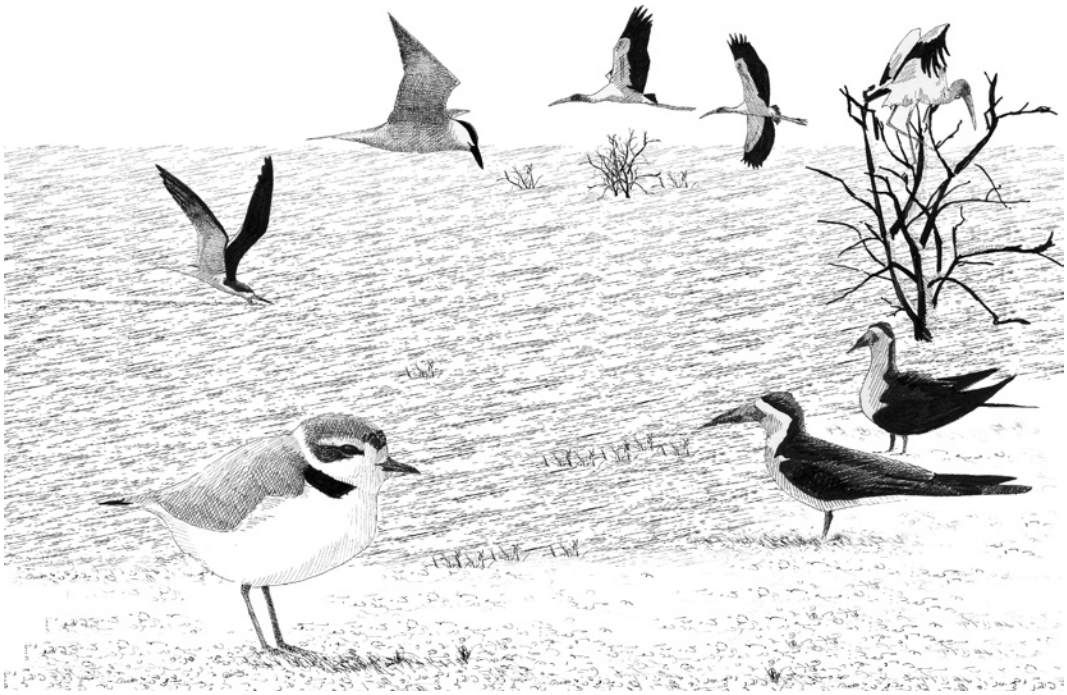
II

Species Accounts



Andy Birch

PDF of Samuels (San Pablo) Song Sparrow account from:

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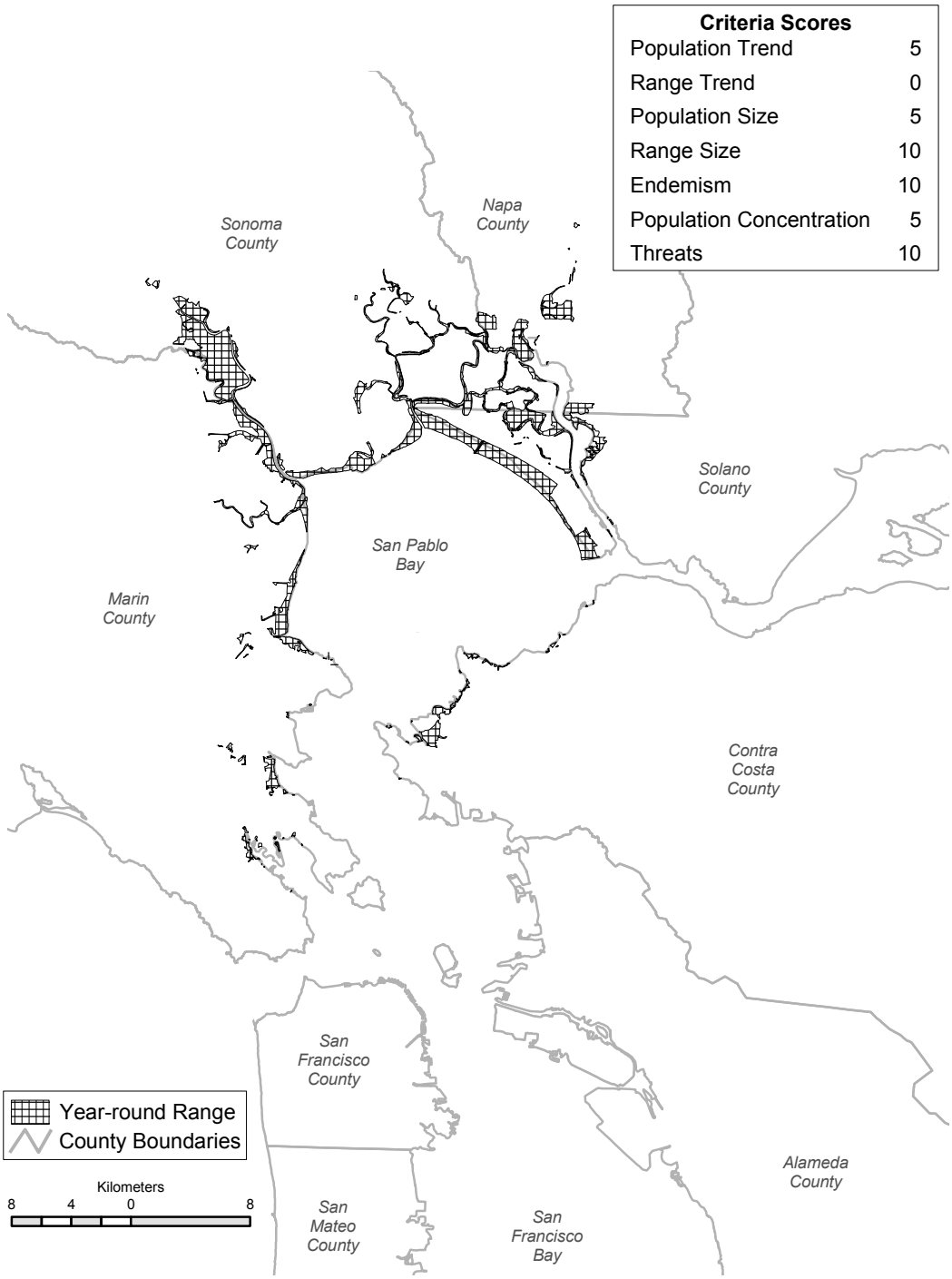
SAMUELS SONG SPARROW (*Melospiza melodia samuelis*)

Hildie Spautz and Nadav Nur



Year-round range of the Samuels (San Pablo) Song Sparrow, a California endemic, on the basis of recent fine-scale mapping of tidal marsh in areas of occupancy. Restricted mainly to the fringes of the San Pablo Bay portion of the San Francisco Bay estuary. Overall outline of the range remains the same, though numbers appear to have declined at least slightly since 1944 (greatly since the 1850s).

Special Concern Priority

Currently considered a Bird Species of Special Concern (year round), priority 3. Not included on the original list (Remsen 1978), but included on CDFG's (1992) unprioritized list.

Breeding Bird Survey Statistics for California

Data inadequate for trend assessment (Sauer et al. 2005).

General Range and Abundance

Song Sparrows (*Melospiza melodia*) range from southern Alaska across central and southern Canada south through the United States into northern (locally to central) Mexico and Baja California; sparrows occupy a large part of northern range in summer only, much of mid-central and southern portion in winter only (AOU 1998, Arcese et al. 2002). In California, the species is resident in much of the state except for the higher mountains and most of the southeastern deserts away from the Salton Sink and Colorado River valley (Grinnell and Miller 1944, Small 1994). Of the 24 subspecies currently recognized, 9 occur in California (Patten 2001, Arcese et al. 2002).

