

State of California  
THE RESOURCES AGENCY  
Department of Fish and Game

STATUS OF THE SALT MARSH YELLOWTHROAT (Geothlypis trichas  
sinuosa) IN THE SAN FRANCISCO BAY AREA, CALIFORNIA  
1975 - 1976 <sup>1/</sup>

by

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ABSTRACT

A study was conducted from late June through August, 1975, and from March through August, 1976, to determine the status of the salt marsh yellow-throat. Remaining areas of suitable breeding habitat were located. Density and distribution of breeding yellowthroat pairs within these areas were determined. Populations were found to be at critically low numbers in the South Bay and Peninsula areas, and greatly reduced from historic abundance throughout their breeding range. The effect of drought on yellowthroat breeding success was studied in 1976. Other factors affecting population ecology are discussed.

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## RECOMMENDATIONS

Based on this study, the Department recommends that:

1. Yellowthroat habitat now protected in parks or refuges be maintained, enhanced and enlarged, and habitat destruction by diking, draining or vegetation removal be prevented. Recommended actions by responsible management agencies include:
  - a. development of a management plan by Point Reyes National Seashore for protection of yellowthroat habitat at Olema Marsh and Limantour Estero.
  - b. development by San Francisco Bay National Wildlife Refuge of fresh and brackish water marsh areas in a portion of New Chicago Marsh. A suggested source of water for this area is the advanced secondary treatment water outflow from the San Jose-Santa Clara Water Pollution Control Plant, which is now under construction.
  - c. protection and enhancement of yellowthroat breeding habitat at Coyote Hills Regional Park by the East Bay Regional Parks Department.
  - d. incorporation of yellow-throat habitat protection considerations in management planning by the Department for Napa Marsh, including the breeding area on Skaggs Island Naval Base.
2. Planning agencies in Marin, San Francisco, San Mateo, Santa Clara and Alameda counties be advised of yellowthroat breeding habitats in their respective counties and be encouraged to assist in efforts to preserve and enhance these areas. Stanford University is also encouraged to provide needed protection for yellowthroat habitat at Searsville Lake.
3. Agencies or other entities that manage or otherwise influence yellow-throat breeding habitats be informed by the Department of this subspecies' breeding habitat requirements and be assisted in management actions taken for habitat enhancement and protection. Such entities include those cities and counties whose treated sewage outfalls now support yellowthroat breeding habitat.
4. Further study be conducted to determine location, quality and extent of salt marsh yellowthroat wintering grounds; seasonal movement patterns; minimum size of marsh habitat that will support breeding birds; and relative productivity of the various marsh habitat types used by breeding yellowthroats.

## INTRODUCTION

The yellow-throat (Geothlypis trichas) is a warbler species normally found in wetland habits. Yellowthroats inhabiting the marshes of San Francisco and San Pablo bays and the Central California coast were identified as a distinct subspecies (G. t. sinuosa) by Grinnell (1901). He described them as being darker dorsally and laterally and smaller than the other two subspecies of yellow-throats found in the western United States (G. t. scirpicola and G. t. occidentalis). Grinnell gave the average wing length of thirteen males as 53 mm (51-55 mm). Mewaldt (pers. comm.) measured eleven males in Alviso in 1975 and found an average wing length of 52.3 mm (50-55 mm). Twenty-one specimens of this subspecies examined in the Museum of Vertebrate Zoology (MVZ) at the University of California, Berkeley, had an average wing length of 52.8 mm (50-56 mm). All males caught during this study had wing lengths within this range. Wing lengths for G. t. scirpicola and G. t. occidentalis are 55-57 mm, Grinnell (1901).

Since small size is the main criterion for identification of the subspecies, I compared the specimens of all three subspecies in the MVZ and found wing length difference to be significant at the 95 percent level of confidence.

Individuals of the salt marsh subspecies have been collected in the nonbreeding season in San Luis Obispo, Los Angeles and San Diego counties, Grinnell and Miller (1944). None have been collected during the breeding season outside the range described by Grinnell and Miller (1944), which is bounded by Tomales Bay on the north, Carquinez Straits on the east, and Santa Cruz County on the south. Within this range, all specimens collected between March and August are members of the sinuosa subspecies.

The name "salt marsh yellowthroat" is something of a misnomer, since the subspecies occurs in salt marsh only in winter. It breeds in fresh and brackish marsh. Ray (1916) proposed that the name San Francisco yellow-throat be adopted; this suggestion was endorsed by Schussler, (1918), who felt that it was less confusing. Sibley (1952) used the "San Francisco" designation, but Mewaldt prefers the original name, and, in consideration of these birds' dependence on the salt marsh habitat, I have done the same.

