State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

REPORT TO THE FISH AND GAME COMMISSION:

A STATUS REVIEW OF THE SUISUN SONG SPARROW (*Melospiza melodia maxillaris*) IN CALIFORNIA

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EXECUTIVE SUMMARY

This report was prepared in response to a petition received by the Fish and Game Commission from Dr. L. Richard Mewaldt of the Coyote Creek Riparian Station to list the Suisun Song Sparrow (*Melospiza melodia maxillaris*) as an Endangered Species.

On August 31, 1988, pursuant to Section 2074.2 of the Fish and Game Code, the Commission determined that the petition contained sufficient information to indicate that the petitioned action may be warranted. Pursuant to Section 2074.6 of the Fish and Game Code, the Department undertook a review of this petition. Based on the best scientific information available on the Suisun Song Sparrow, the Department has evaluated whether, in fact, the petitioned action should be taken. Information and comments on the petitioned action and the species in question were solicited from interested parties, management agencies, and the scientific community.

This report presents the results of our review and analysis.

Findings

The Suisun Song Sparrow is a small passerine bird that is endemic to the brackish tidal marsh habitat in and around the Suisun Marsh in Solano and Contra Costa counties adjacent to California's San Francisco Bay. Though fairly stable in recent years, this once vast and continuous tidal marsh area has been extensively modified and degraded by diking and channelizing for agriculture and seasonal marsh management in the northern Suisun area and by heavy industrial development along the southern Suisun shore. This has been accompanied by a substantial reduction of freshwater outflow from the Sacramento-San Joaquin Delta. A recent review of the remaining brackish tidal marsh habitat indicates that only 10 to 20% remains and that this remaining habitat is in a highly fragmented condition, primarily in thin strips along the inside edges of tidal sloughs. As a direct result of habitat modification and degradation, the Suisun Song Sparrow currently exists at an estimated 10 to 20% of its historical numbers. Recent estimates indicate that less than 6000 pairs remain in 13 isolated habitat fragments, with the largest of these population fragments consisting of about 1300 pairs and the smallest about 20 pairs.

Suisun Song Sparrows occur only in and around the Suisun Marsh, and are physiologically and behaviorally adapted to this area's naturally occurring brackish tidal condition. They are able to drink brackish water, breed earlier than upland subspecies which helps in avoiding nest flooding during the highest spring tides, occupy bulrush and cattails with stems 7.6 to 10 centimeters (3 to 4 inches) apart and forage for invertebrates and seeds directly on the surface of the mud. There is no evidence that they occupy managed marsh areas that are not subjected to unimpeded daily tides. They are highly sedentary throughout their lifetimes, with young dispersing only about

185 meters (607 ft) from their birthplace and adult breeding territories shifting less than 16 meters (52.5 ft) between centers from year to year. They seldom move more than 9 meters (30 ft) from cover, and once a territory is established, they occupy it for their lifetime, seldom moving more than 100 meters (328 ft) away. Mortality rates are fairly high, 80% during the first year of life, and 43% per year for adults thereafter.

Due to their highly sedentary nature and severely fragmented habitat, isolated pockets of small populations presently exist with little or no gene flow occurring between them. Should an isolated population be extirpated, there is little chance of recolonization. This fragmentation and isolation raises a severe question regarding current population viability and places the Suisun Song Sparrow in an extremely precarious situation. The remaining small isolated populations are further threatened by potentially catastrophic toxic spills and environmental contamination from industrial development. A high rate of predation from diurnal raptors during high tides when all of the sparrows are exposed at the tips of vegetation and on the tops of levees and dikes, also poses significant threat. The long-term impact of further reduction of freshwater outflow from the Sacramento-San Joaquin Delta is unknown at this time, since water rights hearings and negotiations are still underway. Further changes in salinity could adversely impact the tidal brackish marsh habitat upon which the Suisun Song Sparrow is dependent. Since the long-term existence of this unique bird is clearly in jeopardy, the Suisun Song Sparrow is considered to be seriously threatened throughout its range.

Conclusions

Although the petitioner requested that the species be listed as Endangered, after reviewing the status of the Suisun Song Sparrow, and based on the best available scientific information regarding the biology of this endemic bird, the Department finds that listing as Threatened is an appropriate action. This finding is based on the following:

1. Habitat modification and destruction has been extensive in the Suisun Marsh and surrounding areas. This once vast and continuous brackish tidal marsh has been severely fragmented by diking and channeling for agriculture and seasonal marsh management, heavy industrial development has degraded and continues to further threaten the south shore and nearby areas, and there has been a severe reduction of freshwater outflow from the Sacramento-San Joaquin Delta with plans for future reductions. The Suisun Song Sparrow occupies only brackish marsh that is subject to unrestricted daily tidal action. Only 10 to 20% of the historically available tidal brackish marsh habitat remains and is in a highly fragmented condition.

2. Overexploitation of the Suisun Song Sparrow itself (as opposed to its habitat) is not a factor threatening the existence of this species.

3. Under natural conditions with more widespread and viable populations, predation on Suisun Song Sparrows that occurs in unaltered brackish tidal marsh habitat would not usually be considered a threat to continued existence. However, under present conditions, there is often no upland cover left to allow a retreat during extreme high tides. The entire

population may be left clinging to the tips of vegetation or exposed on the tops of dikes and levees. When these tides occur during daytime hours, predation by diurnal raptors may be severe. This predation is especially detrimental for small isolated populations.

4. There is no evidence to suggest that competition from other species threatens the existence of Suisun Song Sparrows. If habitat conditions, particularly salinity and vegetation type should change in the future, this should be reevaluated.

5. Although there is no evidence that disease is a threat to the Suisun Song Sparrow, should an outbreak occur, the isolated fragmented populations would be highly vulnerable to local extirpation. More serious threats to the health of this bird are the distinct possibility of a catastrophic toxic spill or for long-term environmental contamination from industrial or shipping activity in the waterways. These birds would be highly vulnerable to ingestion of toxic residues that are tidally deposited on the surface of the mud on which they forage or if these chemicals are otherwise present in the food chain. There is every reason to believe that Suisun Song Sparrows would be seriously affected by these poisons, and local extirpation or catastrophic extinction is a distinct possibility.

6. Less than 6000 pairs of Suisun Song Sparrows remain distributed within 13 small isolated populations, the largest of which consists of about 1300 pairs and the smallest of about 20 pairs. Historically an estimated 69,000 to 77,000 pairs probably occurred throughout the marsh. Current low numbers coupled with high fragmentation and isolation place the birds at risk of extinction due to biological and genetic factors. Their highly sedentary nature precludes natural recolonization of vacated habitat, and gene flow between populations is severely restricted. These factors seriously threaten the continued viability of this species.

Recommendations

1. The Commission should find that the petitioned action that is warranted is for the status of State Threatened.

2. The Commission should publish notice of its intent to amend Title 14 CCR 670.5 to add the Suisun Song Sparrow (*Melospiza melodia maxillaris*) to its list of Threatened and Endangered Species.

3. A vegetation survey of all remaining brackish tidal marsh habitat should be conducted to determine the extent of remaining suitable vegetation within the historic range of the Suisun Song Sparrow.

4. Extensive population surveys should be conducted during the breeding season in all remaining brackish tidal habitat and in other habitats throughout the historic range of the Suisun Song Sparrow to determine the number of breeding pairs and the locations of all isolated population fragments.

5. A population viability analysis of the Suisun Song Sparrow should be undertaken.

6. The Department should continue or establish the interagency coordination and commitment necessary to minimize continued loss and deterioration of Suisun Song Sparrow habitat and ensure the preservation of habitat deemed essential to maintaining the species in perpetuity.

7. Whenever possible, the outboard width of levee berms should be increased to 9 meters (30 ft) to establish brackish tidal marsh vegetation.

8. The growth of upland vegetation should be encouraged on the banks of levees to provide upland cover during extreme high tides.

9. Dispersal corridors of suitable tidal brackish marsh should be established and protected along the banks of all tidal sloughs to allow for increased gene flow between genetically isolated populations. An overall goal in this situation would be to physically eliminate total isolation of fragmented populations by developing connecting habitat.

10. Maintenance activities should be conducted to minimize disturbance to and encourage growth of tidal brackish marsh vegetation, and these activities should not disturb breeding adults.

11. Consideration should be given to restoration of tidal habitat pursuant to goals established in the Suisun Marsh Protection Plan, with particular emphasis on expanding and linking existing habitat fragments.

12. The Department should evaluate the possibility of intensive management activities including the transfer of eggs and/or young between nearby isolated fragments to facilitate gene flow.

13. The Department should establish a recovery planning team and a management plan for the species should be developed and implemented.

14. Tidal marsh protection areas of a size sufficient to maintain self-sustaining populations of the Suisun Song Sparrow should be established. Appropriate habitat should be purchased and restored if necessary to accomplish this goal.

Public Responses

During the twelve month review period, the Department contacted a number of affected and interested parties, invited comment on the petition, and requested any additional scientific information that may be available. A copy of the Public Notice and a list of parties contacted are contained in Appendix A. Copies of comments received and responses to those portions incorporating biological information are provided in Appendix B. Responses to non-scientific comments were not addressed in this analysis but will be addressed as part of the regulatory proceedings should the Commission find that the petition warrants action.

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INTRODUCTION

Petition History

On May 10, 1988, the Fish and Game Commission received a petition from Dr. L. Richard Mewaldt of the Coyote Creek Riparian Station at Alviso, California, requesting State listing of the Suisun Song Sparrow (*Melospiza melodia maxillaris*) as an Endangered Species. The Department of Fish and Game reviewed the petition and recommended to the Commission that they accept it as complete pursuant to Sections 2072.3 and 2073.5 in the California Endangered Species Act (CESA). On August 31, 1988, the Commission accepted the Department's recommendation and designated the Suisun Song Sparrow as a Candidate Species as provided for in Section 2074.2 of CESA. That action initiated a twelve month review period, pursuant to Section 2074.6 of CESA, within which the Department must review the status of the subject species and provide a written report to the Commission. This Department report contains the results of the Department's status review, and a recommendation to the Commission, based on the best scientific information available, whether or not the petitioned action is warranted. It also includes preliminary identification of the habitat that may be essential to the continued existence of the species and suggests management activities and other recommendations for recovery of the species.

Department Review

During the twelve month review period, the Department contacted affected and interested parties, invited comment on the petition, and requested any additional scientific information that may be available. A copy of the Public Notice and a list of parties contacted are contained in Appendix A. Copies of comments received and responses to those portions involving biological information are provided in Appendix B. Responses to non-scientific comments are acknowledged, but not addressed in this document.

FINDINGS

Life History

Description

The Suisun Song Sparrow is a small chunky bird with a rounded outline, large feet, a conical bill, short rounded wings and a long rounded tail which is pumped in flight (National Geographic Society 1983). The eyebrow stripe is

grayish and a broad dark stripe borders the whitish throat. The body is longitudinally streaked with black stripes that align into rows on the back and ventrally gather into a spot on the chest, leaving the lower belly unstreaked. The Suisun Song Sparrow is the darkest of the San Francisco Bay salt marsh subspecies, with a great deal of black in the plumage (Marshall 1948a). The overall background color on the back is dark reddish-brown with wider black streaks than in the other subspecies. Background color on the underparts is whitish in the chest area, but becomes yellowish-olive posteriorly on the sides and belly. The Suisun Song Sparrow is also the largest of the three salt marsh subspecies, and it has a much larger, thicker bill that is both deeper and wider than in the others (Marshall 1948a). The coloration, body size and bill size are reliable physical characteristics allowing this subspecies to be readily distinguished from all others.

Taxonomy

The Suisun Song Sparrow is a distinct subspecies that is completely endemic to Suisun Bay. This subspecies is highly adapted to the specific environmental conditions that naturally occur there. It was first described by Grinnell in the early 1900's. The Song Sparrow (*M. melodia*) is generally known as a highly adaptable species that has separated into many small localized subspecies taking full advantage of available situations. Three subspecies occur in San Francisco Bay Area salt and brackish marsh situations: *M. m. maxillaris* in Suisun Bay, *M. m. samuelis* in San Pablo Bay and *M. m. pusillula* in South Bay. In addition, *M. m. gouldii* occurs in the upland surrounding the Bay Area salt marshes and *M. m. mailliardi* occurs to the east in the Central Valley and the Sacramento-San Joaquin Delta (American Ornithologists' Union 1957, 1983). The highly sedentary nature of these subspecies, coupled with very limited genetic mixing along narrow riparian corridors, has allowed sufficient genetic isolation for physical, physiological, and behavioral differences to become established between subspecies (Johnston 1956a,b).

Biology

Food Habits. Suisun Song Sparrows forage on the bare surface of tidally exposed mud among the tules and along the slough margins in the brackish marshes of Suisun Bay during low tides. They feed principally on *Scirpus* (bulrush) seeds that are picked off the ground after the seeds fall and ignore the supply of full flower heads 1.8 meters (6 ft) above (Marshall 1948a). They also take insects (especially mosquito larvae and flies) and other invertebrates (such as snails) from the exposed muddy ground during low tides (Marshall 1948a, Bent 1968, Walton 1975). Invertebrate fauna of the tidal vegetation is most important as food during the spring and summer (Johnston 1956a). During late summer and fall their diet switches to seeds (Basham and Mewaldt 1987). Especially during the breeding season, Suisun Song Sparrows are limited to the area covered by tides, but during the fall, both adults and juveniles may occasionally wander over levees in the vicinity of their breeding territory to forage on seeds in adjoining fields (Marshall 1948a).

Due to their small size and high metabolic rate, Suisun Song Sparrows must forage constantly (Walton 1975). They hop along the ground and scratch in the slough mud with both feet moving together and then peck at the disturbed surface to obtain invertebrates. Other food gathering movements include short

hops with wing and tail flicks while frequently pecking at food items, and flycatching by using jerky hopping and darting motions with outstretched wings for balance (Bent 1968).

Suisun Song Sparrows forage between stems and along vegetation perimeters on the surface of the mud. Very dense vegetation is avoided if they cannot easily move between stems (Walton 1975). Song sparrows in general have never been observed wading in shallow water (Greenberg 1988). In standing water, they appear unable to move through the emergent vegetation to search for food on the water surface or to lean down to pick up food items floating on the surface. They instead try to land on any small bits of floatsum or anything breaking through the water surface.