The Samuels (San Pablo) Song Sparrow (*M. m. samuelis*) is a California endemic. Its year-round range is confined to tidal and muted tidal salt marshes fringing San Pablo Bay in the northern reaches of the San Francisco Bay estuary (Grinnell and Miller 1944, PRBO unpubl. data). Abundance varies considerably by site, with highest densities at the Petaluma River mouth (see below).

Recent studies by Patten (2001) confirm that this subspecies is phenotypically distinct from the Suisun Song Sparrow (*M. m. maxillaris*) to the east in Suisun Bay. Chan and Arcese (2002) established genetic differentiation of the Samuels Song Sparrow from the Alameda Song Sparrow (*M. m. pusillula*) in San Francisco Bay, but not from the Suisun Song Sparrow.

Seasonal Status in California

Year round, nonmigratory; breeds from early March (rarely late Feb in some populations) to July (PRBO unpubl. data).

Historic Range and Abundance in California

Grinnell and Miller (1944) described the Samuels Song Sparrow as an "abundant" resident in the salt marshes along the north side of San Francisco and San Pablo bays, from Richardson Bay east to Carquinez Strait, and on the south side of San Pablo Bay southwest to San Pablo Point on Richmond headland. They reported specimens collected at Petaluma and Second Napa Slough, Sonoma County; Napa River, 5¾ mi south of Napa, Napa County; south Vallejo Marsh, Solano County; and near Pinole, Sobrante, and San Pablo, Contra Costa County. Historic locations of confirmed breeding include marshes at Greenbrae and San Clemente, Marin County (1918 and 1921, respectively; MVZ egg set data).

No quantitative estimates of historic abundance exist. Prior to development, diking, and filling that began in the 19th century, there were approximately 24,000–25,780 ha of tidal marsh fringing San Pablo Bay (Marshall and Dedrick 1994, SFEI 1998). By 1944, much of the historic tidal marsh habitat had already been diked and filled, and the extent of marsh was likely similar to that of today: 6824 ha (Marshall and Dedrick 1994, SFEI 1998; see below). Long stretches of tidal marsh, particularly in Contra Costa and Marin counties, were already lost to urban development. On the basis of Grinnell and Miller's (1944) observations and recent studies indicating Song Sparrows are presently ubiquitous residents of even the smallest marsh fragments where sufficient high marsh vegetation exists (PRBO unpubl. data), Samuels Song Sparrows apparently were present predevelopment throughout San Pablo Bay marshes. The predevelopment breeding population was probably between 297,000 and 329,000 birds, assuming that historic densities were similar to current estimates and the habitat extent was 24,890 ha (the mean of the range estimates). The lower figure is based on an observed mean density of 14.9 birds per ha (95 % C.I.: 12.6–17.7; PRBO unpubl. data) and the assumption that 20% of adults are "floaters" (i.e., nonbreeders; Nur et al. 2000), whereas the higher figure is based on an observed mean number of breeding pairs documented at three typical sites in San Pablo Bay: China Camp, Black John Slough, and the Petaluma River mouth (mean = 13.2 breeding birds per ha; see below).

We do not know the exact extent of tidal marsh in 1944, but we do know that since then some areas may have been lost to filling and development, and others have been restored (see below). If the extent of tidal marsh was the same in 1944 as it is now, the breeding population size of Samuels Song Sparrows was likely similar to current levels,

between 81,000 and 90,000 birds (see below). It seems reasonable to expect, however, that sparrow numbers were somewhat higher in 1944 than now because of the direct and indirect effects of a huge increase in human population around the bay in recent decades.

Recent Range and Abundance in California

The general range of the Samuels Song Sparrow appears to be relatively unchanged since Grinnell and Miller's (1944) account (see map). Most of the diked areas in the northern part of San Pablo Bay were being used as pasture, and after the 1950s large areas were converted from pasture to salt ponds, croplands, and vineyards, the latter two being the predominant land uses today (Goals Project 1999). Since then, habitat loss and degradation have been gradual, and their effects on Song Sparrow populations are unknown. Current and planned tidal marsh restoration projects in San Pablo Bay will probably increase available habitat in the coming decades by 6000 ha (S. Siegel unpubl. data, available for download at www.swampthing.org/default.htm).