## OBJECTIVES

During this century, both the freshwater marsh breeding ground and the salt marsh wintering ground have been extensively reduced by diking, draining, pollution and other activities attendant upon the increasing urbanization of the Bay Area. Forty percent of the original surface of the San Francisco Bay has been diked off or filled and 75 percent of its salt marshes have been destroyed (San Francisco Bay NWR report, 1974). Over 95 percent of the freshwater marshes have been lost in the last one hundred years (Walton, 1975). The objectives of this study were to 1) determine the quantity and location of suitable habitat still available to the yellowthroat, 2) assess the size and distribution of the population, and 3) identify the aspects of yellow-throat ecology most critical to its continued survival in the Bay Area.

## METHODS

The main objective during the latter portion of the yellowthroat breeding season in 1975 was to locate all possible sites of yellowthroat breeding activity. These areas included fresh or brackish water marshlands. I began by investigating all marshlands that were identified as such on U. S. Geological Survey maps, both around San Francisco Bay and along the Central California coast. I also surveyed freshwater lakes, the upper ends of reservoirs, and the courses of rivers and creeks which empty into the Bay. Aerial photographs of the Bay taken by the Army Corps of Engineers were used to locate marshland areas. Audubon Society members and state and county park personnel were interviewed to help determine yellowthroat breeding presence.

Most marshland areas were identified by the end of 1975. The areas actually used by yellowthroats and their distribution and abundance were established in 1976.

The yellowthroat song was tape-recorded in July 1975 in Coyote Hills Regional Park and was played in areas where yellowthroats were thought to be present. When the recording elicited a response, the location was noted. Because of differences in the dialects of yellow-throat song, not all the birds in the study area responded.

The most reliable method of censusing was to proceed through the occupied area, either on foot or by boat. This was done at dawn, which is the only time during the day that all the yellow-throats present are apt to be singing at once. Other studies (Davis 1965) also support the necessity of standardizing census times in order to obtain accurate census figures for populations of warblers. The number of singing males is taken to represent the minimum number of breeding pairs.

## RESULTS

### Life History

Males arrive on the breeding ground and begin to sing about the middle of March. In 1976 the first male was heard in the Napa Marsh on 13 March, in Coyote Hills about 15 March, and at Searsville Lake on 19 March. At Pescadero Marsh, on the coast, the season begins slightly later, about the first week of April.

Females appear in the territories of the males about a week after the arrival of males. Nest building ensues during the middle and latter parts of April. Nest form is rather variable. Its construction reflects the vegetative composition of the habitat and its location, such as on or near the ground, in tules, or in taller plants. Nests are often placed over the water. Where no open water is available in a territory, the dampest situations seem preferred as nest sites.

The first clutch of eggs, usually four, is laid within a week after completion of the nest. The female incubates the eggs alone for a period of twelve days (Stewart 1953). Both adults feed the young, who remain on the nest for eight or nine days. Adults continue to care for the young for about two weeks after fledging though the female begins to build another nest for the second brood at this time. During the post-fledging period, territorial defense weakens considerably as adults are allowed to attend their young who have strayed into neighboring territories. However, as courtship for the second brood gets under way, territories are reestablished and singing occurs with renewed vigor. Second clutches were finished by mid-July in 1976. By then, migrant birds (Napa, Coyote Hills) had left the breeding grounds, and resident ones (Searsville Lake, Pescadero) had ceased singing or defending territories. Among migrants, adults departed before juveniles and began to appear in small flocks in the salt marsh in late August and early September.

## Habitat Types

The plant communities preferred by yellow-throats for breeding vary considerably even within the Bay Area. These communities can be divided roughly into three principal types though some nesting sites contain mixtures of two or all three types.

### Woody Swamp.

This habitat community type is typified by Olema Marsh, Searsville Lake, and part of Pescadero Marsh. These locations support the largest year-round populations of yellowthroats. The dominant vegetation is willow (Salix) with a thick undergrowth of herbaceous plants. Cover is dense throughout the year. During normal years, the ground is either covered with water or very wet, and insects are abundant throughout the summer. In 1976, most of the ground under the willows was dry by May, insects were noticeably less abundant, and open water had receded so far that most yellow-throat nests were at least 30 m (100 ft.) from the nearest open water.

### Brackish Marsh.

This is the marsh habitat typical of Napa Marsh and the areas around the mouths of streams that empty into the Bay. Yellowthroat nests are found along the banks of sloughs or streams in thick mixed brush composed of coyote bush (Baccharis), dock (Rumex), mustard (Brassica), star thistle (Centaurea), gum plant (Grindelia) and grasses, often grading into tules (Scirpus) in the more saline parts of the marsh, or cattails (Typha) in the upper, more freshwater areas. Tules are the dominant vegetation of Napa Marsh as a whole, but yellow-throats avoid the stands composed exclusively of tules, preferring the mixed, more tangled plots along the banks. As these plants die off in winter, cover becomes less dense. Between the 1975 and 1976 breeding seasons, several of the breeding locations used by yellowthroats underwent changes in plant composition in response to the intervening dry winter. Some areas that contained tules and mixed marsh plants in 1975 were found to have mainly Salicornia in 1976. Since the brackish character of Napa Marsh depends on freshwater from creeks and rivers mixing with salt water from the Bay, the reduction of freshwater due to the drought winter left only tidal water from the Bay in much of the marsh. The less salt tolerant plants were replaced by Salicornia.

