State of California
Natural Resources Agency
Department of Fish and Wildlife
Wildlife Branch

A SURVEY OF THE BELDING'S SAVANNAH SPARROW

(*Passerculus sandwichensis beldingi*)

IN CALIFORNIA, 2015

By

Richard Zembal, Susan M. Hoffman, and Robert T. Patton

Clapper Rail Recovery Fund
Huntington Beach Wetlands Conservancy
P.O. Box 5903
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October 2015

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Cover photograph courtesy Loren Hays

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ABSTRACT

Thirty coastal salt marshes were surveyed for state-endangered Belding's Savannah sparrows (*Passerculus sandwichensis beldingi*), 6 March – 1 July 2015. Belding's Savannah sparrows exhibiting breeding behavior were detected in 27 of these wetlands from Goleta Slough in Santa Barbara County on the north to Tijuana Slough National Wildlife Refuge (NWR) on the Mexican border. A minimum total of 3,740 breeding territories was detected during approximately 409 field-hours. This is the highest state total reported since counts began in 1973 and increased 11.3% from the previous high count in 2010. The Point Mugu subpopulation was again the single largest; after doubling in 2001, it increased 28.8% by 2006, held equal numbers in 2010, and increased 8.4% in 2015, comprising 30.2% of the state total. Totals exceeded 300 territories in the Seal Beach National Wildife Refuge, Bolsa Chica, and Tijuana Marsh, jointly accounting for 26% of the state total; Upper Newport Bay and Sweetwater Marsh NWR held greater than 200 territories each or 13.6% of the total; four additional wetlands held in excess of 100 territories each, 13.9% of the total.

The major need of this little endangered songbird remains habitat restoration, security, and management. At least 75% of southern California's former coastal wetlands have been lost and the remainder suffers ongoing degradation. The long term fate of a few of the occupied wetlands is still uncertain and most are affected by trespass and the side effects of so many millions of people living on their edges and in their watersheds. Counteracting these problems by rebuilding a larger habitat base, with better security, and increased management would greatly benefit a significant suite of species with which the Belding's Savannah sparrow shares its habitat. This is a Contract Final Report (S1450015) to California Department of Fish and Wildlife, funded by the federal State Wildlife Grants Program.

Zembal, R., S. M. Hoffman, and R.T. Patton. 2015. A survey of the Belding's Savannah sparrow (*Passerculus sandwichensis beldin*gi) in California, 2015. Calif. Dep. Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2015-02, Sacramento, CA 20 pp.

INTRODUCTION

The Belding's Savannah sparrow (*Passerculus sandwichensis beldingi*) is one of few species of birds that reside year-round in the coastal salt marshes of southern California. This subspecies of Savannah sparrow is a salt marsh endemic, ranging historically from Goleta in Santa Barbara County, California on the north, south to el Rosario, Baja California, Mexico (American Ornithologists Union 1983, Grinnell and Miller 1944, and Van Rossen 1947). Over 75% of the coastal wetland habitats within this range have been lost or highly degraded (Wiley and Zembal 1989) and the remainder suffer from the effects of increasing human populations. The greatly reduced habitat base, increasing human impacts in the remnants, and small population sizes led to the listing as endangered of this little songbird by the State of California in 1974.

Belding's Savannah sparrows are ecologically associated with dense pickleweed, particularly *Salicornia pacifica*, within which many nests are found. Breeding territories can be very small and they nest semi-colonially or locally concentrated within a larger block of habitat, all of which may appear generally suitable. They can be difficult to count accurately since they are secretive and forage throughout a marsh, often well away from nesting sites (Bradley 1973, Massey 1979). Consequently, only half the nesting population may be manifesting territorial behavior near nests at any given time (Massey 1979).

There were eight surveys of the California population of breeding Belding's Savannah sparrows prior to the current study. The first in 1973 (Bradley 1973) resulted in a total count of 1,084 territories but excluded several occupied marshes. Massey (1977) counted in all of the occupied wetlands but relied upon extrapolations for portions of the population estimates and reported 1,610 territories. In 1986, 2,274 territories were counted in 27 marshes (Zembal et al. 1987). There were late rains in 1991 that interfered with Belding's behavior and survey efforts and the state population estimate was 1,844 territories, although the largest subpopulation was incompletely surveyed (James and Stadtlander 1991). The state population was counted again in 1996, 2001, 2006, and 2010 yielding totals of 2,350, 2,902, 3,135, and 3,361 pairs, respectively (Zembal and Hoffman 2001, 2006, 2010). The purpose of this report is to document the 2015 surveys and update the status and distribution of the endangered Belding's Savannah sparrow in California.