Water Requirements. Suisun Song Sparrows are essentially limited to the area covered by tides, especially during the breeding season (Marshall 1948a). With the building of artificial levees, a process started in the late 1800s, the managed marsh areas on the non-tidal side of the levees are typically seasonally flooded and then drained or allowed to dry. This increases marsh vegetation, but these areas with stagnant or standing water and no tidal flow are consistently avoided by Suisun Song Sparrows (Marshall 1948a). Other song sparrow subspecies also avoid stagnant situations.

Along with the two other salt marsh subspecies, Suisun Song Sparrows are one of the few passerine birds that are physiologically adapted to allow direct consumption of saline water (Bartholomew and Cade 1963, Basham and Mewaldt 1987). Moreover, each salt marsh subspecies is adapted to tolerate and actually prefers to consume water of the average salinity range that naturally occurs within its range.

A water consumption study of captives, conducted by Bartholomew and Cade (1963) showed that Suisun Song Sparrows are generally dependent on brackish water and are fully adapted to utilize this source. This study showed that upland song sparrows that inhabit freshwater marsh drank 21.1% of their body weight per day when given unlimited amounts of water. This is the expected percentage of fresh water consumption for passerine birds of this body size (16.8 grams). In contrast, Suisun Song Sparrows (18.2 grams) drank 41.8% of their body weight per day, which is approximately twice the expected amount. This increased amount of fresh water consumption was also exhibited by other salt marsh passerines and is probably a behavior resulting from the need to consume excess salt water in the wild to obtain enough usable water for physiological purposes. Further, in the upland subspecies the amount of water consumed increased directly with increasing salinity, eventually resulting in cessation of all water consumption and severe loss of body weight. In Suisun Song Sparrows and other salt marsh passerines, the consumption of salt water either decreased or remained nearly constant with increasing salinity. However, the maximum salinity for maintaining body weight in the Suisun Song Sparrow was 50% seawater, whereas some other salt marsh passerines could tolerate much higher salinities. It was also found that some salt-marsh passerine birds can and do distinguish between saltwater and freshwater. When given unlimited choice between both extremes in captivity (some saltwater and some freshwater), these birds will actually drink a combination so that the ingested solution is one that they can readily tolerate physiologically. Although not specifically tested, the Suisun Song Sparrow may also have this ability. In any case, Suisun Song Sparrows are dependent on brackish water and cannot maintain body weight on full strength seawater.

Salt marsh song sparrows are also able to withstand natural variations in the amount of salinity and this physiological adaptation serves to isolate them from upland subspecies (Basham and Mewaldt 1987). Salt marsh song sparrows are highly sedentary, rarely venturing more that 10 meters (33 feet) from cover, and show no interest in traveling even short distances to a freshwater source. Under natural salt marsh conditions high salinity periods without any fog drip or dew that the birds can utilize, only last several days. Experiments in captivity show that salt marsh Song Sparrows can survive salinity stress for 13-14 days. During such a period, Suisun Song Sparrows can perhaps obtain additional salinity-balanced fluids from extensive feeding on insects and invertebrates. However, during late summer and fall, when the diet shifts to seeds, invertebrates are no longer a reliable source of fluids, and salinity is at its peak. Thus, there is a distinct advantage to being able to directly use saline water available in the habitat during these times (Basham and Mewaldt 1987).

The Suisun Song Sparrow is physiologically adapted to survive the changing salinities inherent in the brackish marsh situation found in Suisun Bay as long as there is adequate variation in those salinities, and not a permanent shift to one extreme or the other. If the salinity of the marsh, permanently or for a prolonged period, approaches that of seawater, Suisun Song Sparrows may undergo a fatal loss of body weight.

Home Range and Population Density. During the breeding season, Suisun Song Sparrow pairs occupy small territories strung singly along the edges of sloughs and bays. Each territory must have enough area for nesting and foraging, including tidally exposed mud, water, light and vegetation suitable for nesting and for cover while foraging (Walton 1975). Each pair stays within its limited territory area during the nesting season, and they can rarely be chased more than 91 meters (300 ft) from where they were flushed (Marshall 1948b). They may sometimes chase each other further during episodes of aggressive behavior and they may sometimes perch and sing in grasslands at the edge of marshes, but in both cases they soon return to their territorial headquarters (Marshall 1948b). This activity changes in late summer, fall and winter when adults and young may range up to 183 meters (600 ft) from the territory and forage and sing on the other sides of the levees in adjacent seasonal marsh, grasslands and eucalyptus trees (Marshall 1948b, Walton 1975). Territories are typically staked out in spring, but they may be the same as those occupied during the previous fall. Adults remain permanently in the territory they take up during their first autumn, and few move more than 10 meters (33 ft) from this territory for the rest of their lives (Marshall 1948). The longest recorded movement of an adult outside of its breeding territory was 35 meters (115 feet) (Johnston 1956b, Bent 1968).

Suisun Song Sparrows are not strictly limited to their territorial areas while foraging. Territoriality is reduced in winter, and during that time they forage in the general area of their summer home range. In this case, however, they seldom move more than 183 meters (600 ft) from their territory (Marshall 1948a). They may also vacate their territories during periods of high tides (Walton 1975). In general, however, only occasionally do these birds wander more than 9 meters (30 ft) from cover, when foraging on beaches and flying across wide sloughs (Marshall 1948a).

Appropriate vegetation is required for nesting sites, song perches, and concealment during foraging. The vegetation must also prcduce or harbor food, which is picked up on the ground in the form of seeds or invertebrates. Each territory must also include permanent water or moisture in the form of tidal ebb and flow (Marshall 1948a). Typically, each territory contains at least one patch of tall hard-stem bullrush (*Scirpus acutus*) that stands above the surrounding vegetation and is used as a singing perch (Marshall 1948a). These high song perches are apparently necessary for territory establishment, and their absence may be a limiting factor in the distribution of pairs. Levee height sometimes allows the establishment of upland plants, requiring fresh water, including Coyote Brush (*Baccharis pilularis*), rose (*Rosa*), and willow (*Salix*). Suisun Song Sparrows do not necessarily avoid these plants, but in all cases the territorial headquarters are always at the slough margin (Marshall 1948a). Territories may be vacated during extreme high tides (Walton 1975), and if available, upland brush on the sides of levees may be used for cover during this time.

The amount of light available also appears to be important, as Suisun Song Sparrows will not use areas of similar habitat if it is under a leafy overstory (Marshall 1948a), and they will not pass through trees or dense willows or use the understory. The stems of *Scirpus* and *Typha* generally cast very small shadows, and the interior of the stands are well lighted. The stems must also be a suitable distance apart to allow passage. This appears to be an environmentally limiting factor, as areas with stems only 5 centimeters (2 inches) apart or less are not used, probably because there is not enough ground surface available for foraging. Thus, the common attributes needed for territories appear to be plenty of water, light, vegetation, exposed ground for foraging, and piles of twigs or dense shrubs for concealed foraging and hiding (Marshall 1948a).

Along sloughs where the birds spend all their time during the breeding season, the breeding density ranges from 15 to 25 pairs per hectare (6 to 10 pairs per acre), depending on the absolute number of birds in the marsh and the complexity of the available vegetation (Johnston 1956b, Bent 1968). In the best habitat these breeding territories are very small, approximately 0.04 hectare (0.1 acre) each. Territories are larger where vegetation is sparse (Bent 1968). There is a clear difference in size of breeding territories in relation to the vegetational configuration of the immediate area (Walton 1975). Average dimensions are 9 meters (30 ft) wide by 46 meters (150 ft) long (Johnston 1956b). At high water there is a 1.8 to 3 meter (6 to 10 ft) band of water present, and at low water, mudbank is exposed, which is ideal for foraging (Johnston 1956b). Density varies with the complexity of habitat, including the height and width of vegetation and configuration of drainage sloughs. Pairs are situated approximately 44 meters (144 ft) apart when nesting along a broad band of vegetation on the bay shore, and 47 to 64 meters (156 to 210 ft) apart when nesting along narrow strips of vegetation along the outside edge of levees, depending on the width of the vegetation strip [14 to 4.6 meters (45 to 15 ft), respectively] (Marshall 1948a). Although the amount of historical habitat available has been greatly reduced, the average density of breeding territories in remaining unaltered habitat has not been reduced (Walton 1975).

Only a portion of the remaining tidal marsh is utilized during the breeding season, with large areas of tidal marsh vegetation apparently being unsuitable habitat (Walton 1975). Pairs of birds per acre of tidal marsh during the

breeding season does not accurately describe song sparrow density, since breeding densities are not dependent on size of the entire tidal marsh, but on the specific amount of suitable breeding habitat within the tidal marsh that is available (Walton 1975). In an extensive study over a six year period on the closely related *M. m. samuelis* in San Pablo Bay, Johnston (1956a,b) found that in years of moderate numbers of birds, overall density for the remaining tidal brackish marsh, including all types of tidal brackish vegetation, was about 2.5 pairs per hectare (one pair per acre). During this study, the number of pairs in a 40.5 hectare (100 acre) randomly selected study plot averaged 105, for an average overall density for the entire tidal marsh area, taking into account unused portions, of 2.6 pairs per hectare (1.05 pairs per acre) (Johnston 1956b). Although this figure was developed from studying the closely related San Pablo Bay subspecies (*M. m. samuelis*) in different vegetation, it remains the best available estimate for overall density based on total area of tidal marsh, especially since the behaviors of the three San Francisco Bay salt marsh subspecies of Song Sparrows are so similar (Johnston 1956a,b, Marshall 1948a,b, and Bent 1968). This average overall density was used by the petitioner in conjunction with aerial photographs to estimate the present and historical abundance of Suisun Song Sparrows in Suisun Marsh. As further information becomes available, these numbers will be further refined.

Reproduction. The Suisun Song Sparrow starts breeding 15 days earlier than upland subspecies at the same latitude (Johnston 1954). This early breeding is an adaptation that helps the species avoid the highest spring tides. Suisun Song Sparrows can have more than one brood per year and can build up to three nests per year, but typically only two are attempted if the first one is successful. Extreme high tides are a chief mortality factor for eggs and young. Selection has fitted Suisun Song Sparrows to earlier breeding, so that under normal environmental circumstances they breed before the run of highest spring tides and thus escape a chief cause of mortality for the younger age classes (Johnston 1956a). When this typical early nesting season is delayed, by a late spring or severe weather for example, there are drastic consequences during the highest tides. This results in the lowering of the total seasonal productivity of the population.

The first and major nesting attempt occurs at the time of minimal tides for the whole spring season (Johnston 1956a). Climatic phenomena, including tides, rainfall, outflow, photoperiod and temperature influence the amount and nutritional quality of spring vegetation. The invertebrate fauna of this vegetation is most important as food for Suisun Song Sparrows during this period and in early summer. This food situation is probably instrumental in the initiation of breeding, and adds to the variation in the cycle from year to year.

Suisun Song Sparrows generally breed from March to June (Johnston 1956a) in three peaks of activity every four weeks: the initial and most important nesting attempt; a second clutch and renesting attempt; and, a third period involving renesting by a small part of the population. It takes four days to build a nest, but it takes more than four weeks to raise young to independence. Thus nesting immediately following a successful attempt is not feasible. With respect to tides, Suisun Song Sparrows exhibit the following normal nesting activity. When the tidal cycle is on the downswing during February, the males exhibit territoriality and are ready to breed by mid-February. Egg laying begins some time in March, and most of the population has a complete clutch by the last week in March. Young leave these nests

before the highest tides in late April and early May. An upswing of nesting activity occurs again in May, and the young leave the nests before highest tides in late May and early June. Then nesting is only sporadic and most of these are flooded by the very high tides later in June. High tides float eggs out of the nest, and drown nestlings that are less than eight days old. Those that are more than eight days old may climb up out of the nest during flooding and cling to any vegetation above water (Johnston 1956a).

Nests are typically placed as high as possible in the suitable vegetation while still having necessary cover (Johnston 1956a). The tallest available plants are not always used, probably because using them increases the possibility of predation. Nests are never used twice and the several nests for any one season for one territory are placed in different sites. An average of 2.5 to 3.0 nesting attempts are made by each pair per year. Clutch size averages 3.2 eggs per nest (Johnston 1956a) and over the season the average total number of eggs per pair ranges from 7.5 to 9.1 (Johnston 1956b). Incubation takes 12 to 14 days, the young are in the nest 9 to 12 days and parental care takes 5 to 8 more days, for a total brood attention of approximately 26 to 34 days (Bent 1968). The population density in one year depends on the production of fledglings in the preceding year. Fledgling production is largely influenced by mortality of young in nests. High population density then limits the amount of food available for any one female through the constriction of the territory size. The territory size in turn varies with density (Johnston 1956a). The productivity per pair over the season varies from 2.0 to 5.8 fledglings per pair per season (Johnston 1956b).

Activity Patterns and Dispersal. Yearly activity patterns typically start in late winter and spring with a rise in male song and aggression. By late February or early March territories are set out by most of the males (Johnston 1956a). Any ownership conflicts are resolved by April, with singing decreasing and breeding beginning in the latter half of March and April. Following breeding and beginning with the start of molt in early June, territorial activity ceases and juveniles disperse throughout the population. They are tolerated in breeding territories during April and May, with aggression by the territory holders restricted to other adults. In late August and September when the molt is almost completed, there is a rise in territorial activity and both the young of the year and the adults become aggressive. At this time further dispersal of the young stops as they establish their first tentative territories. True territories are not staked out until spring and during fall and winter there may be three to six birds occupying one territory-sized area. By breeding time in the following year, the occupants are reduced to one pair per territory. Excess individuals disappear by the first week of concerted breeding effort.

Salt marsh song sparrows are highly sedentary, and exhibit an extreme attachment to the breeding territory that is evident throughout the year (Johnston 1956a). They stay in the vicinity of the territory even during times that it is not being actively defended, typically venturing no more than 91 to 183 meters (300 to 600 ft) away. Movement from year to year between territory centers typically is on a scale of less than the territory dimensions. While the majority do not move, those that do, move an average distance of not more than 16 meters (52.5 ft) between territory centers.