### Freshwater Marsh.

This is the third principal type of habitat. It is found in Coyote Hills Regional Park and along Alameda Creek. The dominant plant is cattail (Typha) in thick stands close to the water, with a grass and herbaceous plant complex behind the cattails. Here, too, the amount of plant cover varies greatly from winter to summer.

## General Habitat Characteristics

The factor common to all types of yellowthroat breeding habitat is moisture. Though not directly dependent on the water itself, yellowthroats require the dense growth of vegetation associated with moist situations and the attendant high densities of insects. Accordingly, the winter drought of 1975-76 changed the plant composition and/or density of many yellowthroat breeding sites, and thus adversely affected the breeding success of the populations.

Grinnell and Miller (1944) stated that most yellowthroat activity was within 2 m (6 ft.) of the water, but even under the more moderate conditions of 1975, I found nests on quite dry ground. By the middle of the breeding season in 1976, most surviving nests were more than 2 m (6 ft.) from the water and some territories encompassed no open water at all.

## Artificially Maintained Habitat

The yellowthroat habitat least affected by the winter 1975-76 drought was that located in areas where the water level is artificially maintained. The marsh at Coyote Hills Regional Park is such an area. It is part of the East Bay Regional Park system, and water is supplied, in part, by the Alameda County Flood Control District. The water level did not change appreciably from 1975 to 1976 and the plant density and composition remained constant.

Stable yellowthroat habitat was also found around the outfalls of sewage treatment plants. Each such facility located around the Bay affords a more or less constant source of freshwater which mixes with the Bay water to support several acres of brackish marsh vegetation, much as undisturbed streams did under pristine conditions. The large volume of water (approx. 100 million gallons per day) from the San Jose-Santa Clara Water Pollution Control Plant sustains an extensive area of brackish marsh where yellowthroats breed.

## Distribution and Abundance

Yellowthroat breeding populations were found in 13 areas (Table I and Figure I) in 1975 and 1976. These areas, and areas where yellowthroats were searched for but not found, are described in Appendix A.

Figures for amount of suitable habitat are low because I have been very strict about what I regarded as "suitable:" including only sites occupied by yellow-throats during the course of this study and sites which were occupied historically and have not undergone significant alteration.

There are no density figures for most of the sites. It is not very realistic to speak of density where only 1 to 4 pairs are present. Where only a few birds were found, reliable measurements of territory size were difficult to obtain by methods used in this study.

An attempt to quantify yellow-throat population density was made by Hoppes (1974) at Coyote Hills Regional Park. In 1973, before the freshwater marshlands were altered by diking and channeling, he found densities of 220 singing males per 40 hectares in the south marsh and 34 males per 40 hectares in the north marsh (2.2 males per acre and 0.3 males per acre, respectively). However, I suspect that those figures, calculated from sample areas in this marsh, may have overestimated actual population density throughout the marsh.

TABLE I  
 Summary of  
 Locations, Habitats and Observations  
 of Salt Marsh Yellowthroats, 1975-1976

COUNTY	LOCATION	HABITAT OCCUPIED	OBSERVED OR ESTIMATED NO. OF BREEDING PAIRS
Marin	Olema Marsh	Woody Swamp and Brackish Marsh	20-25 (1975,1976)
	Limantour Estero	Freshwater and Brackish Marsh	3 (1976)
Napa, Sonoma, and Solano	San Quentin <sup>1/</sup>	Freshwater Marsh <sup>2/</sup>	2 (1976)
	Napa Marsh <sup>1/</sup> (3 to 8 areas)	Freshwater and Brackish Marsh	38 (1975,1976)
San Francisco	Lake Merced	Freshwater Marsh	7 (1976)
San Mateo	Sharp Park	Freshwater Marsh <sup>2/</sup>	2 (1975), 0 (1976)
	Searsville Lake	Woody Swamp	11 (1976)
	San Gregorio Creek	Freshwater Marsh	2 (1976)
	Pescadero Marsh	Freshwater and Brackish Marsh, Woody Swamp, and Chaparral	30 (1976)
Santa Clara	Palo Alto Marsh <sup>1/</sup>	Brackish Marsh	2 (1976)
	Alviso Marsh Area <sup>1/</sup>	Brackish Marsh <sup>2/</sup>	6-8 (1976)
Alameda	Coyote Hills Regional Park <sup>1/</sup>	Freshwater Marsh <sup>2/</sup>	27 (1976)
	Alameda Creek <sup>1/</sup>	Freshwater Marsh	8 (1976)