METHODS

Territorial Belding's Savannah sparrows were investigated in 30 wetlands in coastal southern California, from 6 March – 1 July 2015. The counts were mostly done in the early morning from sunrise to usually no more than 4 hours later. If overcast or other conditions led to prolonged morning activity, occasionally the surveys continued into the later morning hours.

The survey results are a compilation of breeding territories in each marsh. Manifestation of territoriality was through their singing, scolding, extended perching together of mates, nest building, feeding young, aerial chases, and prolonged posting under certain circumstances. Aerial chases that were straight line indicated a single territory with the bird being chased leaving the area. Aerial chases that were circular often indicated two territories with the bird being chased holding its ground once removed from the original site of confrontation. Occasionally a third adjacent territory holder would get involved but again the chase would loop back over territorial boundaries. Adjacent territory holders would sometimes spar at boundaries, flying straight up and occasionally locking their feet together. Sometimes they fluttered back down into the vegetation, still locked together and sparring. Mates perched together regularly but the female remained mostly hidden below the top of the vegetation. Regularly spaced individuals that were

perched high and fully exposed in the *Salicornia* were all counted as territory holders including the few not singing at the time. Prolonged high perching during stronger territorial manifestations by other birds all around the exposed individual is a good indication that the perched individual holds the territory there. Observations on plots at the mouth of the Santa Margarita River demonstrated the need for including these perched birds for an accurate total count (Zembal 1986). Given ample observation time, birds that were perched high and exposed eventually sang or were joined by mates.

Surveys were completed in all of the coastal wetlands containing a few acres or more of *Salicornia* within the California range of the Belding's Savannah sparrow. A few of the smaller wetlands on the coast of Camp Pendleton, the Ventura River mouth, and Malibu Lagoon are not listed on the table. The habitat at these locations is too marginal, scant, and/or disturbed to support true subpopulations of the sparrows. The situations at McGrath State Beach and Aliso Creek are similar but these marshes are still included because sightings are more regularly reported therein.

Some of the count participants reported foraging and other non-territorial individuals. These birds were not included in the tally because they could have been counted before or after when they were on territory. This survey is intended to give an accurate indication of the breeding potential of the state population by reporting those individuals manifesting breeding behavior. Consequently, territories are tallied on the basis of observed behavior and reported as territories or presumed pairs.

The authors conducted many of the counts but many other individuals participated and we thank them all. The total observation time expended surveying was approximately 409 field-hours. The marsh summaries below include the count participants, times, dates, and observations.

RESULTS AND DISCUSSION

The 2015 census resulted in a population estimate of 3,740 pairs of Belding's Savannah sparrows in 27 marshes (Table 1). This is 11.3% higher than the previous highest population estimate reported in 2010. Fourteen of the subpopulations were larger in 2015, compared to 2010, and six were smaller; seven subpopulations were within one to four territories of their size in 2010. The size of the subpopulation in Mugu Marsh doubled between 1996 and 2001, was another 28.8% larger in 2006, tallied to that same number in 2010, and increased another 8.4% in 2015. Point Mugu accounted for 17% of the state population in 1996, 27.9% in 2001, 33.2% in 2006, 31% in 2010, and 30.2% in 2015. There have been numerous restoration projects at Point Mugu that have brought a considerable acreage of wetland under enhanced tidal influence. Consequently, this single marsh may represent 20% - 25% of the available coastal marsh habitat in southern California. Furthermore, Belding's are widespread throughout the marsh, perhaps a product of dampened tidal amplitude (see below).

There were 10 marshes with more than 100 pairs each, totaling 3,123 pairs, or 83.5% of the population. Excluding the Mugu subpopulation, the nine marshes held 1,993 territories or 53.3% of the total and included: Seal Beach National Wildlife Refuge (NWR), Bolsa Chica, Upper Newport Bay, Santa Margarita River Estuary, San Elijo Lagoon, Los Penasquitos Lagoon, Sweetwater Marsh NWR, Western Salt Company Dikes, and Tijuana Marsh. Seven additional wetlands held 49 or more pairs each in 2015, accounting for 452 territories, or 12.1% of the total. Finally, 10 marshes housed fewer than 30 pairs, together comprising a total of 165 pairs, or 4.4% of the state population. Although the long-term viability of little subpopulations may be

Table 1. Nine Surveys of Territorial Belding's Savannah Sparrow in California, 1973 – 2015