Juvenile dispersal is the main means by which transfer of individuals occurs between Salt marsh Song Sparrow populations (Johnston 1956a). Young birds are

not as attached to their birth places as breeding adults are to their territories. Dispersal from the place of birth to the place of breeding is an important adaptation for a sedentary species. Juvenile dispersal occurs between one and two months of age and they disperse independently of their siblings. After August and September there is no additional movement, and by the third or fourth month of life there is an apparent attachment to the future breeding territory and an upswing of territoriality. At this point further wandering is inhibited. The median distance of juvenile dispersal is 185 meters (607 ft), with extremes ranging from 30 to 960 meters (98 to 3149 ft) (Johnston 1956a). Of these, 42% settled within 150 meters (492 ft), 66% within 250 meters (820 ft), and 81% within 360 meters (1181 ft). Only about 10% showed any ability to move a greater distance. The great bulk of juveniles have no strong drive to move very far.

Mortality Factors and Predation. All known causes of mortality operate independently of population density (Johnston 1956b). Total mortality rates for the first year of life are approximately 80 to 85%, whereas mortality rates for adults average 43% per year thereafter. In order for the population to remain stable or increase slightly, approximately 20% of each years juveniles must survive their first year.

Mortality of the egg and nestling group is about 50% in the first three weeks. The major agents are rodents and high water (Johnston 1956b). The major rodent predators are introduced Norway rats (*Rattus norvegicus*) and there is direct evidence of their eating eggs and nestlings. Rats are present in the marsh during low water periods; when water is high, these animals move to higher ground. Other potential mammalian predators include mice (*Reithrodontomys* and *Microtus*) and shrews (*Sorex*), although no direct evidence has been found (Johnston 1956b), and common carnivores such as skunks (*Mephitis mephitis*), raccoons (*Procyon lotor*) and feral house cats (*Felis domesticus*). Additional avian predators could include Scrub Jays (*Aphelocoma coerulescens*), Common Crows (*Corvus brachyrhynchos*), Ravens (*C. corax*), gulls (*Larus*), herons and egrets. High tides destroy an average of 11.8% of eggs laid per year, and this may rise to 24% in some years (Johnston 1956b). High water floats eggs out of nests, drowns nestlings or causes death due to exposure, with younger individuals being the most susceptible. Other mortality factors include desertion by the female mainly during the egg stage (6.5%), rainstorms (4.5%), infertility or failure to develop (6.1%) and loss of eggs (2%).

The 43% annual adult mortality is due primarily to predation by Northern Harriers (*Circus cyaneus*) (Johnston 1956b), with a small amount attributable to Short-eared Owls (*Asio flammeus*). Northern Harriers are present in Suisun Marsh throughout the year and breed in the upland areas of Grizzly Island along with Short-eared Owls (Larsen 1987a,b). Presence and abundance of both of these raptors in Suisun Marsh is most likely keyed to numbers of small rodents available, which form the bulk of their diets. Short-eared Owls may be found in small numbers during the winter months also (Johnston 1956b), but only four Song Sparrow skulls were found in 491 pellets that were examined, indicating that they are not a major threat to the species. Behavioral observations also indicate that Suisun Song Sparrows directly react to the presence of Northern Harriers, but seemingly ignore Short-eared Owls (Johnston 1956b).

At times of extremely high winter tides Northern Harriers and Short-eared Owls hunt extensively during daylight along the upland row of vegetation (Johnston 1956b). Only the upper tips of vegetation are left exposed at that time, and the Suisun Song Sparrows perch there and on anything else available. High tides in December can be influenced by rainfall, outflow, and wind that may push water into the marsh (Johnston 1956a). This can make the high tides in December actually higher than those in June. During December these high tides occur during daylight hours, and the entire Suisun Song Sparrow population is left clinging to the tips of vegetation, or any other items that float or project above the water surface, including levees and dikes, even if they have no vegetative cover (Johnston 1956b, Bent 1968). Thus, Suisun Song Sparrows are exposed to heavy predation during this time of highest daylight tides (Johnston 1956b).

Associated Species. The Suisun Song Sparrow is the only obligate ground-foraging bird and the predominant avian species in the brackish tidal marsh (Marshall 1948a). Marsh Wrens (*Cistothorus palustris*) and Yellowthroats (*Geothlypis trichas*) forage in the upper parts of the vegetation and Red-winged Blackbirds (*Agelaius phoeniceus*) forage in adjacent fields. Thus, Suisun Song Sparrows occupy an uncontested niche by foraging on the surface of the mud.

Several previously listed species also occur in the tidal brackish marsh of the Suisun Bay area, including the State Threatened California Black Rail (*Laterallus jamaicensis coturniculus*), the State and Federally Endangered California Clapper Rail (*Rallus longirostris obsoletus*) and the State and Federally Endangered Salt Marsh Harvest Mouse (*Reithrodontomys raviventris*). The Salt Marsh Harvest Mouse is not restricted to tidal marsh, can occupy some managed marsh habitat, and is not as specialized as the Suisun Song Sparrow.

Essential Habitat

The Suisun Song Sparrow is endemic to the Suisun Marsh and completely dependent on the vegetation occurring in the brackish marsh subject to daily tides. Suisun Bay receives salt water from tides flowing eastward through Carquinez Straits, and fresh water flowing westward from the Sacramento and San Joaquin rivers and Delta. Judging from the historical uniformity of the naturally occurring vegetation (Marshall 1948a), the Marsh was entirely brackish. Initially the Marsh was vast and continuous, but there has been massive habitat alteration, and the original brackish tidal marsh is now reduced to isolated patches and vegetation intervals along sloughs (Walton 1975).

Brackish tidal marsh habitat occupied by the Suisun Song Sparrow in Suisun Marsh is described by Marshall (1948a). The predominant plant species are *Scirpus acutus* (bulrush or tule) and *Typha latifolia* (cattail). Additional bulrush species include *S. olneyi*, *S. campestris*, and *S. californicus*. On a gradually sloping bay shore the growth is relatively homogeneous, consisting of a 91 to 183 meter (300 to 600 ft) wide belt of mixed *Typha* and *S. olneyi* that are 1.8 to 2.4 meters (6 to 8 ft) high, with widely spaced large patches of *S. acutus* that are 2.4 to 3.7 meters (8 to 12 ft) high. In this vegetation the stems are 10 to 15 centimeters (4 to 6 inches) apart. There are also large patches of pure *S. campestris*, which are 0.6 to 0.9 meters (2 to 3 ft) high with stems 2.5 to 5 centimeters (1 to 2 inches) apart. On the steeper

banks of large sloughs, the vegetation is more zonal in nature, with stands of pure *S. acutus* growing in deep water either in a continuous belt or in patches 46 to 69 meters (150 to 225 ft) apart, followed by a fairly continuous band of *Typha* higher on the bank, then large masses of pure *S. olneyi* alternating with *S. campestris*. These plants, especially *S. acutus*, retain masses of dead stems from the previous year, sometimes in piles up to 1.8 meters (6 ft) high, and there is exposed mud at the bases of the stems and along slough margins. This habitat is limited to land that is covered at high tide and drained by sloughs at low tide.

Suisun Song Sparrows use the tallest *S. acutus* in the centers of patches for song and calling perches, find concealment in the piles of dead stems, and forage on the bare surface of the mud between stems and along the slough margins at low tide (Marshall 1948a). They do not forage between stems that are only 2.5 to 5 centimeters (1 to 2 inches) apart, but only forage in areas with stems that are 10 to 15 centimeters (4 to 6 inches) apart. Thus they generally avoid *S. campestris* with its highly packed stems. They are limited to the area covered by tides, where flow is unimpeded by dikes, levees or channels. Within a typical brackish marsh, each pair is limited to a territory containing a patch of *S. acutus* standing above surrounding vegetation. These high song perches are apparently necessary, and may be a limiting factor in Suisun Song Sparrow distribution.

The height of levees allows upland plants [including *Baccharis pilularis* (coyote brush), *Rosa californica* (wild rose), and some *Salix* (willow)] that require fresher water to grow. Song sparrows do not avoid this vegetation, but their territorial headquarters are always at the slough margins. Flooding with brackish water in low places inside artificial levees can result in high salt concentration due to evaporation and allows for development of salt marsh vegetation such as *Salicornia* (pickleweed) and *Grindelia* (gum-plant). Suisun Song Sparrows consistently avoid these areas due to impeded tidal flow and stagnant water. There is, however, one area on the east side of Cordelia Slough in Solano County where a marsh with *Salicornia* and *Grindelia* contained a few Suisun Song Sparrows. In fact, this area was subject to tidal action and drained at low tide through a culvert, so there was no stagnant water. Suisun Song Sparrows used *Salicornia* for foraging and singing, so they are not strictly intolerant of this vegetation, but breeding there has never been documented. Under historical conditions this vegetation would probably have occurred in limited backwater areas.

Suisun Song Sparrows are remarkably sedentary and do not make long flights over unfamiliar habitat (Marshall 1948b). Also, since the tidal habitat that they occupy never dries up, there is little reason to move. If they do travel it is only for a short distance to an adjacent marsh. Under natural conditions each habitat is connected to another by a zone of intermediate vegetation forming a gradual transition between them. A long row of song sparrow pairs occupies this transition zone, with an opportunity for free interbreeding between birds of the habitats being connected (Marshall 1948a). Narrow connecting avenues occur between marsh and upland subspecies along streams with appropriate vegetational transition zones. However, birds from upland riparian habitats only a few hundred yards away from the salt marsh show no mud on their crown or bill, and do not exhibit feather wear from *Scirpus* (Marshall 1948b), indicating that there is probably little or no overlap and very little inbreeding between these subspecies.

Distribution and Abundance

The Suisun Song Sparrow was historically described as an abundant permanent resident of the marshes surrounding Suisun Bay, more particularly from the vicinity of the confluence of the Sacramento and San Joaquin rivers near Antioch west to the Carquinez Strait (Grinnell and Miller 1944). The Suisun Song Sparrow is divided into three separate populations by geographic barriers: North Suisun, South Suisun, and Southampton Bay (Marshall 1948a,b). The population in Southampton Marsh is cut off from the larger North Suisun population by steep dry grassy slopes and the steep banks of Carquinez Strait. There is no marsh vegetation east or west of this population and birds here are the least likely to receive any genetic influence from other populations. The population in southern Suisun Bay is cutoff from the larger northern population by a major expanse of water.

Historical Distribution

Prior to human alteration, the entire Suisun Marsh was a brackish tidal marsh. The Suisun Song Sparrow occurred throughout the area (Figure 1) wherever suitable brackish marsh vegetation occurred. There were three distinct populations, North Suisun, South Suisun, and Southampton Bay. The overall historical total tidal marsh habitat area is estimated to be 269 to 298 km^2 (104 to 115 mi^2) or 26960 to 29831 hectares (66,618 to 73,712 acres, Table 1). Those areas considered to be historically tidal include all the areas where bay mud is indicated on Suisun Marsh Protection Plan maps, as opposed to areas considered to be upland. At that time the marsh was filled with numerous unimpeded tidal sloughs with various types of brackish marsh vegetation appropriate for Suisun Song Sparrows.

Historical Abundance

The estimated number of pairs of Suisun Song Sparrows expected to have occupied the available historical brackish tidal marsh habitat at 2.6 pairs per hectare (1.05 pairs per acre) of unaltered habitat (Johnston 1956a,b, Walton 1975) is 69,949 to 77,398 (Table 1). This estimate of 2.6 pairs per hectare (1.05 pairs per acre) is used so that areas of brackish tidal marsh lacking vegetation preferred by Suisun Song Sparrows can be included in the overall estimation of numbers. During the breeding season, Suisun Song Sparrows occupy densely packed territories along the edges of sloughs and bays, leaving areas in between with densely packed vegetation unoccupied. Considering only density figures obtained during the breeding season will not accurately reflect the overall population throughout the remaining tidal marsh, since many portions of the habitat are unused (Walton 1975). The overall average number of pairs of the closely related San Pablo Bay subspecies (*M. m. samuelis*) population occupying a randomly selected 40.5 hectare (100 acre) study plot over a six year survey was 105 pairs, resulting in 2.6 pairs/hectare (1.05 pairs/acre) as an overall average (Johnston 1956a,b) for salt marsh Song Sparrows. This estimation takes into account areas of tidal marsh that are not used by salt marsh Song Sparrows. At this time, this population estimate is considered to be the best available scientific information and has been used in this document and by the petitioner to estimate Suisun Song Sparrow populations. When further information is available, these figures will be further refined.