<sup>1/</sup> Areas adjacent to San Francisco Bay

<sup>2/</sup> Artificially maintained water supply

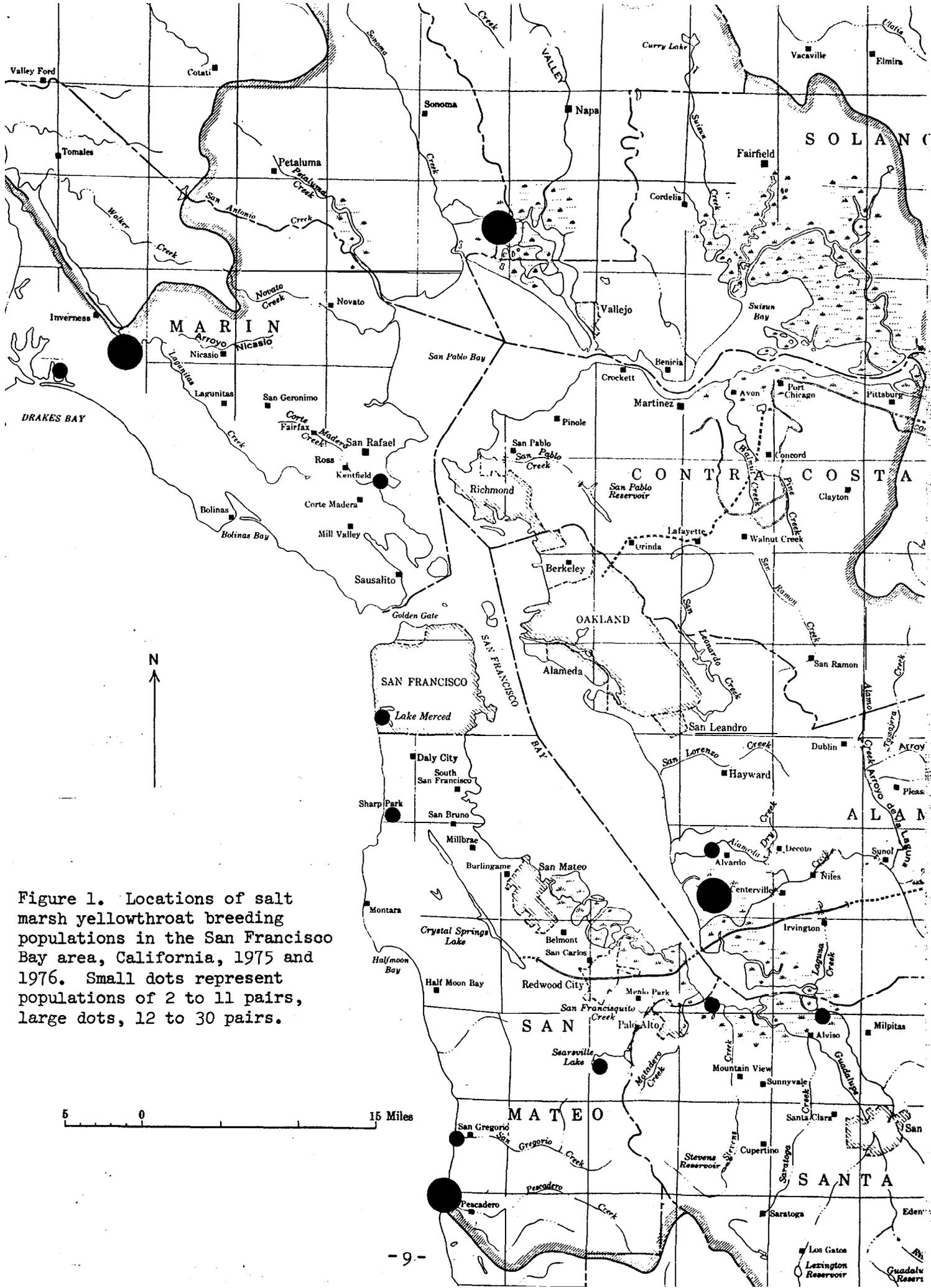


Figure 1. Locations of salt marsh yellowthroat breeding populations in the San Francisco Bay area, California, 1975 and 1976. Small dots represent populations of 2 to 11 pairs, large dots, 12 to 30 pairs.

## DISCUSSION

The problem of tracking the seasonal movements of yellow-throats of the San Francisco Bay Area remains unsolved. Because of their low numbers and the difficulty encountered in catching them, there are as yet no banding returns which would indicate where the migrant breeders winter. However, work on the question is continuing and will be reported in my masters thesis (at San Jose State University) in 1977. Based on my own observations and on the accounts of Grinnell and Miller (1944), I consider that all the yellowthroats breeding in the Bay Area are members of the salt marsh subspecies, and the migrant or resident status of each population is determined by the quality of the habitat in which it breeds. In the woody swamp areas of Olema and Searsville Lake, where cover is heavy throughout the year, the yellow-throats are resident, whereas in the fresh and brackish water areas where plant die-off is extensive in winter, the birds are migratory. It seems likely that the birds which winter in Salicornia areas of San Francisco and San Pablo Bays breed in adjacent brackish marshes. Some Bay Area yellowthroats may travel greater distances. Grinnell identified those he collected in San Luis Obispo County as being the salt marsh subspecies. He further stated that migrants from the Bay Area could be found wintering in coastal marshes from the Bay south as far as San Diego County. Within the Bay Area, coastal marshes such as Limantour and Pescadero support more yellowthroats in winter than during the breeding season. The resident breeders of these coastal marshes may be joined in winter by short-distance migrants from scattered inland breeding sites (see Appendix A).