LOCATION	NUMBER OF TERRITORIES								
	1973	**1977**	**1986**	**1991**	**1996**	**2001**	**2006**	**2010**	**2015**
Santa Barbara County									
Devereux Slough	-	-	-	-	-	-	1	3	-
Goleta Slough	50	28	50	81	48	68	52	55	52
Carpinteria Marsh	100	34	74	52	64	75	53	46	61
Ventura County									
McGrath Beach State Park	-	12	0	1	0	0	0	0	0
Ormond Beach Wetlands	-	17	20	15	61	33	50	36	20+
Mugu Lagoon	175	250	446	239	400	809	1042	1042	1130
Los Angeles County									
Ballona Wetlands	25	37	32	5	37	13	12	-	53
Los Cerritos Marsh	-	5	2	9	4	19	33	23	86
Orange County									
Seal Beach NWR	125	267	244	138	234	293	289	326	311
Sunset Aquatic Park	-	6	0	0	0	2	6	4	9
Bolsa Chica Wetland	40	186	163	110	193	154	201	280	343
Newland Avenue Marsh	-	-	24	32	20	18	6	16	5
Huntington Beach Wetlands	-	34	47	19	87	71	117	107	93
Santa Ana River Marsh	-	-	0	0	17	36	34	29	49
Upper Newport Bay	130	83	245	199	252	206	105	268	278
San Diego County									
Aliso Creek Marsh	-	-	5	5	0	1	0	-	-
Santa Margarita River Estuary	125	106	107	120	185	172	122	100*	153
Buena Vista Lagoon	0	5	1	0	0	6	5	0	0
Agua Hedionda Lagoon	37	16	45	13	29	22	24	18	17
Batiquitos Lagoon	0	20	47	50	36	66	37	44	58
San Elijo Lagoon	17	30	31	47	42	75	137	72	105
San Dieguito Lagoon	0	9	39	39	42	40	58	43	18
Los Penasquitos Lagoon	160	52	156	108	115	129	203	101	105
(Mission Bay)									
Kendall-Frost Reserve	-	45	13	9	28	38	21	10	26
San Diego River	-	70	28	9	8	26	16	7	9
FAA (Beacon) Island	-	4	0	0	0	4	0	1	0
(San Diego Bay)									
Paradise Marsh	-	16	19	14	6	7	20	18	22
Sweetwater Marsh NWR	-	40	118	141	78	93	119	208	222
G Street Marsh	-	18	8	15	12	9	7	6	9
Western Salt. Co. Dikes/Otay River	-	100	70	29	71	102	70	169	158
South Bay Marine Reserve	-	25	15	42	31	26	21	12	30
Tijuana Marsh NWR	100	95	225	303	250	289	274	317	318
TOTALS	**1084**	**1610**	**2274**	**1844**	**2350**	**2902**	**3135**	**3361**	**3740**

*Estimated; + Partial count.

questionable, it is noteworthy that many have persisted. This may be due to the proximity of larger subpopulations for most of them and potential re-colonization after extirpation. For example, Belding's in 2001 were once again defending territories in four marshes where they were undetected in 1996; two of these subpopulations persisted into 2010 and at least one persisted into 2015. Some of the smallest seem to come and go and the issue in each is the paucity of suitable habitat coupled with the proximity of a larger population center.

Although Belding's Savannah sparrows occurred in greatest numbers and densities in marshes with regular tidal flushing (Zembal et al. 1987), they were not distributed equally across all available pickleweed habitat, avoiding areas that are flooded too frequently. In each of the marshes with abundant higher marsh, there were local concentrations of Belding's therein. High marsh acreage has been greatly reduced in southern California because it was the easiest to fill and convert to other uses. Much of the remaining high marsh is artificially separated from full tidal influence by berms and roads. The dampened tidal conditions result in drier substrate that is probably more conducive to successful incubation and chick survival, enhanced predator access notwithstanding. However, enough tidal influence to retain salt marsh vegetation and hydrologic characteristics is required to keep upland plants and birds from replacing the Belding's and its habitat (Zembal et al. 1985) and to temper depredation, particularly by snakes.