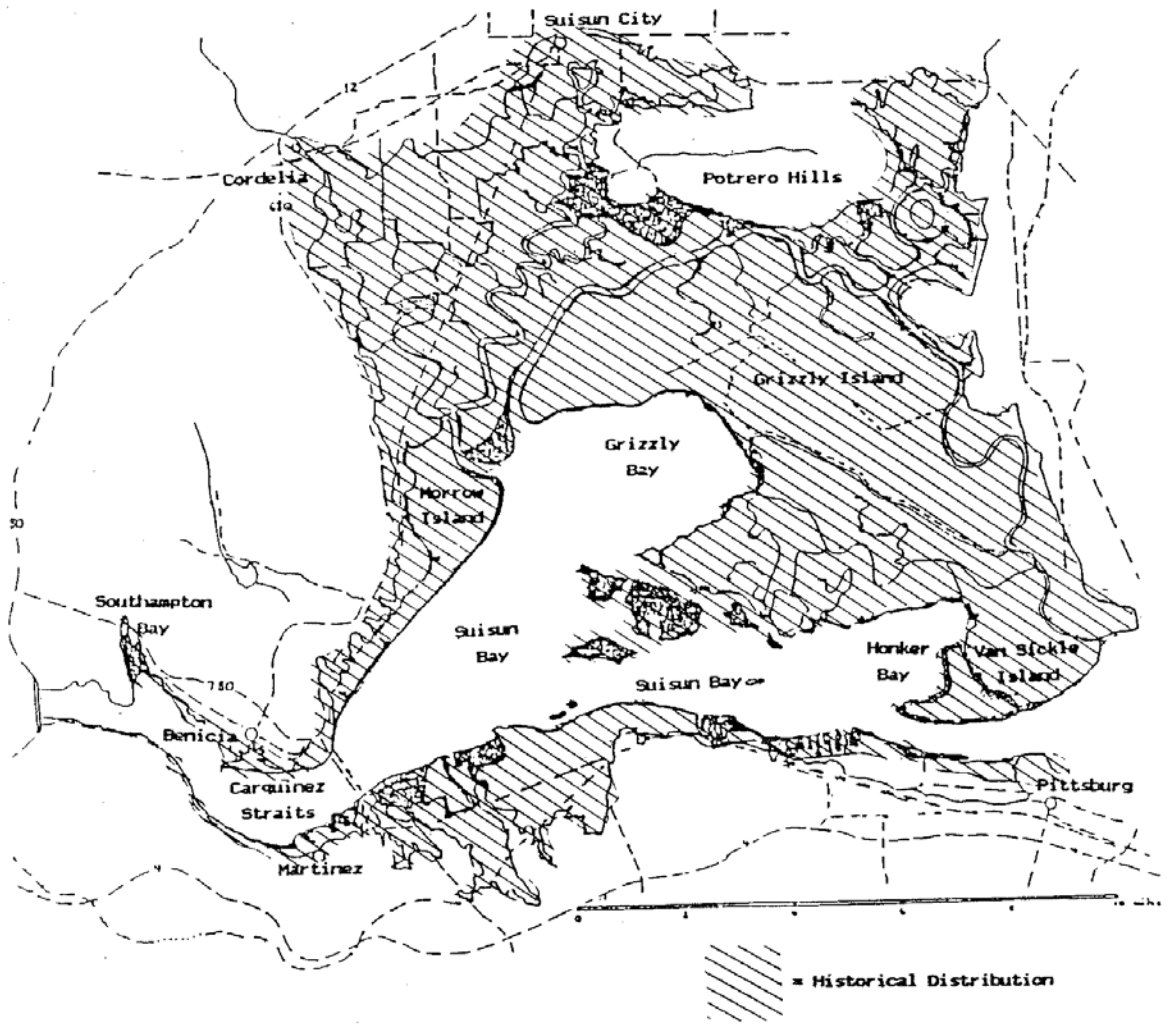

Figure 1. Historical Distribution of Suisun Song Sparrow based on original extent of tidal brackish marsh habitat in Suisun Marsh.

Table 1. Historical Distribution and Estimated Historical Abundance of Suisun Song Sparrows (based on Scientific Information provided in Petition, Published Literature, and Historical Maps).

LOCATION	ESTIMATED ACREAGE	ESTIMATED NO. PAIRS*
Southampton Bay	208 - 272	218 - 286
North Suisun	58,912 - 64,384	61,384 - 67,603
South Suisun	7,498 - 9,056	7,873 - 9,509
Totals	66,618 - 73,712 (104.1 - 115.2 mi^2)	69,949 - 77,398

* Based on average number of pairs of Salt Marsh Song Sparrows known to occupy unaltered brackish tidal marsh acreage: 1.05 pairs/acre (Johnston 1956a,b, Walton 1975).

Current Distribution

Tidal brackish marsh habitat has been reduced by an estimated 80 to 90% from what historically occurred. The Suisun Song Sparrow is currently confined to these remaining fragments of suitable habitat (Figure 2) that are still subject to daily tidal action outside of the levee system. These pockets are incompletely connected by narrow strips [0.9 to 2.7 meters (3 to 9 ft) wide] of tules and bulrush remaining along the outboard edges of levees bordering tidal sloughs. This estimate of existing tidal habitat was measured from aerial photographs using planimeters, and the result is that only about 2800 hectares (7,000 acres) remain (Table 2). These measurements do not include the narrow strips of tidal vegetation remaining along levees, as these areas cannot be considered optimal habitat, but are marginal. In addition, these strips are not continuous, and it is unknown how many have the potential to be occupied by breeding pairs of Suisun Song Sparrows. The larger fragments of remaining acreage occurring in South Suisun is considered highly degraded due to heavy industrialization, shoreline development and diking. Since these birds are restricted to tidal brackish marsh habitat, the current distribution of this remaining habitat is considered the same as the current distribution of the Suisun Song Sparrow.

Current Abundance

The most recent estimate of abundance indicates that fewer than 6,000 pairs of Suisun Song Sparrows still occupy suitable fragments of habitat in the Suisun Marsh (Table 2). This estimate is slightly lower than expected from considering the remaining amount of habitat due to the degraded condition of the tidal brackish marshes in South Suisun, where it is estimated that only one-third of the normal density of pairs can exist. Except for this difference, the same overall density estimate is used here as was used previously. This figure still applies in this case because remaining brackish tidal marsh fragments also include types of vegetation that are not used by Suisun Song Sparrows, presumably in the same proportions as originally occurred in the unaltered marsh. There are 13 known large isolated fragments of tidal brackish marsh habitat with unimpeded tidal flow, the largest containing about 1300 pairs, and the smallest containing about 20 pairs.

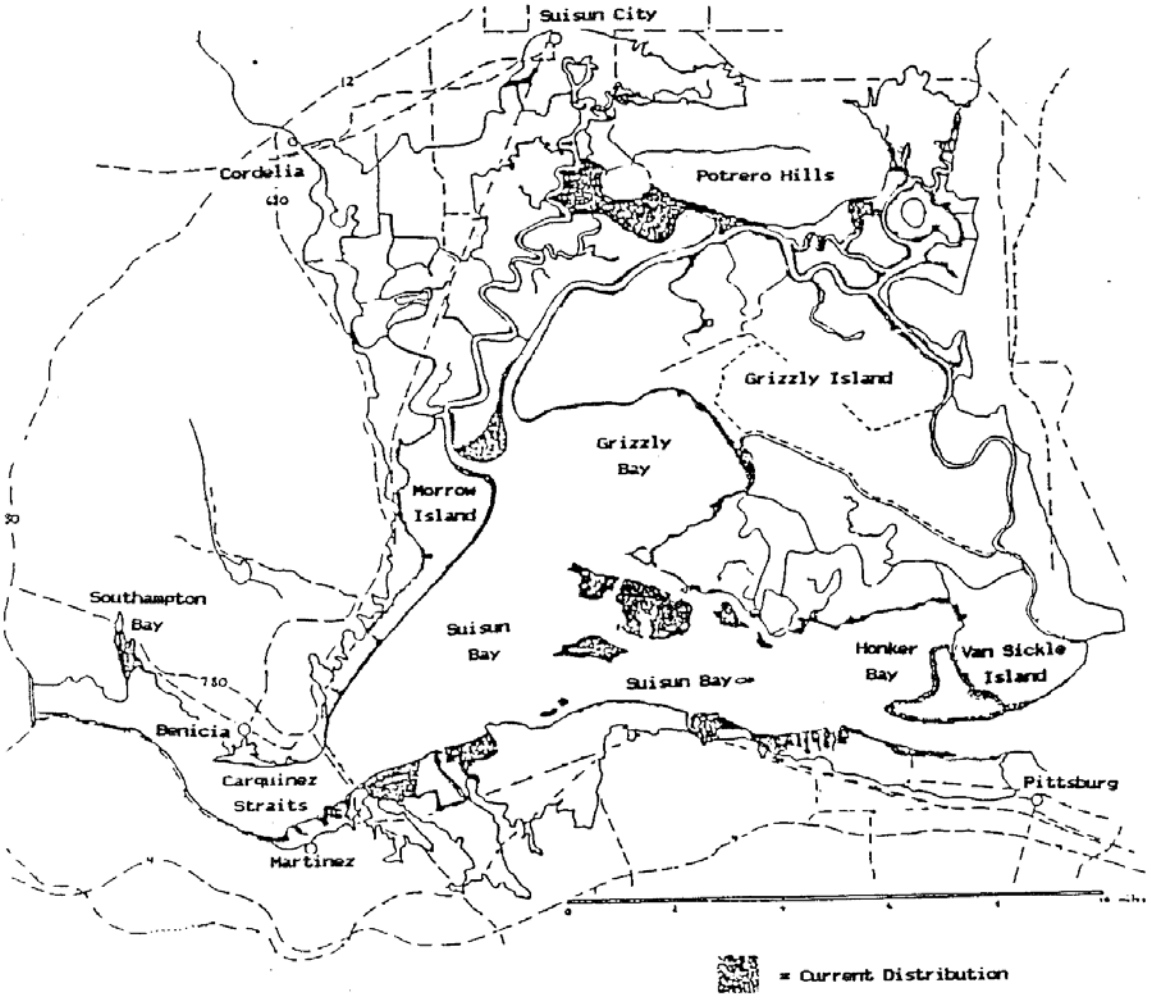

Figure 2. Current Distribution of Suisun Song Sparrow based on remaining tidal brackish marsh habitat in Suisun Marsh.

Table 2. Current Distribution and Abundance of Suisun Song Sparrows (based on remaining brackish tidal marsh vegetation indicated in recent aerial photographs).

AREA	LOCATION	ESTIMATED ACREAGE	ESTIMATED NO. PAIRS*
Southampton Bay	Total:	146	153
North Suisun:	Benicia Marsh	21	22
	Morrow Island Shore	191	200
	South Joice Island	372	391
	Peytonia Slough	262	275
	Cutoff Slough Marsh	1308	1373
	Nurse Slough Marsh	460	483
	Grizzly Bay Shore	412	433
	Suisun Cutoff Islands	813	854
	Chipps Island Marsh	991	1041
	Total:	4830	5072
South Suisun:	McAvoy	1156	405
	Avon	782	274
	Martinez to Crockett	110	38
	Total:	2048	717
	Overall Total:	7024	5942

* Same calculation as in Table 1, except for South Suisun, where numbers are estimated to be 1/3 of that expected due to habitat degradation.

Threats

Habitat Fragmentation

The major threat to the continued existence of the Suisun Song Sparrow is the severe fragmentation of brackish tidal marsh habitat that has occurred in and around the Suisun Marsh. The once vast brackish tidal marsh has been reduced to small fragments that are separated by dispersal barriers or only connected by very narrow strips of vegetation remaining along the banks of tidal sloughs. Gene flow between these fragments is thus either highly restricted or non-existent. Evidence indicating continued alteration since 1950, involving further diking, levee construction, channelizing and industrial development, is provided by 1980 photorevisions of 1950 U.S. Geological Survey 7.5' maps.

Suisun Song Sparrows are strictly tied to tidal brackish marsh vegetation, and typically disperse only a very short distance from their birth place. Once a territory is established, they remain there throughout their lifetime. When the tidal marsh was continuous, gene flow was unrestricted, allowing for optimal adaptation to naturally occurring environmental fluctuations. Gene flow throughout the population allowed the Suisun Song Sparrow to successfully

drink brackish water, to breed slightly earlier to avoid nest flooding by extreme high tides, and to eat large *Scirpus* seeds. These adaptations separate this subspecies behaviorally, physiologically, and geographically from nearby Song Sparrow subspecies. Thus, the Suisun Song Sparrow is endemic to Suisun Marsh.

The danger of fragmentation without possibility of gene exchange between populations is that small isolated populations are extremely vulnerable to local extinction, especially in the face of a local catastrophe. Once a small isolated population is extirpated, there is a limited amount of dispersal from other fragments and a very poor chance of naturally reestablishing a population at an isolated site. Some of this limited dispersal could occur along the narrow strips of brackish tidal vegetation remaining along the inner edges of channelized tidal sloughs. However, these strips of vegetation are not continuous between fragments and Suisun Song Sparrows are extremely sedentary. Wherever substantial vegetation gaps exist [more than 50 meters (164 ft), for example], dispersal is extremely restricted, especially since these birds are reluctant to move more that 10 meters (33 ft) from cover.

Another problem with small reproductively isolated populations is that there may not be enough genetic variability within an isolated gene pool to insure that the population can remain viable in the future. As the number of breeding adults successfully contributing genes to the next generation is decreased, overall genetic variability of the population and the ability to adapt to long-term environmental changes is decreased. To remain genetically viable, a healthy well-distributed population in suitably continuous (non-fragmented) habitat typically exists in the tens of thousands, as Suisun Song Sparrows did historically, not in the hundreds or thousands. Once these low levels are reached, continued viability is adversely affected.

At the present time, the largest fragment of remaining habitat is in Cutoff Slough Marsh, where an estimated 529 hectares (1308 acres) supports a well distributed population of about 1300 breeding pairs (Table 2). Population estimates for each of the twelve additional remaining fragments range from 22 to 1000 pairs, with an average of 381 pairs per fragment. Each of these remaining fragmented populations, including the largest one at Cutoff Slough, is already well below the level necessary to insure the continued viability of any of these populations. This seriously jeopardizes the continued existence of the Suisun Song Sparrow.

Toxicants

Areas in and around Suisun Bay are highly industrialized and its major channels are used for shipping, including oil tanker traffic, and there are several toxic waste dumps in the area, at Benicia, Martinez and Pittsburg. In addition, high levels of selenium have been found in diving ducks in Suisun Bay. This contaminant has concentrated in mud, invertebrates and vegetation, and subsequently ingested by these ducks through the food chain. The tidal areas of Suisun Marsh are directly susceptible to accidental toxic waste discharge and oil spills, as well as to long term concentration of contaminants.

Any chemicals discharged into nearby waters could be directly transported by the tides into the tidal brackish marsh areas occupied by Suisun Song Sparrows. A recent oil spill near Martinez along the south Suisun shore

resulted in the death of many large water birds, but the effect on any Suisun Song Sparrows in the area remains unknown. Also unknown is the effect of these toxic contaminants on the tidal marsh ecosystem. We do not know, for example, how the recent oil spill has affected the tidal marsh vegetation and food chain at Point Edith.

In general, little is known about the effect of toxic spills or contaminants on marsh passerines, such as the Suisun Song Sparrow, but there is no reason to believe that chemicals toxic to larger birds are not also toxic when ingested by small marsh birds, even those that do not swim in the water. Suisun Song Sparrows drink almost half their body weight in brackish tidal water each day, and they forage directly on the surface of the mud, which, along with the marsh vegetation, would be covered with oil or other toxic chemicals during ebb tide in the case of a spill. Thus, Suisun Song Sparrows would directly ingest toxic chemicals in the case of an accidental spill, which would result in outright death from poisoning, or longer term chronic effects that lower health and reproductive capability. They would also ingest contaminated invertebrates or seeds if the toxic chemical entered the food chain. During the breeding season parents would feed their nestlings food that was taken directly from the surface of contaminated mud or that already contained toxic chemicals. If toxic chemicals were taken up by the vegetation, the birds could ingest contaminates contained in seeds during other times of the year as well.