One of the aspects of yellowthroat ecology which could not be examined in the present study is their fate on the wintering ground. Lack (1954) stated that bird populations are strongly influenced by events occurring in the winter. Fretwell (1976) noted that in every study which considered the whole life cycle of a temperate bird species events during the nonbreeding season appeared to be more critical than events during the breeding season. During the years in which yellow-throat populations have been declining, the reduction in area of salt marsh has been nearly as great as that of fresh and brackish marsh, so it is conceivable that the size of the breeding population is determined or at least strongly affected by wintering ground factors. If this were the case, it would help to explain the observation that there are areas of marshland which are apparently adequate for yellowthroat breeding but which are unoccupied.

There are some areas where yellowthroats were known to occur in the past, but no longer do so, although there has been little or no disruption of the areas. The upper reaches of Coyote Creek, the Guadalupe River and Los Gatos Creek (all in the general San Jose area) are examples. The lower stretches of these streams have been channelized, diverted and heavily polluted by industrial run-off. If in the past, the birds moved along the stream courses from wintering in the salt marsh to breeding sites further inland, such disruption could have blocked dispersion to upstream areas and account for their present unoccupied state.

I had hoped to determine whether yellowthroats had undergone a relative as well as an absolute reduction in numbers, but historical references are scanty and somewhat contradictory. Sibley (1952) reported that of a flock of small land birds on a levee "seventy-five percent were song sparrows, a few Savannah sparrows, white crowns, five or more marsh wrens, and one yellowthroat." These are approximately the proportions encountered currently. On the other hand, Grinnell (field notes) reported that yellowthroats wintering at Morro Creek were about equal in numbers to other insectivorous passerines, a relation that no longer exists anywhere in the Bay Area. At Lake Merced, where both marsh wrens and yellowthroats were "abundant" (Ray 1916, Schussler 1918) early in the century, marsh wrens remain numerous, but yellowthroats can no longer be said to enjoy that status. Though vague and qualitative, these few references suggest that yellowthroats have undergone a disproportionately large reduction in numbers compared with other marsh passerines.

There was a significant drop in the number of yellowthroats between the 1975 and 1976 breeding seasons. Lower numbers than usual were noted on the wintering grounds in the Napa, Alviso, Palo Alto and Pescadero areas, and no yellowthroats were sighted in some other wintering areas (Lake Merced and in Marin County). In the locations where censuses were made in 1975, the number of breeding pairs was noted to be smaller in 1976. The most drastic reduction occurred in the Napa Marsh, where the plant composition of breeding sites changed due to changes in salinity.

Fluctuations in salinity, shoreline changes due to sedimentation, variations in rainfall, and resulting changes in plant distribution are normal events in marshes. Animals adapted to live in marshes can adjust to such changes. In a natural population of warblers there are enough birds to constitute a "reserve force" of breeders (Stewart and Aldrich 1951, Hensley and Cope 1951), so that individual reproductive failures in a stress year or several stress years will be compensated for in normal years. But where the population has been continuously depleted by human alteration of habitat, additional stress from a natural occurrence such as a dry year may reduce the number of breeders to a critically low population. The yellowthroat populations of the "salt marsh" subspecies of the Bay Area are in such a situation or close to it now.

Another effect of the drought year has been a decrease in abundance of insects, which is the yellowthroats' food supply. Although insect abundance was not measured directly, its effect on breeding yellowthroats was indicated in several ways. First, compared with 1975 observations, territory size increased in 1976, as would be expected if each territory contained a sparser food supply. Also, when adults were feeding young in the nest, the intervals between feedings were abnormally long, suggesting that the parents were encountering difficulty in finding food. Yellowthroats feed the nestlings more frequently as the young grow older (Stewart 1953), bringing food to hatchlings approximately every 20 minutes, and increasing the rate until nestlings a week old receive food at roughly 5 to 7 minute intervals. But in 1976, at two nests at Searsville and one in Coyote Hills, birds about a week old were being fed at 20 minute intervals or longer.

There was also a difference between 1975 and 1976 in the number of successful second clutches. There are normally fewer second broods attempted than first broods, and of these, fewer still are actually fledged (Stewart 1953). There were very few second clutches attempted in 1976. Of the eleven territories in Napa which I followed all summer, none produced successful second broods. In early July, I found three nests in which young were still being fed. Three young fledged from one; the fate of the others is unknown. The situation was similar in the East Bay and Alviso. Only at Pescadero Marsh was breeding success in 1976 comparable with that in 1975.