In the lower marsh, Belding's are precluded from nesting by the frequency and duration of inundation. Most coastal marshes in southern California are associated with streams and are flooded during rains. In those with poor tidal exchange, the impounded water submerges the salt marsh for prolonged periods. With late season rains, slowly draining or stagnant impoundments preclude Belding's nesting in much of the marsh. San Elijo and Los Penasquitos Lagoons are examples wherein portions of the high marsh are rendered unsuitable after spring rains. Local runoff from increasing development has had the same effect in several San Diego wetlands. Batiquitos Lagoon for example, is so wet and poorly drained on the inland edge that many acres of pickleweed have been invaded by freshwater marsh plants and birds such as song sparrows (*Melospiza melodia*), common yellowthroats (*Geothlypis trichas*), and marsh wrens (*Cistothorus palustris*). When the substrate is wetted enough to support brackish marsh habitat for these species, Belding's are precluded. One may observe a male singing but nesting does not happen or is unsuccessful due to the unsuitable hydrology and constantly wetted substrate, altered cover type, and competition, particularly with the song sparrows.

On the upper edge of the saltmarsh, Belding's are limited by both the extent and vigor of pickleweed cover and the proximity of other, particularly upland habitats and associated species. Belding's have been observed being displaced from narrow bands of pickleweed by song sparrows many times during surveys. The following observations from Upper Newport Bay are thematic. A Belding's flushed as a song sparrow approached and took over the song perch; Belding's are physically chased off for some distance by song sparrows; song sparrows were observed body-slamming Belding's off a song perch and then singing from that perch. Usually, narrow salt marsh bands along uplands and freshwater marsh are simply not occupied by Belding's. Unless the upper marsh belt is much wider than 10 m across, any occupation by Belding's will be quite local. If song sparrows are territorial, Belding's are not expected there. On the other hand, if song sparrows are lacking, the habitat for Belding's can be nothing more than a few shrubs thick or only the nest shrub as is observed at the Salt Works in south San Diego Bay, Bolsa Chica, on the San Diego River, and elsewhere. For the sake of the Belding's it is important to stretch upper marsh restoration upslope and forgo the common practice of restoring maritime scrub, song sparrow habitat right on the edge of the salt marsh; such upland restoration excludes Belding's from otherwise suitable salt marsh edge.

In 2015, 70% of the Belding's subpopulations increased in size from 2010. Nineteen marshes held a total of 467 more Belding's, while 8 marshes decreased collectively by 87 breeding pairs. The increases were from 1 to 88 territories, and the reductions varied from 1 to 26 territories at individual wetlands. Overall increases in numbers could be due in part to warmer, drier conditions than usual, which probably increased nesting success and chick survival in the spring.

On the other hand it was noted that rising ocean waters are already affecting the distribution of Belding's in wetlands like Upper Newport Bay. Concentrations of nesting territories have become much more pronounced and local there over the years of these surveys. However, some of the Belding's have altered their physical nest placement and been observed nesting successfully in the middle marsh; perhaps an adaptation to rising waters. Nests examined by the author in former years were either built directly on the substrate or very slightly elevated. Recent nests found in the University of California Kendall-Frost Reserve were suspended in the marsh canopy of pickleweed and cordgrass under the cover of small flotsam deposits, often associated with dodder, *Cuscuta salina*. If such nest placement becomes more common, much more of the marsh would be available to nesting Belding's.

The overall population trend has been upward for the Belding's Savannah sparrow; they continue to thrive within their range in California, particularly at Point Mugu, Seal Beach NWR, Bolsa Chica, Upper Newport Bay, Sweetwater Marsh NWR, and Tijuana Slough NWR, among others. This is associated in part with the level and quality of management of these wetlands. Although there have been many accomplishments in securing, restoring, and managing our coastal wetlands, the most critical issues for the Belding's Savannah sparrow remain the maintenance or enhancement of tidal flushing, and the control of sediment, people, their pets, and exotic predators.

THE MARSHES

Santa Barbara County

Devereux Slough – Not Surveyed
The 158 acre Coal Oil Point Reserve, University of California Natural Reserve System was the northernmost breeding site for *P. s. beldingi* in 2010. Public access is prohibited from this Reserve. Territorial Savannah sparrows were detected at the north end of the Devereux Slough in 2010, where a narrow band of *Salicornia* persists. The habitat is marginal, affected by territorial upland birds, prolonged inundation, easy predator access, and not expected to be occupied every year.

Goleta Slough – 52 territories
Goleta Slough was surveyed by Dave Compton on 3 May 2015 for 5.1 field-hours. The total territories in 2015 equaled the lowest recorded in slough-wide surveys since 1996. The total was comparable to totals from each of the two previous surveys, conducted in 2006 (52 territories) and 2010 (55 territories). The high number of territories identified based on behavior other than vocalization (22 territories, or 42%, were identified based on the presence of one or two silent adults) may reflect the relative late date on which the survey was conducted, as territorial birds become less vocal as the season progresses. It is possible that, because the survey was conducted relatively late in the nesting season, some territories went undetected.