Since Song Sparrows and other marsh passerines are small-bodied, they are not usually included or accounted for during clean-up activities after a spill. They are simply missed, since they most likely would die in concealed areas at the base of tules and bulrush, and would not be floating with larger water birds in areas easily accessible to clean-up crews. In addition, passerine birds are typically not included in studies that assess food chain contamination in marsh situations. The effect of the most recent oil spill on Suisun Song Sparrows or the on the tidal marsh ecosystem in the vicinity of Martinez is still unknown.

Barring any evidence to the contrary, it must be assumed that toxic spills or food chain contaminants affecting the brackish tidal marsh of Suisun Bay could result in the severe reduction or elimination of Suisun Song Sparrows from one or more isolated fragments of remaining tidal brackish habitat. This potential catastrophe could directly affect the long term viability of the subspecies, especially since their sedentary behavior would preclude recolonization of the vacated habitat once it recovers.

Salinity Changes

The normal brackish condition of Suisun Marsh is directly attributable to the amount of freshwater outflow it receives from the Sacramento-San Joaquin Delta. This freshwater mixes with the saltwater transported on incoming tides through Carquinez Straits. The amount of freshwater outflow has already been reduced by 50% since historical times during years now considered normal. Water rights are currently under negotiation, with the aim of allowing as much fresh water as possible to be transported south while still maintaining healthy conditions in the Bay and Delta.

Suisun Song Sparrows are adapted to withstand short term alterations in brackish conditions, being able to subsist on pure saltwater for several days.

The vegetation they occupy in the brackish marsh is similarly adapted. However, should the water regime change drastically or permanently, there could be a large scale change in habitat. Should water become fresher, the Suisun Song Sparrow could face lowered reproductive rates, competition and genetic dilution from invading upland subspecies that can only drink freshwater. If the water becomes too salty, the brackish vegetation could change to saltwater marsh vegetation, which is not suitable, and the Suisun Song Sparrow would be faced with drinking full-strength saltwater, which they are not adapted to withstand over the long term.

If water rights decisions do not result in the maintenance of brackish tidal marsh and its associated vegetation in Suisun Marsh, the future maintenance of viable populations of Suisun Song Sparrows could be jeopardized. As these negotiations are not yet completed, the effect of the final decisions on the Suisun Song Sparrow cannot be anticipated. Enhancement of tidal brackish marsh should be included in the outcome in order to insure Suisun Song Sparrow viability.

Predation

Suisun Song Sparrows are normally subject to a high rate of mortality, about 43% per year for adults, and 80% for individuals during their first year of life. These normal survival rates for yearlings are barely sufficient for replacement of breeders under steady-state conditions. However, Suisun Song Sparrows are subject to additional heavy predation during the periods of extreme high tides, particularly those that occur during daylight hours in the winter. During these times the entire population is left clinging to the tips of vegetation remaining above the water, or on the tops of bare levees or dikes. Predation by diurnal raptors is high when all the individuals of the population are exposed in this manner.

Under normal circumstances, Suisun Song Sparrows can retreat to vegetation that is slightly upland for cover, but in the altered marsh, the highest ground is typically the bare tops of levees. In some areas of the marsh, vegetation has been allowed to grow on the sides of the levees, but in other cases it has not, and it is unknown just how widespread this practice has been in the vicinity of tidal marsh. In addition, levees and dikes must be physically maintained, and these activities may further alter and limit upland vegetation as well as brackish tidal marsh vegetation. Under these circumstances, isolated Suisun Song Sparrow populations could be threatened by severe reduction or elimination due to predation. When a small isolated population undergoes loss of viability or extirpation, the chances of recolonization are remote due to the sedentary nature of the subspecies.

Development

Although the tidal marsh habitat along the southern edge of Suisun Bay appears to be extensive on aerial photographs, in reality it is highly fragmented and degraded. The area is heavily industrialized, and Suisun Song Sparrows now occur in reduced numbers in five isolated sites that no longer are capable of gene exchange. As further industrialization and development occurs along the southern shore, habitat will be further degraded, and the potential is for ultimate loss of viability for the South Suisun population.

Industrial and residential development in other areas surrounding the marsh continues. Residential development in Benicia, Cordelia, and Suisun City is occurring to the west and north, and industrial development in Collinsville is occurring to the east. The cumulative effects of these further developments on the Suisun Song Sparrow and remaining tidal brackish marsh habitat will be generally indirect, but could include increased shipping traffic and higher potential for industrial pollution or spills, and increased human disturbance and predation by feral pets.

Current Management

Suisun Marsh Protection Plan

The Suisun Marsh Protection Plan (plan), as published by the San Francisco Bay Conservation and Development Commission (BCDC) in 1976, defines tidal areas in Suisun Marsh as public trust areas. These areas are generally waterward of the mean high tide line and BCDC exercises permit authority over State tidelands. In these areas, BCDC is mandated to review projects and issue permits only for developments consistent with the public trust. The State Lands Commission has primary responsibility for carrying out the management recommendations in the plan on tidelands owned by the State. The Suisun Resource Conservation District is responsible for improvement and maintenance of exterior levee systems as well as other water control facilities on the privately owned managed wetlands within the primary management area. Suisun Channel is designated as a navigable channel and maintained by the U.S. Army Corps of Engineers.

Findings of the Suisun Marsh Protection Plan indicate that *"the tidal marshes of the Suisun Marsh are an important wildlife habitat and also contribute to the maintenance of water quality in the San Francisco Bay"* and that *"some areas of lowland grassland and seasonal marsh ... are historic marshlands and could be restored as tidal marshes...."* Further policies stated in the plan include the following: *"The tidal marshes in the primary management area should be preserved...; where feasible, historic marshes should be returned to wetland status...as tidal marshes....; if, in the future, some of the managed wetlands are no longer needed for waterfowl hunting, they should also be restored as tidal marshes."* A general recommendation of the plan states that *"...it should be the policy of the State to protect, use with discretion, enhance, and where possible, restore the tidal marsh...."* and a priority of the land acquisition criteria states that *"land should be acquired in or adjacent to the Marsh for the purpose of restoring areas to tidal action ...."*

Although the general Plan repeatedly specifies that tidal marsh is important and should be restored, the uniqueness of this habitat type appears to have been lost when marsh management practices were described in the plan's Fish and Wildlife Element. In this element "tidal marsh" was lumped with "managed marsh" in a category called "permanent marsh," assuming that since the vegetation is similar, there is no appreciable difference in wildlife use. In addition, densities for Suisun Song Sparrows stated in the element were for high-density breeding concentrations in prime preferred habitat. These figures cannot be used to describe overall abundance for the entire tidal area of the marsh, since some types of vegetation in the tidal area is not used during the breeding season. Unfortunately, these assumptions were not changed in the more recent publication entitled "Plan for Protection for the Suisun

Marsh including Environmental Impact Report" (Department of Water Resources 1984), which addresses impacts of salinity changes and water quality control mechanisms.

This difference between tidal marsh and managed marsh is crucial for the Suisun Song Sparrow. As presently conducted, this species is not adequately considered in Suisun Marsh management. To our knowledge, no areas have been purposefully restored to tidal action in the Suisun Marsh Management Area. In the early 1980s, dikes were accidentally broken on Ryer Island (under jurisdiction of the U.S. Navy) and have not been repaired. Presently, this area may slowly be returning to tidal marsh habitat, and there are no known plans to repair the breaks. If the interior elevations of the island are such that exposure to tidal action is possible, it may be an important addition to existing tidal marsh. However, this will result in the maximum addition of only several hundred pairs of Suisun Song Sparrows if natural brackish tidal marsh habitat is successfully reestablished. In addition, there were initial plans in the Fish and Wildlife Element of the plan to restore the area east of the southeastern portion of Montezuma Slough to tidal marsh, but no known action has been taken on this proposal.

In summary, the plan to date has not directly resulted in any significant restoration of tidal habitat that would benefit the Suisun Song Sparrow. The implementation of the plan has specifically concentrated on the maintenance of managed marsh habitat. In addition, the plan does not encompass the southern shore of Suisun Bay or Southampton Bay Marsh, where populations of Suisun Song Sparrows exist. The plan also does not provide for jurisdiction over development in the vicinity of the Marsh, except as an advisory document. Residential development and further industrialization in the vicinity are under the jurisdiction and discretion of local planning agencies and decision making bodies.

Grizzly Island Wildlife Area Management Plan

The Grizzly Island Plan (Becker 1989) differentiates between permanent tidal marsh and managed seasonal marsh. The largest area of permanent tidal marsh in the Grizzly Island Wildlife Area is on the northeastern edge of the Joice Island Unit. This area, approximately 101 hectares (250 acres), potentially supports 263 pairs of Suisun Song Sparrows. In addition, there are strips of tidal marsh on the outside edges of exterior levees, but the extent of this vegetation is unknown. Undoubtedly, additional pairs of Suisun Song Sparrows may use these areas, and they are used as dispersal corridors for juveniles. In addition, riparian communities that may provide upland cover for these birds are found along the external levees.

One of the stated goals of the Grizzly Island Plan is to maintain the existing population of Suisun Song Sparrows. If they are listed, habitat preference studies and population surveys will be conducted to gain information necessary to guide habitat protection for these birds at Grizzly Island Wildlife Area. The objective of this management plan would be to protect tidal habitat. A more specific objective states that *"tidal marsh habitat and slough edge habitat will be protected on all management units. As exterior water control structures are installed, the tule fringe will be protected. As exterior levees are maintained sufficient outboard slope will be constructed to allow approximately 10 yards of tules to grow. In most years, exterior levee or pipe work is accomplished at two or more locations."* Implementation of these

plans will benefit Suisun Song Sparrows that occur in the Grizzly Island Management Area.

Peytonia Slough Ecological Reserve

This reserve contains 106 hectares (262 acres) of brackish marsh, presumably with tidal action. No surveys have been done in the area, but it is possible that Suisun Song Sparrows occur there, since brackish marsh vegetation is present. A brackish tidal marsh of this size, if not adversely affected by diking or channelizing, could theoretically support 275 breeding pairs. This area is most likely isolated from nearby populations. If narrow margins of suitable and continuous vegetation occur, there may be minimal gene flow with the population in the Cutoff Slough area. Further study is required in Peytonia Slough to determine whether or not it is providing suitable habitat for Suisun Song Sparrows.

Suisun Marsh Salinity Control Gates

The Control Gates located near the southeastern end of Montezuma Slough are specifically designed to help keep the marsh brackish. They operate by closing when flows are easterly in Montezuma Slough and opening when flows are moving westerly in the slough. This allows fresher water to enter the marsh from an upstream area near the confluence of the Sacramento and San Joaquin rivers, and then be retained in the system to mix with the saltier water entering through Grizzly Bay at the western end of Montezuma Slough. The open sloughs and tidal areas within the marsh are not deprived of tidal action when the gates are closed. Judging from the ability of the Suisun Song Sparrow to ingest brackish water of various salinities, and since tidal action is not limited, the Salinity Control Gates will probably not adversely impact the population as long as there is no change in brackish tidal marsh vegetation. On the other hand, since these tidal gates do not affect the salinity regimes of Suisun Bay, Grizzly Bay, Honker Bay, Suisun Slough, the islands near Suisun Cutoff or the south Suisun shoreline, they will be of no benefit to the Suisun Song Sparrow populations in these areas.

ALTERNATIVES TO THE PETITIONED ACTION

If the Commission should choose not to list the Suisun Song Sparrow, it is our opinion that this bird would be deprived of protection provided through recognition and formal consultation available to a listed species. When a species is listed as Threatened or Endangered, a higher degree of urgency is mandated, and protection and recovery receives more attention from the Department and other agencies than does a non-listed species.

In the absence of listing, it would be possible to devise a management plan for this species after further study. However, this Departmental status review indicates that the future existence of this species is already seriously threatened. Despite good intentions on the part of the Department and the Commission, promises of management and protection for a non-listed species do not have the weight of law behind them, and thus seldom receive high priority in the eyes of other agencies, especially in these times of limited funding. Without the benefits of listing and the cooperation of other agencies in preservation and recovery actions, the species could decline

further until their populations are no longer viable, and they will no longer be able to exist in perpetuity. Eventually extinction could occur.

Although the petitioner has requested listing of the Suisun Song Sparrow as Endangered, the Department has made the recommendation and the Commission has the option to list this bird as Threatened instead. Under this option, the Suisun Song Sparrow would receive the same special consideration and protection under the California Endangered Species Act (CESA) and the California Environmental Quality Act (CEQA) as if it were listed as Endangered. This Departmental status review indicates that the continued existence of the Suisun Song Sparrow is seriously threatened throughout its range, and that this alternative is appropriate.

PROTECTIONS RESULTING FROM LISTING

If listed, the Suisun Song Sparrow will receive protection from take during development activities subject to CEQA and be subject to formal consultation requirements under CESA. They will also be eligible for the allocation of resources by government agencies to provide protection and recovery. During the CEQA environmental review process listed species receive special consideration, and protection and mitigation measures can be implemented as terms of project approval. Species that are not listed do not readily receive protection. The status of listing provides a species with recognition by lead agencies and the public, and significantly greater consideration is given to the Department's recommendations resulting from project environmental review.

Listing this species increases the likelihood that State and Federal land and resource management agencies will allocate funds and manpower towards protection and recovery actions that benefit the Suisun Song Sparrow. With limited funding and a growing list of Threatened and Endangered Species, priority has been and will continue to be given to species that are listed. Those that are not listed, although considered to be of concern, are rarely given serious consideration under these circumstances.