The present area of fully tidal marsh in San Pablo Bay is about 5694 to 6541 ha (Marshall and Dedrick 1994, SFEI 1998). An additional 339 ha of marsh has muted tidal flow (SFEI 1998), and some of this (e.g., Tubbs Island, Sonoma County) has Song Sparrow densities comparable to those found in fully tidal marshes (PRBO unpubl. data). The total area of available habitat (including fully and muted tidal marsh) presently is only about 25% of the historic area. Much of the remaining marsh is highly fragmented, and the surrounding habitat is highly developed. Only 1 continuous tract of tidal marsh is >1000 ha (Petaluma Marsh), 14 parcels are >100 ha, 95 are 2–100 ha, and 65 are <2 ha (SFEI 1998). Half of the existing tidal marsh habitat, and presumably a corresponding proportion of the existing population of sparrows, is found within the six largest sites.

Surveys from 1996 to 2004 found Song Sparrows in every tidal marsh site and at most restoration and muted marshes in San Pablo Bay (Herzog et al. 2004, PRBO unpubl. data). Absolute densities ranged from <10 birds per ha in marsh fragments under 2.5 ha to >20 birds per ha in some larger marshes (PRBO unpubl. data). The mean density for 25 San Pablo Bay sites surveyed in 2000 was 14.9 birds per ha (95% C.I.: 12.6–17.7; PRBO unpubl. data). Densities (breeding birds per ha) derived independently from intensive spot mapping in 2000 and 2001 at three sites in San Pablo Bay ranged from 9.1–11.6 at Black John Slough, 13.5–15.4 at China Camp State Park, and 13.1–16.2 at Petaluma River mouth (PRBO unpubl. data).

Johnston (1956a) reported an average density of 5.5 birds per ha at a single study site in Richmond at the mouth of Wildcat Creek. This figure was based on intensive spot mapping at a site with an extensive area of unoccupied high marsh, which is uncharacteristic of the marshes in San Pablo Bay, and may explain the comparatively low densities (H. Spautz pers. obs.).

The current breeding population estimate is between 81,000 and 90,000 birds in 6824 ha of available habitat. The lower figure is based on an observed mean density of 14.9 birds per ha and the assumption that 20% of adults are floaters (Nur et al. 2000), whereas the higher figure is based on an observed mean number of breeding birds documented at three typical sites in San Pablo Bay (mean = 13.2 breeding birds per ha; see above). Marshall and Dedrick (1994) estimated the population size at 31,200 birds on the basis of 5695 ha of tidal marsh and Johnston's (1956a) density of 5.5 breeding birds per ha, which is lower than the PRBO estimate both because it excludes muted marsh and because the density estimate on which it was based is lower.

Ecological Requirements

Samuels Song Sparrows are found in virtually every tidal salt marsh in San Pablo Bay, though densities vary considerably, presumably reflecting habitat suitability (PRBO unpubl data). As with all Song Sparrow subspecies, dense vegetation is required for nesting sites, for song perches, and as cover from predators (Marshall 1948). Where vegetation is too short and sparse, Samuels Song Sparrow nests are more likely to be exposed to predators or flooding during high tides (Marshall 1948, Johnston 1956a, PRBO unpubl data). The dominant plants of tidal salt marshes in San Pablo Bay are California Cord Grass (*Spartina foliosa*) in low elevations, Pickleweed (*Salicornia virginica*) at higher elevations, and Gumplant (*Grindelia stricta*) on the highest ground along slough edges and levees. Marshall (1948) noted that Song Sparrows were either absent or less dense where *Spartina* was <46 cm high or Pickleweed was <30.5 cm high.

