to 12 different species of ducks began to use the network of water channels.

Throughout the study period greater numbers of shorebirds used the study area at high tide than at low tide. Before the mitigation commenced, a total of 46 birds, counted in 10 observations, used the study area at high tide, whereas at low tide 34 utilized the study area. After the disruption of the study area the difference in numbers between high and low becomes more distinct. In the seven observations after the disruption, a total of 54 shorebirds used the marsh at high tide, compared to six birds at low tide. An overall change in activity also occurred. Before disruption some birds fed while others foraged. However, after the disruption the shorebirds predominantly roosted.

A change in population of birds occurred after the disruption of the study area. Killdeer and semipalmated plovers were the dominant species in the study area. They used the area to roost. After the work on the marsh, an increase in killdeer occurred. They congregated in the middle and west sections which contain no pickleweed. The numbers of dowitchers and greater yellowlegs also changed. Although large numbers of the species never congregated in the study area, one or two of the birds consistently utilized the salt pans before the disruption. However, after the rains ceased in early February, the use of the study area by dowitchers and greater yellowlegs decreased. After the rains I observed one bird of each species. I sighted the birds on different days and tides, but both roosted rather than fed as in the past. The willet population experienced a great change after the work on the marsh. Before the change in environment, six or seven willets consistently roosted or foraged in the pickleweed at high tide or fed in the south salt pan at low tide. However, after the disruption I sighted no willets in the study area.

Weather impacted the number of shorebirds in the study area. I censused the area seven times in clear weather and two times in the rain. An average of six shorebirds used the marsh on clear days, whereas the numbers greatly increased on the two occasions I observed the birds in the rain. Thirty-one shorebirds appeared in the study area on November 6th at high tide, and on November 8th 17 appeared at low tide. Ten western sandpipers roosted in the pickleweed on November 6th and greater numbers of killdeer, willets, and greater yellowlegs occurred. After the disruption I censused only on clear days. The numbers of shorebirds remained fairly consistent with those gathered before the disruption. However, on March 4th I observed 49 shorebirds roosting in the study area. Although clear, the morning of March 4th had followed a heavy storm, and I censused during a very high tide. Most of the use occurred in the dry middle area of the section. The unusually high numbers were probably caused by the rain the night before, combined with the high tide which covered the normal roosting spots and forced the birds to use the sheltered marsh.

Discussion

The presence of large numbers of multi-habitat birds signifies the lack of tidal exchange in the study area. These birds forage in the study area because it is drier than the main section and therefore likely to support rodents, small organisms and other forage they prefer. Changes in numbers, diversity and use patterns occurred within the multi-habitat bird populations after the disruption. Since the multi-habitat birds used the study area consistently except in the month of February, it is likely that seasonal changes in bird populations explain the variances, not the effects of the work in the marsh.

Changes in the populations of shorebirds were not attributed to migration. According to Birds of North America (McCaskie, 1979), the shorebirds studied in this paper were abundant in the bay area during the seasons I censused the marsh (Figure 2). On the basis of McCaskie's field guide I assumed that variance was due to some other variable than normal seasonal change in shorebird populations. Although I can assume constant populations, it is impossible statistically to prove that changes were caused by specific variables such as weather or disruption because of the small amount of data. To conduct this study appropriately, one must monitor the bird populations from October, 1984 to October, 1985 and so forth. Since this period of time was not available to me, I can only discuss large changes and those which mirror patterns discussed in past studies.

Before the disruption the study area exhibited characteristics which differed from the main section. The healthy marsh was flooded at high tide, but the study area remained dry. The dryness encouraged roosting by small birds, such as the plovers. Salt pans also existed in the study area. The salt pans provided forage around the tidal cycle which caused the populations of dowitchers, greater yellowlegs and willets to use the study area at high and low tide. After the disruption, the study area still differed from the main portion in that the area remained dry at high tide, but the salt pans were destroyed. The destruction caused a change in diversity of the shorebirds. The birds which used the

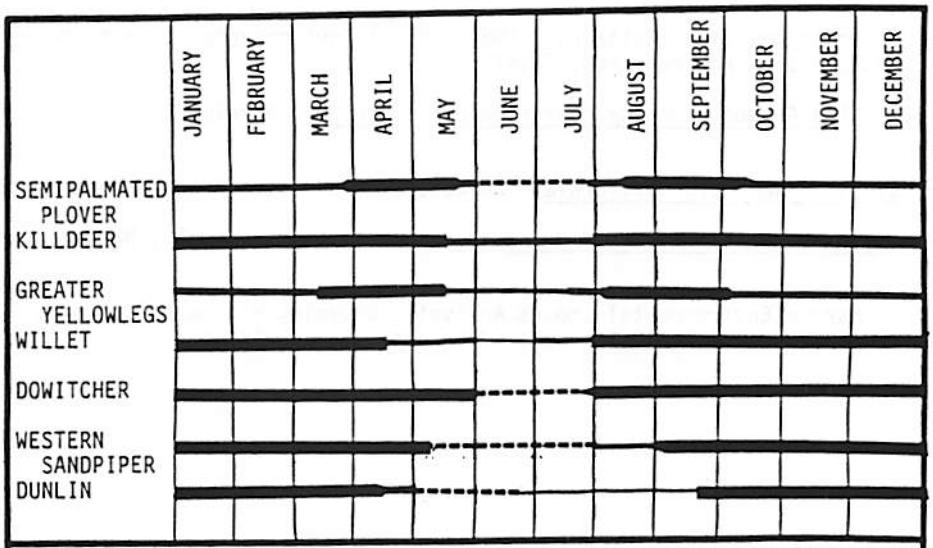

Figure 2. Abundance and Seasonal Occurrence of Birds in the Bay Area
Source: McCaskie, 1979

marsh predominantly to roost at high tide remain unchanged; instead, the action affected the dowitcher, greater yellowleg, and willet populations. Low numbers of dowitchers and greater yellowlegs had consistently foraged in the salt pans, but ceased after the north salt pan dried up.

After the disruption I sighted no willets in the study area. The disappearance of the willet population was due to two factors. Without the salt pans one of the areas of forage was abolished. However, willets also feed on pickleweed, but in the process of dredging much of the pickleweed was bulldozed and destroyed. Thus, by damaging the forage sources, a decrease in diversity occurred.

Conclusion

The change of environment did not increase use in the study area. The total number of birds remained fairly consistent. However, the loss of the salt pans destroyed the main sites of forage and therefore caused a decline in the diversity of shorebirds which used the study area. Clearly, the marsh is a necessary habitat shorebirds use for shelter from rain and high tides, and maximum diversity is desired. Therefore, if mitigation is to be continued, I suggest constructing salt pans, or lowering the entire level of the south end, but also leaving a few areas raised for roosting birds. The lower level would diminish the high-elevation vegetation in the study area (see Darrin Craig's paper, Vegetation of Hoffman Marsh Before Restoration Project, for further explanation) and allow growth of more productive vegetation.

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