Most of the Slough is a California Department of Fish and Wildlife Ecological Reserve although it lies within Santa Barbara Airport property, consists of several distinct areas, only some of which are tidal. Formerly, the entire slough consisted of continuous tidal estuary. However, the

construction of berms within the slough divided the area into several basins. Over time, several culverts that permitted tidal waters to flow into and out of the basins became blocked, leaving portions of the slough cut off from tidal flow. However, several formerly tidal basins still support vegetation communities associated with Belding's Savannah sparrow, especially pickleweed marsh. Sparrows have persisted in these areas, despite the lack of tidal influence.

An unknown influence on the population of Belding's Savannah sparrow at Goleta Slough in 2015 is the changing management practices in relation to the slough mouth. As more of the slough became non-tidal during the latter part of the twentieth century, the mouth of the slough, at Goleta Beach County Park, periodically became blocked. The Santa Barbara County Flood Control District (SBCFCD) previously possessed permits to mechanically breach the slough, and several decades of management of Goleta Slough were based on the understanding that the slough mouth would remain open, and that an open mouth and greater tidal influence were associated with a healthier ecosystem. In late 2012, however, SBCFCD's permits for mechanically breeching the slough mouth expired, and the National Marine Fisheries Service (NMFS) indicated that permits could not be renewed unless impacts to the federally endangered steelhead, *Oncorhynchus mykiss,* were analyzed. SBCFCD subsequently elected not to seek renewal of the permits, although the Santa Barbara Airport is currently preparing a Biological Assessment for steelhead and the federally-listed tidewater goby, *Eucyclogobius newberryi*, in hopes of renewing some level of management of the slough mouth. In the spring 2013, water levels reached a constant level above the mean high tide line for Goleta Slough, and ponding occurred in large parts of Basin A, where the majority of Belding's have been recorded in most years. No survey of the Belding's population was conducted in that year, and the effects of ponding that spring are unknown. During the extreme drought years of 2014 and 2015, although the slough mouth remained closed, water remained below the mean high tide line throughout the Belding's Savannah sparrow breeding season. However, in future years, should management of the slough mouth not resume, high water levels could become the norm during the Belding's breeding season.

Carpinteria Marsh – 61 territories

Carpinteria Marsh was counted by Peter Gaede (PG) on 28 and 31 March 2015 for 5 field-hours. There were 52 territories in the University of California Natural Reserve (including some private property), larger portion of the marsh, six on the Land Trust property, and three territories in the City's Nature Park. Belding's Savannah sparrows were slightly more abundant (27 territories) in the largest basin, Basin III (western-most basin) than in the second largest basin (25 territories), Basin II (this is the central of the three larger basins and located just west of Santa Monica Creek), where tidal influence is lowest or marsh elevations are highest. Belding's were distributed more on the edges of the larger, more tidal basin leaving a big, soggier interior patch of pickleweed unoccupied. Basin II is well less than half the size of Basin III with almost as many sparrows and they were more evenly distributed across the basin. The Belding's were more confined in 2010 than in 2015 and Basin I is now occupied.

PG visited Carpineria Marsh at least monthly over more than a decade to conduct general bird surveys. Predators (mammals) routinely observed included both Red Fox, *Vulpes fulva*, and Raccoon, *Procyon lotor*. Red Fox have bred at the marsh in the past, and tracks are ubiquitous along the dirt roads dividing the marsh basins. Over the past decade, foxes and remains of their prey have been observed regularly. Little evidence of feral cats is currently seen. Carpinteria Marsh remains in dire need of active management of non-native predators.

Ventura County

McGrath Beach State Park - 0
The small wetland at the park campground has shifted over time between freshwater marsh and pickleweed. It was surveyed by Alexis Frangis, Brooke Sheridan, and Chelsea Fletcher on 5 May 2015 over 1 field-hour. Occasionally in the pickleweed stage, Belding's have been detected in the past but much of the area is currently, perhaps permanently, converted to freshwater wetland with dominant cattails and bulrushes. The adjacent Santa Clara River Estuary Natural Preserve was checked as well. The survey yielded 21 song sparrows and no Belding's.