There are a few other factors which may play a role in yellowthroat reproductive success. Stewart (1953) found parasitism by cowbirds (Molothrus ater) to be a significant cause of mortality among yellowthroats in Michigan. I did not find any parasitized nests, but cowbirds are not uncommon in the study areas. I had no direct observations of predation, but known predators of song sparrows are present. Although the extent of predation is not known, it can be assumed that reduction of cover due to drought, or to disruption of vegetation by humans, would increase the incidence of predation.

Lastly, we know very little about the minimum size of marsh sufficient to support breeding pairs of yellowthroats. Many of the marshes supporting breeding pairs in 1975 and 1976 have been reduced to small sizes because of human intervention. The fragmentation and reduction in size of the marshes, plus the wholesale destruction of breeding areas throughout their range threaten the existence of this race. Their continued presence depends upon the preservation, enlargement and management of present breeding sites and the recreation of new ones.

## SUMMARY

The salt marsh yellowthroat has decreased drastically in distribution and abundance in the San Francisco Bay Area since the early part of this century. Habitat available for both breeding and wintering has been reduced greatly or altered in quality. Immediately adjacent to the Bay, the highest quality habitats are in areas where water flow is artificially maintained. The largest, most stable populations are resident ones in coastal marshes or bayward marshes under protection. Yellowthroat numbers are critically low in all areas peripheral to the Bay. Additional losses were incurred as a result of the drought winter of 1975-76. Events occurring on the wintering ground may be as important in affecting population size as factors involving only the breeding season.

## ACKNOWLEDGEMENTS

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## APPENDIX A

### LOCATIONS AND DESCRIPTIONS OF SALT MARSH

#### YELLOWTHROATS HABITATS, 1975-1976

##### Olema Marsh, Marin County

Olema Marsh consists of two very different types of habitat, both used by yellowthroats. The section north of Point Reyes National Seashore Headquarters is about 8 ha (20 acres) of wooded swamp which grades into Typha marsh. East of Bear Valley Road, the vegetation is salt marsh and brackish marsh types, Scirpus and salt grass (Distichlis) predominating. The total population for both areas is 20 to 25 pairs. The population is resident year-round but winter sightings are fewer, suggesting that some of the birds move out to nearby salt marsh areas, while some remain all year. The entire area is under protection, the eastern section being part of the Point Reyes National Seashore, while the western section belongs to Audubon Canyon Ranch. From 1975 to 1976, I did not note any vegetative changes in the area under tidal influence. The stream, while low, continued to supply enough freshwater to maintain the character of the marsh.

##### Limantour Estero, Marin County

Ten kilometers (6 mi.) south of Olema Marsh is Limantour Spit, fronting two small estuaries, each with a marsh that grades from salt to fresh upstream from the Tomales Bay. Three breeding pairs were observed in the Glenbrook Creek marsh in 1976. Fifteen to twenty yellowthroats have been observed in the winter in the salt marsh section, indicating that Limantour supports winter migrants as well as its own resident breeders.

##### San Pablo Bay, Marin County

Though small patches of apparently acceptable yellow-throat habitat are scattered throughout Marin County, a fairly exhaustive search discovered only two pairs. These were in the sewer out-fall marsh in San Quentin. There is one record of yellow-throat nesting in San Rafael early in this century (Ray 1916), and it is probable that they were historically common in appropriate habitat. But the parts of Marin County adjacent to the Bay have been heavily developed. Most streams have been channelized for part of their course, and the remaining areas of freshwater marshland are cut off from each other and from the salt marsh. In 1976, Marin County was severely affected by drought, some streams and marsh areas being completely dry in April, further decreasing the likelihood of successful yellow-throat breeding.

### Napa Marsh

The area bounded by Tolay Creek, the Napa River, San Pablo Bay and Highway 121 contains about 650 ha (1600 acres) of brackish marsh vegetation. The mixture of reeds and low, tangled vegetation preferred by yellowthroats covers about one-tenth of this area, mostly along the margins of the smaller channels. The yellowthroat breeding population occupies three to eight breeding areas arranged linearly along the sloughs. Territory size varies widely; at one site on Hudeman Slough, pairs were so close that each territory did not include more than 0.1 ha (0.25 acre) of marsh vegetation. A lone male nesting at the Vallejo sewer outfall was sighted singing from perches over a 2 ha (5 acre) area. Instances of lone pairs were not encountered during 1975; all were within hearing distance of other pairs. In three locations I observed in 1976, on the other hand, several males were singing in April, but only one remained by the time the young were fledged. These were in areas where the vegetation had changed between 1975 and 1976.

### Lake Merced, San Francisco County

In San Francisco, yellowthroat breeding is restricted to Lake Merced, where seven males were heard in 1976. This represents a great decrease from historical abundance (Schussler 1918). The MVZ collection contains nine yellowthroats which were collected over a two-day period in 1917. Golden Gate Park is another historical breeding site for yellowthroats, but none were observed there during this study.