Samuels Song Sparrows are primarily associated with high marsh, particularly Pickleweed, and their territories are densest in areas where tidal channels are lined with Gumplant (Grenier

2004, Spautz et al. 2006). In a typical San Pablo Bay marsh, sparrow territories are lined single file every 10 to 50 m along channels, providing each pair with access to the slough and its associated tall vegetation for song perches and nesting cover. However, the sparrow diet is primarily terrestrial invertebrates gleaned within the marsh plain, making both the marsh plain and tidal channels critical sparrow habitat components (Grenier 2004). These sparrows use both natural and artificial channels (mosquito ditches), but territories along natural channels are smaller, indicating the habitat is of higher quality (Collins and Resh 1985). However, the construction of these ditches probably increased the sparrows' overall population size (Collins and Resh 1985). In marshes lacking sloughs, tidal influence is still required; few sparrows are found in diked areas with stagnant water. In marshes where brackish or freshwater influence creates extensive tall stands of *Scirpus maritimus*, Tule (*Scirpus acutus*), or cattail (*Typha* spp; e.g., Pond 2A in Napa-Sonoma marsh and Black John Slough on the Petaluma River), the association of Song Sparrows with channels is weaker (H. Spautz pers. obs.).

Exposed ground for foraging is also required. In salt marshes, dense *Salicornia* is opened by small mammal trails and tidal action. Marshall (1948) noted that the densest vegetation used by Song Sparrows is *Scirpus* with stems growing at least 2.5 to 5 cm apart, providing openings for foraging on the ground.

Analyses of the relationship between tidal marsh Song Sparrow abundance and a series of vegetation and habitat variables indicated that Song Sparrows respond positively to shrub cover (primarily Gumplant and Coyote Brush [*Baccharis pilularis*]) and negatively to pond cover and to *Juncus* cover, which tends to be too sparse or short for nesting (Spautz et al. 2006). Collins and Resh (1985) also found a positive relationship between Samuels Song Sparrow density and shrub cover (Coyote Brush), as well as plant cover height and plant spatial diversity. At the landscape level, all three subspecies of tidal marsh Song Sparrow are positively associated with marsh size and proportion of adjacent natural upland, and negatively with the proximity to nearest water edge and with proportion of adjacent marsh (tidal or nontidal) or agriculture (Spautz et al. 2006). Thus, Song Sparrows tend to be denser along upland edges of large marshes, especially where shrubs are present.

The mean height of Samuels Song Sparrow nests is 22 cm (SD = 11, n = 1450; PRBO unpubl. data). Nest success ranged from 6% to 31% (median = 18%) at five sites in San Pablo Bay between 1996 and 2004 (Spautz et al. 2003, Herzog et al. 2004). Though adult and juvenile survival rates are unknown for this subspecies, if they are typical of other Song Sparrows, then nest success rates would need to be 25% or higher to achieve long-term population stability (PRBO unpubl. data). Nest success was significantly different among sites (highest at Black John Slough), and success was generally higher at natural marshes than at restoration sites (Herzog et al. 2004). Predation is the highest cause of nesting failure (57% of nests) versus tidal flooding (9% of nests), abandonment (6% of nests), and failure to hatch (5% of eggs; Spautz et al. 2001, Greenberg et al. 2006, PRBO unpubl. data). Sites where nest success was lowest and predation highest were smaller, had higher perimeter-to-area ratios, and were more isolated (PRBO unpubl. data). Thus, even though Samuels Song Sparrows are present in marsh fragments of a large size range, low reproductive success at smaller, more isolated marshes may not be sufficient to replace birds lost to mortality at these sites.

Threats

Further habitat loss, fragmentation, and degradation are the primary threats to the Samuels Song Sparrow (Takekawa et al. 2006). Alteration of marsh habitat by invasive cord grass (*Spartina* spp.) may also have adverse effects (Gutenspergen and Nordby 2006), although the effects of another non-native, Peppergrass (*Lepidium latifolium*), are apparently neutral or positive (Spautz and Nur 2004).