ECONOMIC CONSIDERATIONS

Designation of the Suisun Song Sparrow as Threatened will subject it to CESA and CEQA. These acts would prohibit its taking and possession except as may be permitted by the Department, and subject it to formal consultation procedures. Listed status would not necessarily result in any significant adverse economic effect on small businesses or significant cost to private persons or entities. CEQA presently requires local governments and private applicants undertaking projects to consider *de facto* Endangered species to be subject to the same requirements under CEQA as though they were already listed by the Commission in Section 670.2 (CEQA Guidelines, Section 15380, CAC). The Suisun Song Sparrow has qualified for protection under CEQA Guidelines Section 15380 for several years.

Required mitigation as a result of lead agency actions under CESA and CEQA, whether or not the species is listed by the Commission, may increase the cost of a project. Such costs may include, but are not limited to, development of

management plans, transplanting or establishing new populations, purchasing or restoring additional habitat, and long-term monitoring of mitigation sites. Project modification to avoid impacts may be a less costly alternative than implementing required mitigation. The total expenses incurred in hiring consultants, preparing management plans, transplanting and maintenance activities, and long-term monitoring may be more costly than setting aside tidal brackish marsh habitat for the bird. Lead agencies may also require additional measures to be employed should the mitigation project fail, resulting in additional expenditures of funds by the project proponent.

Listing of the Suisun Song Sparrow as Threatened could result in additional expenditures of funds for wetland enhancement by the Department and other pertinent agencies. Restoration of tidal brackish marsh habitat may be a necessary recovery action for this species.

A potential economic benefit of listing for the local economy and the Department could result from viewing Threatened and Endangered wildlife. Persons interested in such activities would spend money in local communities for food and lodging and there could be an increase in sale of daily passes at Grizzly Island Wildlife Area. This bird could be included in wildlife interpretation programs and thus contribute to public education about Threatened and Endangered species. Increased public education could result in increased contributions to the Income Tax Check-off program, which would in turn provide further funding for management and recovery activities for all listed species.

Further economic considerations will be discussed as part of the regulatory process should the Commission find that listing is appropriate.

CONCLUSIONS

Based on this status review of available scientific information, we conclude that the Suisun Song Sparrow is seriously threatened throughout its range due to loss of habitat, change of habitat, habitat fragmentation, loss of genetic viability, danger of catastrophic toxic spills or environmental contamination, and predation. This species has declined as a result of extensive alteration of the tidal brackish marshes that historically extended throughout Suisun Marsh. This bird is totally endemic to Suisun Marsh, and is now restricted to isolated tidal fragments and thin strips of remaining habitat along the inside edges of tidal sloughs. It is completely dependent on and adapted to tidal brackish marsh, and does not occupy managed marsh areas. The extreme fragmentation of its range has resulted in small isolated populations with little or no gene flow between them. These isolated populations are highly vulnerable to extirpation. As any one population is extirpated, there is little possibility of natural recolonization of the area due to the extremely sedentary behavior of this species. Severe population fragmentation lowers the overall viability of the population, and under these conditions it cannot be expected to survive over the long-term. In our professional judgment, the Suisun Song Sparrow qualifies for listing as Threatened under the California Endangered Species Act.

RECOMMENDATIONS

Petitioned Action

1. The Commission should find that the petitioned action that is warranted is for the status of State Threatened.

2. The Commission should publish notice of its intent to amend Title 14 CCR 670.5 to add the Suisun Song Sparrow (*Melospiza melodia maxillaris*) to its list of Threatened and Endangered Species.

Recovery and Management Actions

The Department's objective is the protection of a sufficient number of Suisun Song Sparrows in permanently protected sites to insure their long-term survival in their native habitat and range. In order to achieve recovery, a predetermined number of populations must be protected, monitored, and shown to be self-sustaining. At the successful conclusion of a standardized monitoring program, the Department will reexamine the status of the Suisun Song Sparrow. When, in the Department's judgment, recovery goals and reclassification criteria have been met, it will make recommendations to the Commission regarding delisting this species.

In order to achieve management and recovery objectives, the following actions should be taken:

1. Conduct a vegetation survey of all remaining brackish tidal marsh habitat to determine the extent of remaining suitable vegetation within the historic range of the Suisun Song Sparrow.

2. Conduct extensive surveys during the breeding season in all remaining tidal habitat and other selected habitats throughout the historic range of the Suisun Song Sparrow to determine the number of breeding pairs and the locations of all isolated population fragments.

3. Undertake a population viability analysis for the Suisun Song Sparrow.

4. Continue or establish the interagency coordination and commitment necessary to minimize continued loss and deterioration of Suisun Song Sparrow habitat and ensure the preservation of habitat deemed essential to maintaining the species in perpetuity.

5. Whenever possible, increase the outboard width of levees to 9 meters (30 ft) to establish brackish tidal marsh vegetation.

6. Encourage the growth of upland vegetation on the banks of levees to provide upland cover during high tides.

7. Establish and protect dispersal corridors of suitable tidal brackish marsh along the banks of tidal sloughs to allow for increased gene flow between genetically isolated populations. An overall goal in this situation would be to physically eliminate isolation of fragmented populations by

developing connecting habitat through which dispersing birds can move and establish territories.

8. Maintenance activities should be conducted to minimize disturbance to tidal brackish marsh vegetation, and should not disturb breeding adults.

9. Consideration should be given to restoration of tidal habitat in appropriate areas whenever possible, with particular emphasis on expanding existing fragments of habitat.

10. Evaluate the possibility of intensive management activities including the transfer of eggs and/or young between nearby isolated fragments to facilitate gene flow.

11. A recovery planning team should be established and a management plan for the species should be developed and implemented.

12. Tidal marsh protection areas of a size sufficient to maintain self-sustaining populations of the Suisun Song Sparrow should be established. Appropriate habitat should be purchased and restored if necessary to accomplish this goal.

LITERATURE

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Appendix A: Public Notice and List of Interested Parties Notified by the Department.

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
P.O. BOX 944209
SACRAMENTO, CALIFORNIA 95814-2090

PUBLIC NOTICE

TO WHOM IT MAY CONCERN:

Pursuant to Section 2074.4 of the California Fish and Game Code (FGC), **NOTICE IS HEREBY GIVEN** that on **August 31, 1988** the California Fish and Game Commission accepted a petition from **Dr. L. Richard Mewaldt** to amend the official state list of Endangered and Threatened species (Section 670.2, 670.5, Title 14, California Code of Regulations) as follows:

Species	Proposal
Suisun song sparrow (*Melospiza melodia maxillaris*)	**List as Endangered**

The California Endangered Species Act (FGC, Chapter 1.5, Section 2050 et seq.) requires that the Department of Fish and Game notify affected and interested parties that the Commission has accepted the petition for the purpose of receiving information and comments that will aid in evaluating the petition and determining whether or not the above proposal should be adopted by the Commission. If the above proposal includes adding a species to the list as Endangered or Threatened, the Commission's action has resulted in this species receiving the interim designation of "Candidate species." The Department has 12 months to review the petition, evaluate the available information and report back to the Commission whether the petitioned action is warranted (FGC 2074.6). The Department's recommendation must be based on the best scientific information available to the Department. Therefore,

NOTICE IS FURTHER GIVEN that anyone with data or comments on the taxonomic status, ecology, biology, life history, management recommendations, distribution, abundance, threats, habitat that may be essential for the species or other factors related to the status of the above species, is hereby requested to provide such data or comments to:

Nongame-Heritage Program
California Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Responses received by **April 1, 1989** will be included in the Department's final report to the Fish and Game Commission. If the Department concludes that the petitioned action is warranted, it will recommend that the Commission adopt the above proposal. If the Department concludes that the petitioned action is not warranted, it will recommend that the Commission not adopt the proposal. (If the petitioned action is to list a species as Endangered or Threatened and the Commission accepts the Department's recommendation to not adopt the proposal, the species will lose its

Candidate status.) Following receipt of the Department's report, the Commission will allow a 45-day public comment period prior to taking any action on the Department's recommendation.

NOTICE IS FURTHER GIVEN that any species above proposed to be added to the State list as Endangered or Threatened is a "Candidate species" pursuant to Section 2074.2 (FGC) and, pursuant to Section 2085 (FGC), may not be taken or possessed except as provided by Section 2080, et seq. of the Fish and Game Code, or other applicable statutes.

for Stephen J. Nicola
Acting Program Manager
Nongame-Heritage Program

List of parties receiving the Suisun Song Sparrow Public Notice, including newspapers where Legal Notices were published:

Mr. Tim Egan, President
California Waterfowl Association
3840 Rosin Ct, Ste 200
Sacramento, CA 95834

Mr. Leland Lehman, President
Suisun Resource Conservation Dist.
PO Box 426
Suisun, CA 94585

Napa/Solano Chapt of the Audubon Society
141 Terrybrook Ln
Vallejo, CA 94590

Mr. Alan Pendleton, Executive Dir.
San Francisco Bay Conservation &
Development Commission
30 Van Ness Av, Ste 2011
San Francisco, CA 94102-6080

Mr. George Barnes
Calif. Department of Water Resources
3251 S St
Sacramento, CA 95816

Mr. Rick Coleman
San Francisco Bay Nat'l Wildlife Refuge
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Newark, CA 94560

Ms. Monique Liquori, Exec. Dir.
Suisun Marsh Natural History Assoc.
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County of Solano
Dept of Environmental Management
580 Texas St
Fairfield, CA 94553

City of Fairfield
Dept of Environmental Affairs
1000 Webster St
Fairfield, CA 94533

City of Suisun City
Planning Director
701 Cedar St
Suisun, CA 94585

City of Benicia
Planning Dept
250 East L St
Benicia, CA 94510

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David N. Kennedy, Director
Department of Water Resources
PO Box 942836
Sacramento, CA 94236-0001

Contra Costa County
Board of Supervisors
651 Pine St Rm 106
Martinez, CA 94553

Sacramento County
Board of Supervisors
700 H St Rm 2450
Sacramento, CA 95814-1280

Solano County
Board of Supervisors
Solano County Courthouse
Fairfield, CA 94533

Art Feinstein
Golden Gate Audubon Society
590 Texas St
San Francisco, CA 94107

Lynn Tennefoss
Santa Clara Valley Audubon Society
415 Cambridge Ste 21
Palo Alto, CA 94306

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Elizabeth Wright, Executive Secretary
California Wildlife Federation
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Dr. Gerald H. Meral, Executive Director
Planning and Conservation League
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Jerry Bogges, President
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San Francisco Bay Chapter
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San Francisco, CA 94123

Lawrence Downing, President
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Sally Kabisch, Representative
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Director
Museum of Vertebrate Zoology
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Moraga, CA 94575

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Dept. of Biology & Natural Resources
University of California, Davis
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Sacramento Bee
PO Box 15779
Sacramento, CA 95852

Sacramento Union
PO Box 2711
Sacramento, CA 95812

Woodland Daily Democrat
PO Box 730
Woodland, CA 95695

Davis Enterprise
PO Box 1470
Davis, CA 95617

San Francisco Chronicle

Oakland Tribune

Newspapers in cities of
Napa, Fairfield, San Jose, Vallejo

William M. Geyer
Consulting and Advocacy
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1029 K Street, Suite 33
Sacramento, CA 95814

List of parties receiving a copy of the the Suisun Song Sparrow petition for review:

Mr. Alan Pendleton, Executive Dir.
San Francisco Bay Conservation &
Development Commission
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San Francisco, CA 94102-6080

Mr. Rick Coleman
San Francisco Bay Nat'l Wildlife Refuge
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Newark, CA 94560

Gail Kobetich
U.S. Fish and Wildlife Service
California Endangered Species Office
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STATE OF CALIFORNIA—THE RESOURCES AGENCY

GEORGE DEUKMEJIAN, *Governor*

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
P.O. BOX 944209
SACRAMENTO, CALIFORNIA 95814-2090
(916) 324-0561

February 22, 1989

The Daily Republic
PO Box 47
Fairfield, CA 94533

ATTENTION: LEGAL NOTICES

Please publish the enclosed Public Notice regarding the **Suisun song sparrow** on any one day during the week of **February 26 through March 4, 1989.** Please send an invoice and proof of publication to:

Paul Kelly
Endangered Species Coordinator
California Department of Fish and Game
Nongame-Heritage Program
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Thank you.

Sincerely,

Paul R. Kelly

Paul R. Kelly
Endangered Species Act Coordinator
Nongame-Heritage Program

PRK:jma

Enclosure

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
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SACRAMENTO, CALIFORNIA 95814-2090
(916) 324-0561

February 22, 1989

The Pittsburg Post Dispatch
PO Box 152
Pittsburg, CA 94565

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Paul Kelly
Endangered Species Coordinator
California Department of Fish and Game
Nongame-Heritage Program
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Thank you.

Sincerely,

Paul R. Kelly
Endangered Species Act Coordinator
Nongame-Heritage Program

PRK:jma

Enclosure

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
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SACRAMENTO, CALIFORNIA 95814-2090
(916) 324-0561

February 22, 1989

The Vallejo Times Herald
PO Box 3188
Vallejo, CA 94590

ATTENTION: LEGAL NOTICES

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Paul Kelly
Endangered Species Coordinator
California Department of Fish and Game
Nongame-Heritage Program
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Thank you.

Sincerely,

Paul R. Kelly

Paul R. Kelly
Endangered Species Act Coordinator
Nongame-Heritage Program

PRK:jma

Enclosure

ATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF FISH AND GAME
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SACRAMENTO, CALIFORNIA 95814-2090
(916) 324-0561

February 22, 1989

The Sacramento Bee
PO Box 15779
Sacramento, CA 95852

ATTENTION: LEGAL NOTICES

Please publish the enclosed Public Notice regarding the **Suisun song sparrow** on any one day during the week of **February 26 through March 4, 1989.** Please send an invoice and proof of publication to:

Paul Kelly
Endangered Species Coordinator
California Department of Fish and Game
Nongame-Heritage Program
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Thank you.

Sincerely,

Paul R. Kelly

Paul R. Kelly
Endangered Species Act Coordinator
Nongame-Heritage Program

PRK:jma

Enclosure

STATE OF CALIFORNIA—THE RESOURCES AGENCY

GEORGE DEUKMEJIAN, *Governor*

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
P.O. BOX 944209
SACRAMENTO, CALIFORNIA 95814-2090
(916) 324-0561

February 22, 1989

The San Francisco Chronicle
901 Mission Street
San Francisco, CA 94103

ATTENTION: LEGAL NOTICES

Please publish the enclosed Public Notices regarding the **Suisun song sparrow and Lessingia germanorum var. germanorum** on any one day during the week of **February 26 through March 4, 1989.** Please send an invoice and proof of publication to:

Paul Kelly
Endangered Species Coordinator
California Department of Fish and Game
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Sacramento, CA 95814

Thank you.