### Sharp Park, San Mateo County

A 4 ha (10 acre) marsh in Sharp Park, San Bruno, had two pairs of yellowthroats nesting in 1975, but none were found in 1976.

### Searsville Lake, San Mateo County

A stable population of resident yellowthroats is found at Searsville Lake in southern San Mateo County. Eleven pairs were observed in 1976 in that part of the marsh which is located on Stanford University's Jasper Ridge Biological Preserve. The edge of the lake had receded about 30 m (100 ft.) from its normal dimensions in the area of greatest yellowthroat concentration, and some nests were built over dry ground in cattails from the previous year. However, I did not observe any instances of nest failure. The average territory size was 0.5 ha (1.2 acres). About 20 ha (50 acres) of yellowthroat habitat is within the Stanford reserve and an equal or greater amount extends outside the reserve into an area of upper-income residences. This part of the habitat, though not specifically protected, is probably not subject to further disruption or development.

### Palo Alto Marsh, Santa Clara County

A plot of brackish water marsh between San Francisco Creek and the Palo Alto Yacht Harbor had two nesting pairs of yellowthroats in 1976. Post of the Palo Alto Marsh is Salicornia and yellowthroats are relatively common here in winter.

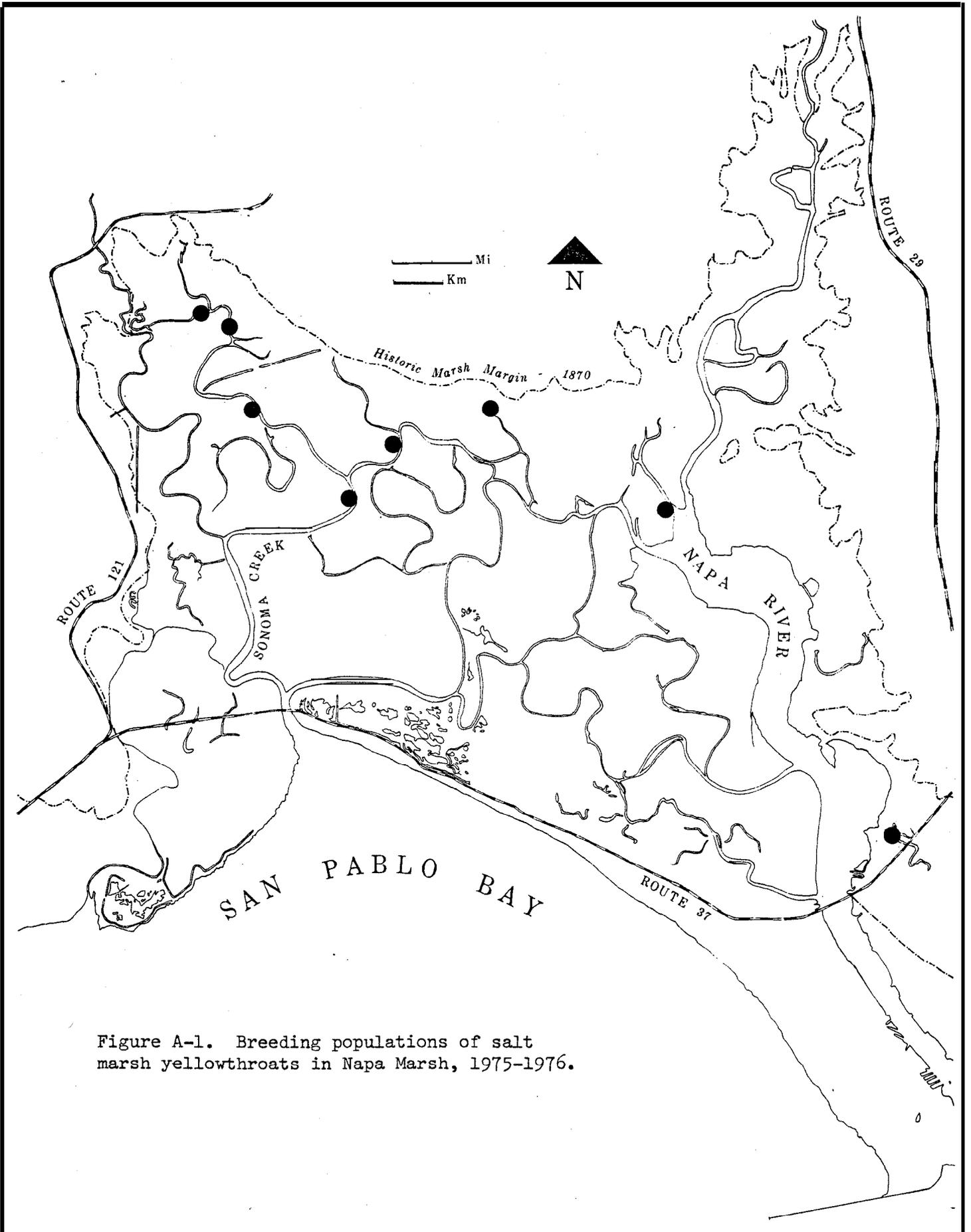


Figure A-1. Breeding populations of salt marsh yellowthroats in Napa Marsh, 1975-1976.