There also are concerns that habitat fragmentation and lack of sufficient dispersal corridors will impede dispersal following catastrophic disturbance or habitat changes (Scollon 1993, Cogswell 2000). Because Samuels Song Sparrows and other tidal marsh subspecies are highly sedentary, it has been assumed that birds are unlikely to disperse across inhospitable habitat. Larsen (1989 cited in Cogswell 2000) assumed a maximum dispersal distance of 50 m across inhospitable habitat for Suisun Song Sparrows, which we believe is unrealistically small for both Suisun and Samuels Song Sparrows. However, maximum dispersal distance is not known. A study of color-banded Suisun and Samuels Song Sparrows found that birds commonly dispersed up to 1 km within tidal marsh habitat, but successful dispersal of birds across large stretches of unsuitable habitat has not yet been confirmed (PRBO unpubl. data). Chan

and Arcese (2002) found no genetic differentiation between Samuels and Suisun Song Sparrows and their upland neighbors to the east, suggesting either dispersal occurs among the populations or there has been insufficient time since genetic isolation for differences in microsatellite distribution to develop.

Reproductive failure caused by high levels of nest predation may also have a significant impact. Predators include non-native species, such as the house cat (*Felix catus*), Norway Rat (*Rattus norvegicus*), and Red Fox (*Vulpes fulva*), and some native predators, such as the American Crow (*Corvus brachyrynchos*), Common Raven (*Corvus corax*), and Raccoon (*Procyon lotor*), that respond positively to human disturbance. Present mean rates of Samuels Song Sparrow nest loss to predation (57%, range = 31%–82%; Greenberg et al. 2006, PRBO unpubl. data) are higher than that documented in the 1950s (20%; Johnston 1956b), implying a possible increase in predators and/or predation rates.

Disturbances such as oil exploration, grazing, and recreational use may contribute to habitat degradation, destruction of nests or nesting habitat, and disruption of breeding behavior (Takekawa et al. 2006).

Although threats from global climate change are beyond the scope of management at the state level within the next 20 years, the threat of loss of tidal marsh in San Francisco Bay from projected sea level rise (Galbraith et al. 2002, Orr et al. 2003) deserves discussion. In urbanized portions of San Pablo Bay lacking natural habitat inland into which tidal marsh can move, a projected 0.4-m rise in sea level in the next 100 years (IPCC 2001, Orr et al. 2003) could drown significant areas of tidal marsh, making them unsuitable for Samuels Song Sparrows.

Management and Research Recommendations

Beyond those listed here, Cogswell (2000) provided additional detailed management recommendations for Samuels Song Sparrow.

- Protect existing habitat and restore additional large contiguous areas to tidal action in San Pablo Bay. Restoration projects underway in the Napa-Sonoma marshes and in Marin County are critical. Projects along the northwestern Contra Costa County shoreline, where little tidal marsh remains, should be a high priority.
- Restore dispersal corridors, particularly in highly fragmented areas such as southern Marin and Contra Costa counties.
- Study the effect of invasive exotic plant species, particularly *Spartina alterniflora* (which has just begun to invade San Pablo Bay) and Peppergrass, on the population density and reproductive success of Song Sparrows.
- Identify habitat requirements and ecological conditions that support self-sustaining sparrow populations, paying particular attention to ideal restoration of tidal marsh habitat.
- Identify important nest predators and evaluate predation control measures, if necessary.
- Study the effects of contaminants (including pesticides and agricultural runoff) on reproductive success.

Monitoring Needs

The Breeding Bird Survey and Christmas Bird Count are inadequate for monitoring population trends for this subspecies. Its tidal marsh habitat is difficult to survey, and access requires permits out of concern for protecting the endangered California Clapper Rail (*Rallus longirostris obsoletus*) and Salt Marsh Harvest Mouse (*Reithrodontomys raviventris*). PRBO has been conducting standardized point counts based on variable circular plots in San Pablo Bay tidal marshes since 1996 (Nur et al. 1997, Spautz et al. 2006). This monitoring should continue in at least a sample of sites throughout San Pablo Bay to track population trends, as should monitoring of reproductive success.

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