Sincerely,

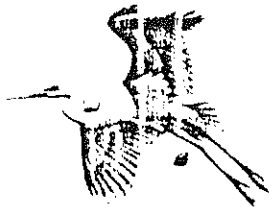
Paul R. Kelly
Endangered Species Act Coordinator
Nongame-Heritage Program

PRK:jma

Enclosures

Appendix B: Responses to Public Comments

1. National Audubon Society
2. Defenders of Wildlife
3. Bay Planning Coalition
4. Suisun Resource Conservation District
5. California Waterfowl Association
6. Point Reyes Bird Observatory



National Audubon Society

Western Regional Office
555 AUDUBON PLACE, SACRAMENTO, CA 95825 (916) 481-5332

23 August 1988

Harold J. Cribbs, Executive Director
California Fish and Game Commission
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Dear Hal:

The National Audubon Society has reviewed the materials generated by the Department of Fish and Game relative to the listing of the Tipton kangaroo rat and the bank swallow. We have also reviewed the petition submitted in support of listing the Suisun song sparrow.

We support the recommendations of the petitions concerning the listing of these three species. It is in the best interests of the management of these beleaguered animals to extend the appropriate protections afforded by listing as threatened or endangered.

Sincerely,

Glenn Olson

GLENN OLSON
Vice President

GO/ll

Response to **National Audubon Society**:

Comments noted, no response necessary.

Defenders
OF WILDLIFE

January 31, 1989

Stephen J. Nicola
Acting Program Manager
Nongame-Heritage Program
Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Dear Steve:

Defenders of Wildlife submits this letter in response to your "Public Notice" requesting comments on Dr. L. Richard Mewaldt's petition to list the Suisun song sparrow as an endangered species.

We support this petition, and we urge the Department to make a favorable listing recommendation to the Commission.

We believe that the Suisun song sparrow deserves and needs endangered species classification. For example, the U.S. Bureau of Reclamation has released three water contracting Draft Environmental Impact Statements which could lead to significant changes in the hydrology of Suisun Marsh and the Delta. The Bureau's proposed actions would commit significant additional fresh water for agricultural, industrial, and municipal uses. These future fresh water diversions could pose substantial, cumulative adverse impacts on aquatic habitats.

Please support this petition and urge the Commission to approve this endangered species listing.

Thank you very much for considering our views.

Sincerely,

Richard Spotts
California Representative
Defenders of Wildlife

RS/js

cc: Paul Kelly

CALIFORNIA OFFICE: 5604 ROSEDALE WAY, SACRAMENTO, CALIFORNIA 95822 • (916) 442-6386
NATIONAL OFFICE: 1244 NINETEENTH STREET, NW • WASHINGTON, DC 20036 • (202) 659-9510

Response to **Defenders of Wildlife**:

We agree that the future additional diversion of freshwater to the south could adversely impact the water quality of the Suisun Marsh area by further reducing Delta freshwater outflow. This could result in a reduction of brackish tidal marsh and an increase in saltwater tidal marsh, due to increased salinity. This would adversely impact the Suisun Song Sparrow by directly reducing brackish marsh vegetation and making the water too salty for the species to drink. In order to preserve this species and its habitat, the water in Suisun Bay and Grizzly Bay must remain brackish. Salinity in Suisun Bay is a direct result of the freshwater Delta outflow mixing with saltwater coming from the ocean through Carquinez Straits. Salinity control structures and tide gates may help maintain brackish conditions in the inner portions of the marsh, but they have little or no effect on Suisun Bay salinity. Should the water rights currently being negotiated result in adverse salinity changes, isolated pockets of vegetation and the habitat strips lining the inner edges of these bays and sloughs would be lost, and the Suisun Song Sparrow would be driven closer to extinction.

BAY PLANNING COALITION

666 HOWARD STREET, SUITE 301 SAN FRANCISCO, CALIFORNIA 94105 (415) 543-3830

April 28, 1989

Mr. Paul Jensen
Deputy Director
California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

Subject: Opposition to petition to list the Suisun Song Sparrow as endangered

Dear Mr. Jensen,

After reviewing the above-referenced petition from the Coyote Creek Riparian Station with the biological and ecological consultant members of our organization, there does not appear to be enough scientific evidence to support listing the Suisun Song Sparrow as endangered at the present time.

We respectfully request that the Department examine the technical information in the petition in more depth to determine its scientific merit and its breadth about the above-referenced species.

We believe the wildlife resources of the tidal marshes of Suisun Bay and marsh are adequately regulated and protected by the San Francisco Bay Conservation and Development Commission under the Suisun Marsh Preservation Act adopted by the state legislature in 1977.

Sincerely yours,

Ellen Johnck

Ellen Johnck
Executive Director

cc: Hal Cribbs, Executive Director, California Fish and Game Commission
Steven Kostka, California Department of Fish and Game

Response to **Bay Planning Coalition**:

We have examined the technical information provided in the petition in depth and have reviewed all scientific information regarding the Suisun Song Sparrow and closely related species available in published ornithological literature. We have also reviewed agency documents relating to the Suisun Marsh and current literature regarding biological conservation, population viability, and extinction processes. Although some of the statements made in the petition were inaccurate (involving the Salinity Control Gates and the Salt-marsh Harvest mouse), this does not change the biology of the species in question, especially in light of the additional available scientific information we reviewed. In our professional judgment, the Suisun Song Sparrow is seriously threatened throughout all of its range.

Although the Suisun Marsh Preservation Act repeatedly stressed the importance of tidal brackish marsh, and in fact called for its restoration, the major focus of plan implementation has been towards managed marsh. This de-emphasis of tidal marsh began in the Fish and Wildlife Element of the Plan, when tidal marsh and managed marsh were lumped into a category called "permanent marsh" and mapped that way. In fact, to our knowledge, no tidal marsh restoration has been undertaken since the implementation of the Plan. In addition, the Act does not include Southampton Bay or the southern shore of Suisun Bay, where industrial development is extensive. It is also powerless against toxic spills and the genetic effects of fragmentation and isolation. We do not believe that the Suisun Marsh Preservation Act, by itself, adequately protects the Suisun Song Sparrow from extinction.

RECEIVED MAY 2 3 1989

May 19, 1989

Mr. Stephen J. Nicola
Acting Program Manager
Nongame-Heritage Program
Department of Fish and Game
1416 Ninth Street, Twelfth Floor
Sacramento, California 95814

SUBJECT: Petition to List Suisun Song Sparrow as Endangered

Dear Mr. Nicola:

I would first like to apologize for the tardiness of our response to the referenced subject. Although copies of documents now in my possession indicate the petition was initiated in May 1988, our District was unaware of it until April 1989, even though a memo dated December 30, 1988 from the Department of Fish and Game, Region 3, indicated we should have been notified. As the primary local agency with water and habitat management responsibility in the Suisun Marsh, my Board of Directors is concerned that we were not made aware of this petition sooner.

Our District is charged with a state mandate (Suisun Marsh Preservation Act) to ensure sound management practices on privately-owned, managed wetlands in the Suisun Marsh. State law recognizes the vital importance of the Marsh for wintering waterfowl and other wildlife species. Just as the petitioners claim habitat loss for the sparrow, it must be recognized that California now has less than 10% of its historic wetlands, and the Suisun Marsh represents about 15% of what's left. As California winters most of the Pacific Flyway waterfowl, we must manage more intensively with what we have left.

An integral part of the continued management effort for habitat diversity is the maintenance of existing levees. We do not contemplate construction of new levees to remove areas from tidal action; indeed, such action is already precluded by the regulatory authority of a number of agencies. The contention of the petitioners that sparrow habitat (tidal marsh) will be lost through the building of levees is incorrect.

The 230 miles of exterior levee do indeed need periodic repair and maintenance; this is a recognized, approved activity by the authorized permitting agencies. In fact, Marsh landowners recognize the benefit of the tidal tule berm from the standpoint of levee protection from wind and wave erosion. Extra effort is made to avoid and protect these berms during maintenance activities. In fact, much of the Marsh levee system already accommodates a berm of at least the "magical" 10 yards. Where such a berm does not exist, I'm sure the landowner would be overjoyed by the development of one if it were feasible from an engineering standpoint and if someone else (the petitioners?) were financially responsible. As it is, the private landowner has historically borne (by choice) the brunt of financial responsibility for habitat maintenance, development, and enhancement in the Marsh. They do this for the year-round enjoyment of the waterfowl resource.

The petitioner seems to believe that the DWR-Montezuma Control Structure is in some way going to reduce tidal marsh habitat, and that Nurse and Cutoff Sloughs would be "lost." This is incorrect. The Control Structure maintains tidal action in existing

SUISUN RESOURCE
CONSERVATION DISTRICT
P.O. Box 426
Suisun, CA 94585
(707) 425-9302

channels while providing improved water quality through the Marsh, which benefits tidal marsh as well as managed wetlands. The petitioner does not seem to understand the true nature of the State's existing and proposed facilities for water transport in the Marsh, and to maintain it as a brackish marsh.

I note that DFG staff have already made more specific comments about the text of the petition which I won't reiterate, although with which we do concur. However, I am somewhat amused, and more disturbed, by the petitioner's contention (page 12-13) that marsh productivity is better measured by counting Song Sparrows than monitoring water quality, seed production, and habitat diversity. There is even a back-handed jab at the hunting community by belittling the importance of lead shot studies and waterfowl kill records. Am I to presume all of our research efforts out here are useless?

Scanning the petition further, I note (page 19) the capture of five song sparrows at Roaring River Slough, which is a man-made facility and part of the DWR project. Maybe we are not negatively impacting the sparrow by current activities. There is further discussion of seed producing plants utilized by the sparrow which just happen to be abundant in the Marsh as a result of management activity. I would also like to see justification for the contention that bulrush seed passes unused through a duck's digestive tract; if nothing else, it is used as a source of grit.

Further, if Figure 25 (depicting a map of critical habitat of the Suisun Song Sparrow) were correct, then some managed wetland is also critical habitat. Indeed, the petitioner has not limited himself to tidal marsh on the map.

In closing, there is no evidence to indicate recent habitat or population declines, nor is there clear potential for such. The petition does not accurately depict existing regulatory controls, wetland management activities, or objectives of the State water control facilities. The SRCD Board of Directors does not believe the Suisun Song Sparrow should be listed.

In fact, if such action should occur, the impact and implications could destroy our ability to continue to manage the resource as prescribed by state law. The suggestion that the Suisun Marsh be returned to tidal action to increase song sparrow habitat is wholly unacceptable. It would be analogous to the waterfowl community demanding that all development and agriculture in the Sacramento/San Joaquin valleys be surrendered and returned to wetland status for ducks.

Sincerely,

/s/

MICHAEL D. LEWIS
Manager

MDL:slw
cc: Pete Bontadelli, Director, DFG
Red Hunt, Chief, Wildlife Management Branch, DFG
Brian Hunter, Region 3 Manager, DFG

Response to **Suisun Resource Conservation District:**

We have no information to indicate that the Suisun Song Sparrow occupies managed marsh. It is endemic and appears to be dependent on the tidal brackish marsh habitat that was originally vast and continuous throughout the Suisun Marsh. The Suisun Marsh Preservation Act repeatedly points out that tidal brackish marsh is important, must be preserved, and must be restored whenever possible. This mandate of the Act has been generally overlooked in the effort to maximize the amount of managed marsh, and no brackish tidal marsh habitat has yet been restored under the Act.

We realize that construction of new levees is precluded by current regulations and agree that the petitioner was indeed wrong in the statement that new levee construction would remove further tidal habitat. However, it must be emphasized that massive levee construction starting in the late 1800s has already removed substantial (80 to 90%) Suisun Song Sparrow habitat so that the population is severely fragmented and vulnerable to local extirpation as a result. Some of this levee construction, channelization and industrialization has occurred since the 1950's, as indicated on 1980 photorevised USGS 7.5' series maps.

We also realize that existing levees must be maintained and support agency and private landowner efforts to avoid and protect tule berms along their exteriors. However, providing 9 meters (30 ft) of tules along these levees is a measure intended to minimize complete isolation of small populations. Provision of continuous berms is a move toward recovery, but not the complete answer to preserving this endemic species. The 9 meter width is advisory, so that these areas can be used as avenues of dispersal by young of the year. However, wherever there are gaps in this tule berm, they can be dispersal barriers. There is a need to do a complete survey of all levees subject to tidal action to find out just where these corridors exist, and where the gaps are so that efforts can be made to close these gaps at the most important sites.

We agree that the petitioner was incorrect in his interpretation of the effects of the Montezuma Slough Salinity Control Gates. These gates do not remove any existing tidal action, and may improve the brackish characteristic of the water in the upper interior tidal portions of the marsh. However, these gates have no effect on the water quality of Suisun and Grizzly bays or Suisun Slough, and thus do little to protect brackish tidal marsh for the Suisun Song Sparrow.

We agree that counting Song Sparrows is not a way to measure the productivity of managed marsh, since they do not occur there. However, if the productivity of brackish tidal marsh is in question, numbers of Suisun Song Sparrows would be a very good indicator.

The five Song Sparrows you referred to were captured at the mouth of Roaring River Slough in October, after all territorial and breeding activity has ceased, and the birds move in small, restless, foraging and dispersing flocks. Since tidal action still occurs outside the tidal gates at either end of Roaring River Slough, it is not surprising that they were found there. However, unless there is appropriate habitat and breeding pairs present during spring, claims that adequate habitat has been provided can not be

substantiated. It is true that seed producing plants used by the sparrow are in fact present in managed areas of the marsh, because these plants do survive there. However, this species does not use areas with standing water that are not influenced by tidal action.