### Alviso Marsh Area, Santa Clara County

The brackish water marsh in Alviso Marsh extends from the San Jose sewage treatment plant to Coyote Creek partly through the San Francisco Bay National Wildlife Refuge. At Artesian Slough in 1976, two of the three males present in April had disappeared by June. Other observations indicate six to eight breeding pairs in the combined outfall and refuge area of about 14 ha (35 acres) of brackish water vegetation. Total South Bay observations indicate a breeding population of approximately 25 to 30 pairs (Gill 1972) in addition to those at Searsville Lake. Most of these have been isolated sightings along streams within 16 km (10 mi.) of the Bay, and in a small marsh south of Los Esteros Road and west of the San Jose sewage treatment plant. Since this area and the sewer outfall area are the only significant plots of good brackish water marsh left in the extreme South Bay, its character should be preserved.

### Coyote Hills Regional Park, Alameda County

Coyote Hills formerly contained 34 ha (85 acres) of high quality marsh habitat, but park development reduced the area to about 18 ha (45 acres). The breeding population is at least 27 pairs. The habitat is stable as the water level is maintained by the Alameda County Flood Control District. The park district plans to flood a segment of land adjacent to the present marsh and restore the marsh vegetation, thus restoring the yellow-throat breeding habitat to its original size.

### Alameda Creek, Alameda County

Yellow-throat habitat occurs along a 0.8 km (1/2 mi.) section of Alameda Creek between Hesperian Boulevard and the Leslie Salt ponds in Union City. Eight yellow-throat territories were found. This section of the creek is on private land and not under any habitat protection.

### San Gregorio Creek, San Mateo County

6.4 km (4 mi.) north of Pescadero is San Gregorio Creek, which supports reeds and mixed marsh vegetation along its bank. Two pairs of yellow-throats were nesting there in 1976. The total habitat available there is about 8 ha (20 acres).

### Pescadero Marsh, San Mateo County

The Pescadero marsh complex is an extensive system of freshwater, brackish, and salt marsh. Two creeks supply freshwater, and ocean water enters with the tides and is channeled through sloughs between agricultural fields. It includes every kind of habitat preferred by yellow-throats, and all this habitat appears to be utilized. Yellowthroat territories were found on the chaparral hillsides in addition to the marsh areas. The breeding population is about 30 pairs for the whole marsh area. Ray Patton of the San Mateo Coast State Park Area has seen as many as 50 in one day; I counted 15 males along a 1.6 km (1 mi.) stretch of trail. Although resident breeders are numerous, winter sightings are so high as to suggest that Pescadero is also the wintering ground for some migrants from further

inland. Part of the Pescadero Marsh is already under protection; the proposed acquisition of additional area would greatly enhance the prospects for continued survival of this small but thriving yellowthroat population.

### Other Areas

Many other wetland areas appeared to have suitable yellowthroat habitat, but yellowthroats were not found breeding in these habitats in the 1975 and 1976 breeding seasons:

Drake's Beach Marsh, Marin County. National Seashore rangers maintain records of bird sightings in this 8 ha (20 acre) Scirpus-Typha marsh, but no yellowthroats have been recorded.

Petaluma River Marsh, Marin County. This area contains about 21 sq. km (8 sq. mi.) of salt marsh habitat, but suitable yellowthroat breeding habitat appears limited. Four males were heard singing at a distance on four occasions in July 1975, but whether or not these were breeding birds could not be determined. A small breeding population may have existed in this area in the 1975 breeding season.

Crystal Springs Reservoirs, San Mateo County. Freshwater marsh vegetation was found in many coves of the Upper and Lower reservoirs. One yellow-throat was heard singing in Upper Crystal Springs Reservoir in the 1975 survey, and others might have been in the area; however, evidence of a breeding population was not obtained.

Charleston Slough, Santa Clara County. About 4 ha (10 acres) of freshwater marsh vegetation exists near a sewer plant at the upper end of this slough. No yellowthroats were found in two censuses in 1975; however, censuses were made during adverse weather conditions.

### Contra Costa and Northern Alameda Counties

Historically, yellowthroats bred all along the fringe of the Bay in Contra Costa and Alameda Counties. Grinnell and Miller (1944) cite San Pablo, Wildcat Creek, Cerrito Creek and Bay Farm Island as specific nesting locations, and the MVZ collection contains sixteen specimens collected in the East Bay prior to 1940. I investigated each site mentioned and found no yellowthroats. Moreover, I estimate that the destruction of suitable breeding habitat adjacent to the Bay approaches 100 percent. Some upland sites (Lake Chabot and a few stream courses) contain apparently acceptable habitat, but it was not occupied by yellowthroats during this study.