Since Suisun Song Sparrows do not use managed wetlands, any indication of such on the specified figure is an error. Correction of this error reduces available remaining habitat in this figure, but this error is relatively insignificant when the overall loss of habitat is taken into account. In addition, there are no provisions under the California Endangered Species Act that directly provide for the designation of "critical habitat." This is a common misconception stemming from confusion with the Federal Act.

Habitat and population declines have already severely impacted the Suisun Song Sparrow, resulting in less than 6000 pairs remaining in highly fragmented habitat and small reproductively isolated populations. There is clear potential for continued decline from threats of toxic spills and proposed further reduction of Delta outflow.

Listing the Suisun Song Sparrow will not preclude the District from continuing to manage the resource as prescribed by state law, especially since that very law also mandates protection and restoration of tidal wetlands. There is no intention on the part of the Department or any other entities to completely restore Suisun Marsh to tidal action. However, it should be recognized that the marsh must continue to support viable populations of declining native wildlife and Threatened and Endangered Species. There is no reason to believe that this can only be accomplished with major changes to existing uses in the managed marsh.

CALIFORNIA WATERFOWL ASSOCIATION
3840 ROSIN COURT • SUITE 200 • SACRAMENTO, CA 95834 • (800)-424-DUCK • (916)-648-1406

May 30, 1989

Eldridge G. Hunt, Chief
Wildlife Management Division
Department of Fish and Game
1416 Ninth Street
Sacramento, California 95814

Dear Mr. Hunt:

The Association's research staff have reviewed this petition with care and interest. As wildlife biologists, they have subjected the information provided to the scrutiny normally associated with acceptable scientific procedures. Enclosed is a summary of Dr. Robert McLandress's analysis and comments, which have been reviewed and approved by our Director of Research, Dr. Mickey Heitmeyer.

Because of the potential for severe adverse impacts to other species if this petition is granted, we request that no action be taken until the validity of Dr. Mewaldt's claims can be thoroughly evaluated. In the meantime, the Association strongly opposes reclassification of the Suisun Song Sparrow to "Endangered" status.

Sincerely,

D. Chapin

D. Chapin, Chairman
Resources Committee

DC/ms
Enclosure

cc: Peter Bontadelli
Robert Bryant

Review of: Petition to list the Suisun Song Sparrow (Melospiza melodia maxillaris) as Endangered.

Author: L. Richard Mewaldt, Ph.D.

General: Biological justifications for elevating the Suisun Song Sparrow (SSS) to endangered status presented in this petition are not convincing. Existing laws already protect tidal wetlands. Any further restrictions of practices to rejuvenate tidal wetlands as a consequence of such action and the suggested habitat alterations on upland slopes next to these wetlands may not be in the best interest of the subspecies.

Amounts of optimal habitat and population levels of SSS's are biased to present an impression of precipitous decline in numbers. Little change in SSS habitats has occurred in the Suisun Marsh since the early 20th century. Recognition of habitats and a need for population surveys of miles of internal sloughs and channels that are tidally influenced and lined with "1 and 2 dimensional" potential SSS habitats are not considered. There is general ignorance expressed of the value of non-tidal, managed, marsh habitats to SSS's throughout the petition. Nothing in the knowledge of diet or habitat requisites presented in the petition indicates why SSS's are restricted to tidal wetlands, and some of the "critical" wetlands alluded to are presently non-tidal (e.g. Chipps Island, Wheeler Island). Finally, suggestions for habitat improvements along the upland slopes of tidal wetlands would likely benefit predators that prey on SSS's.

Specific:

Page No.	Comment
2,3.	Salinity control structures were designed to offset further salinization of the Suisun Marsh, not stop tides. Tidal ebbs and flows will not be stopped by these gates. Statements concerning the dependance of Salt Marsh Harvest Mice on tidal wetlands are incorrect. These mice prefer non-tidal wetlands with pickleweed.
16,18, Fig.3	References to data concerning limited dispersal of SSS's are misleading. Dispersal data contains a bias. The probability of recapture of marked individuals decreases with distance from the original site of capture. The contention that the SSS does not disperse as far as other subspecies is unwarranted.
4,24.	Predators, especially exotic species such as feral cats and norway rats, are indeed a serious problem to nesting

birds in the Suisun Marsh. Suggestions for encouraging growth of rose thickets and Baccharis pilularis to provide sparrows with hiding places from predators require further investigation since these plants are heavily used by cats and rats.

9,21,24,Fig.8. Statements about wetland values inside of existing levees are inaccurate and their importance to SSS's requires further investigation. Managed wetlands are very productive of moist soil seed plants, which are important to granivorous waterfowl and passerines. There are miles of ditches, often lined with tules and cattails, that are used to flood and drain these managed wetlands. Many are subject to tides and/or dramatic changes in water level. The petition indicates that Wheeler Island and Chipps Island have SSS's, but many acres of habitat on several large duck clubs that appear suitable for SSS's (e.g. Tip End, The Can Can, the Greenhead, DFG portion of Joice Isl. etc.) have not been evaluated for this petition.

10,15,17. Sub-species determination of the SSS are based on characters that have been demonstrated to be very plastic in other avian species. There is a tendency for birds of many species in the Suisun Marsh to exhibit reddish plumage. This may be related to chemicals in the diet rather than genetic differences. Changes in bill morphology to the size of seeds in the diet of passerines is not unusual and may not be genetic in origin. Other characteristics do not appear to differ much from those of other subspecies (e.g. song, blood groups, dispersal distances, behavior, etc.). Therefore, the rational for subspecific status of Song Sparrows needs to be reexamined with modern methods (DNA hybridization, mitochondrial DNA analyses, etc.).

12,19,20 There isn't strong evidence to suggest that populations of SSS's have declined. Density figures used to generate population size were obtained in 1956. The decline in habitat discounts any possibility that non-tidal managed wetlands are occupied.

20 Seeds of alkali bulrush are incompletely digested by ducks, not "unused". Below-ground tubers are an excellent food source for waterfowl.

22 Scirpus acuta and Typha latifolia are indicators of relatively fresh water areas of the Suisun Marsh; the other species mentioned are more tolerant of saline areas. Therefore, the SSS should benefit from attempts to keep the Suisun Marsh from becoming too saline.

24 Existing tidally influenced canals and wetlands are already providing habitat for dispersal.

24 Managed wetlands are protected from pollutants from Suisun Bay waters by levees. Control of water on these wetlands provides a higher level of protection and a greater variety of hydrologic regimes than are available to tidal wetlands.

Response to California Waterfowl Association:

We have examined in depth, the technical information provided in the petition and have reviewed all scientific information regarding the Suisun Song Sparrow and closely related species available in published ornithological literature. We also reviewed agency documents relating to the Suisun Marsh and current literature regarding biological conservation, population viability, and extinction processes.

Only 10 to 20% of the original tidal brackish marsh habitat that made up the vast and continuous Suisun Marsh remains, and because of this, the remaining endemic Suisun Song Sparrow population exists in a highly fragmented condition. This is a precipitous decline in biological terms. One and two-dimensional strips of remaining habitat that are present along tidally influenced sloughs cannot be considered optimal habitat, especially in view of the sedentary nature of these birds. It is well documented in published scientific literature (Marshall 1948a,b, Johnston 1956a,b, Bent 1968, Basham and Mewaldt 1987, Greenberg 1988) that Suisun Song Sparrows do not frequent managed marsh habitats, and in fact avoid any situations with standing water. They are endemic to brackish tidal marsh habitat and occupy tidal habitat remaining in the marsh, including that on Chipps Island. Large managed marsh areas with infrequently flooded and drained areas are apparently not used by these birds. There is no information available that indicates that they establish territories in any brackish marsh habitat that is not influenced by unimpeded daily tides. We would be happy to work with CWA to assess this situation further and in fact, have identified our interest in looking in other areas in Recovery Action number 2.

We agree that the effects of the Montezuma Slough Salinity Control Structure is misinterpreted in the petition. However, since this structure will have little or no effect on the salinity within Suisun and Grizzly bays, and Suisun Slough, it will not benefit Suisun Song Sparrows. Salt-marsh Harvest Mice can utilize both tidal and non-tidal wetlands with pickleweed. We agree that these are not the same as the habitat requirements of the Suisun Song Sparrow.

Limited dispersal of both young of the year and adult Suisun Song Sparrows is well documented in the published scientific literature (Marshall 1948a,b, Johnston 1956a,b, Bent 1968, Walton 1975, Basham and Mewaldt 1987). The extensive fragmentation of remaining habitat has resulted in small reproductively isolated populations. This in combination with the potential for topic spill impacts and possible predator impacts threatens the continued viability of this species.

The suggestion of allowing vegetation to grow on adjacent levees was made to give these birds cover from diurnal aerial raptors during extremely high tides when the entire population is exposed and clinging to tips of vegetation and the bare tops of dikes and levees.

There have been no questions in the ornithological community regarding the validity of the Suisun Song Sparrow as a legitimate subspecies since they were originally described. They are reproductively isolated from other subspecies geographically, physiologically and behaviorally. In addition, they can be distinguished from other subspecies by physical characteristics. We agree that song sparrows are a generally plastic species, which is the reason the

Suisun Song Sparrow was able to adapt so well to environmental conditions in the Suisun Marsh in the first place. Although there is a minor possibility that feather pigments may be influenced by chemical ingestion, we could find no basis in fact for suggesting that bill size is not a genetic characteristic. The Suisun Song Sparrow is currently recognized as a distinct subspecies. Expensive DNA analyses may prove interesting and helpful in the long term, but are not considered to be pertinent to the current decision making process.

Density figures were obtained from published scientific literature from an extensive study conducted on a closely related subspecies, and we have no reason to doubt their validity. These figures are the best available information at this time, so they are used to estimate abundances of Suisun Song Sparrows. These estimates will be refined when further population information is available. Regardless of the exact density estimates used, there has been an 80 to 90% reduction in habitat, which translates directly into a highly significant reduction of carrying capacity.

Whether or not bulrush seeds are used or unused by ducks has no relevance to the biology of the Suisun Song Sparrow.

The Suisun Song Sparrow will benefit from attempts to keep the tidal brackish marsh that they occupy brackish, and will be adversely impacted if Suisun and Grizzly bays become either too salty or too fresh.

Habitat occurring in thin strips along tidally influenced sloughs can provide some opportunity for dispersal as long as the strips are continuous, which they are not in many cases. These strips cannot be considered optimal habitat for Suisun Song Sparrows.

The fact that managed wetlands are protected from pollutants has no known bearing on the continued existence of Suisun Song Sparrows. Literature indicates that they do not occupy managed wetlands. Any toxic spills or pollutants brought in by the tides and deposited on the mud will directly impact this species.

POINT REYES BIRD OBSERVATORY

4990 Shoreline Highway, Stinson Beach, California 94970
Telephone (415) 868-1221

July 10 , 1989

Nongame-Heritage Program
California Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

To whom it may concern:

The following are comments on the petition to list the Suisun Song Sparrow (Melospiza melodia maxillaris) as endangered:

As Program Manager of the Landbird Research Program, I have conducted a nine-year study on the Marin Song Sparrow (Melospiza melodia gouldii). The research design involves intensive monitoring of individually colorbanded Song Sparrows, their nests, dispersal and productivity.

Assuming that the breeding biology of both races is similar, I would like to make the following points that support listing this species as endangered:

1) Our data agrees with Halliburton and Mewaldt's (1976) and Collins and Resh's (1985) results, that breeding and natal dispersal is minimal. With documented low dispersal ability, a catastrophic event in the limited range of these races could cause rapid extinction.

2) We documented (DeSante and Geupel 1987, Condor 89:636-653) a significant reproductive failure of our resident Song Sparrows (as well as other species) during the breeding season of 1986 in what has been shown to be a more stable terrestrial ecosystem. In the following breeding season the number of breeding Song Sparrow pairs was again 47% lower. Should a reproductive failure occur in combination with some other event, natural or man-made, a viable breeding population could be quickly and substantially reduced.

3) The high rate of Song Sparrow nest mortality (apprx. 70%) in our study area is due to Scrub Jay (Aphelocoma coerulescens) and snake (primarily Thamnophis elegans) predation. The former appears to use visual cues to locate nests. In areas where scrub habitat or other structures provide Scrub Jay perching sites, nest success and recruitment may be substantially decreased.

4) Predation on fledglings and adults from the increasing feral cat (Felix domesticus) population continues to be a formidable problem for all ground foraging birds even away from human population center. (The dumping of unwanted cats in rural areas appears to be the major cause of this increase. The previous breeding season in our 22 hectare study site (located in the Point Reyes National Seashore, 4 miles from the nearest town) we trapped 12 feral cats).

5) We have observed higher rates of nest failure in areas of high Song Sparrow densities and less preferred habitat. Further reduction in habitat may increase densities or push birds into marginal habitats and substantially reduce the species fecundity.

In consultation with Gary Page (Director of PRBO's Coastal/Estuarine Research Program) concerning the merits of the petition, we agreed on the following points:

1) The maxillaris race is distinct from other races of Song Sparrows.

2) The maxillaris race resides only in tidal marsh vegetation of Suisun Bay and Suisun Marsh.

3) The tidal marshes of these areas have been reduced to approximately 10% of their former extent.

4) The reduction of the maxillaris population reflects nearly exactly the reduction of the habitat.

It should be noted that the data presented on the population reduction (point #4) is extrapolated from the samuluelis race occurring in marsh vegetation of San Pablo Bay that is quite different from the marsh vegetation in Suisuan Bay. Thus, more research on the Suisun tidal marshes and the maxillaris race is warranted to accurately determine present populations.

Accepting these points, a unique race of Song Sparrow has been reduced to about 10% of its former level. Thus we concur with the authors that the maxillaris race should be given endangered status in order to protect its remaining tidal marsh habitat.

Best Regards,

Geoffrey R. Geupel
Landbird Program Manager

Response to **Point Reyes Bird Observatory**:

Comments noted.

We agree that the Suisun Song Sparrow is distinct and resides only in tidal brackish marshes of Suisun Bay and Marsh. We also agree that only about 10 to 20% of original habitat remains, along with a proportionally reduced number of birds. At this time, the best density estimate available is based on the closely related subspecies that occupies San Pablo Bay salt marsh. We agree that further study on the Suisun subspecies is necessary to refine this estimate. This will be especially important for future management and recovery actions.