Ormond Beach Wetlands – 20 territories
Ormond Beach was partially surveyed by Martin Ruane, and Joshua More on 8 May 2015 in about 1 hour. They observed 20 territories along the beach, adjacent to Naval Base Ventura County. The Nature Conservancy (TNC) property located west of the Oxnard Drainage Ditch #3, west of the Edison/Reliant Power Plant was not surveyed. With the purchase of the more inland marsh by the Coastal Conservancy and ongoing management by TNC, past issues with human recreation, trash dumping, and homeless encampments are subsiding there but not so much on the beach. The Belding's population has fluctuated from 15 to 61 territories since the 1977 survey and is probably twice as large as reported in 2015 including the birds on the TNC property. This wetland complex has great future potential for wildlife but will take greatly enhanced management of human activity to reach full potential.

Mugu Lagoon (Naval Base Ventura County) – 1,130 territories
Mugu Lagoon was surveyed on 12, 13, 17, 18, 20, 24, 25, 31 March; 1, 3, 8, 10, 24 April; and 1, 7, and 8 May 2015 by Francesca Ferrara, Josh Moore, Martin Ruane, Debra Barringer, Colleen Del Vecchio, Chelsea Fletcher, Alexis Frangis, Justin Hoesterey, Russell Johnston, Dave Pereksta, Adam Searcy, Brooke Sheridan, and Jennifer Turner, totaling 85.2 field-hours of observation. There were 407 territories west of the runway, 381 territories between the runway and Laguna Road, 149 territories between Laguna Road and Calleguas Creek, and 190 territories east of Calleguas Creek.

Two hundred thirty-three more territories were observed during the 2006 surveys compared to 2001 (the same total was tallied in 2010) and an 88 territory (8.4%) increase was reported for 2015. This total represents 30.2% of the entire state population. The Mugu population is over 100 territories larger than the three next largest populations in the state, combined. The increase in Belding's probably resulted from a variety of factors, particularly restoration projects that have resulted in limited tidal access to many formerly isolated patches of marsh that were very dry or too wet. There has also been an intensive predator management program employed annually since 1996. Belding's now seem to be everywhere in the marsh.

Los Angeles County

Ballona Wetland (Playa del Rey) – 53 territories
Ballona Wetland, also known as Playa del Rey, was surveyed by Dan Cooper on 13 May 2015 for 2.7 field-hours. He found 31 territories in the northeast section (north of Culver/main saltpan east of eastern tidal channel) including 26 pairs, three singing males, and one silent individual; they were roughly evenly split between the northern and southern edge of the main saltpan. One singing male and the one silent individual were east of the main saltpan, near a smaller saltpan. In the northwest section (north of Culver/main saltpan west of eastern tidal channel) there were 21 pairs roughly divided between the western portion of the saltmarsh (against the dunes) and the "island" of saltmarsh between the two main tidal channels. In the southwest section (south of

Culver/west of Gas Co. Rd.) there was a singing bird with a possible calling bird (very faint) nearby. Finally, there was a single pair in the southeast section (south of Culver/east of Gas Co. Rd.).

Several possible explanations would account for the high total; one is that in 2015 access was granted to all portions of the marsh, including the interior areas where birds would not be visible/audible from public/semi-public areas like the Ballona Creek bikepath, or the overlook west of the saltpan. Also, there has been a dramatic increase in tidal flow through the area that supports Belding's Savannah sparrows, owing to repaired floodgates. The saltpan is now partially flooded year-round, both by tidal flow from the eastern channel, and apparently by sub-irrigation (water forced up) during high tides. So, what had been a dry, dusty saltpan is now damp over most of its surface year-round, and often flooded through winter and spring. This change is also evident south of Culver Blvd., where extensive pickleweed marsh has developed across what had been weedy/fallow fields. Thus, it is probably not unreasonable to find that the population has increased 50-100% over time. Non-native predators remain a pervasive problem at Ballona including red foxes and feral cats.

Los Cerritos – 86 territories
Los Cerritos Marsh was surveyed on 24 and 29 April 2015 by Richard Zembal (RZ) and Lenny Arkinstall for 7.5 field hours. This is the highest total reported for this wetland in part because that portion of the marsh known as the Hellman Property was included in 2015, accounting for 36 additional territories. This parcel is access-controlled and had not been included in past counts. Four of the territories detected there were in the Orange County settling basins in spite of the fact that there was sign of heavy recent disturbance including removal of habitat. The main marsh is the area surveyed in all previous counts, except 2006 when 7 territories were documented in habitat patches scattered throughout the oil fields. These areas were not covered in 2010 but were surveyed in 2015 and were too dry to be viable for Belding's because of the drought. Tidally deposited trash is problematic but dealt with through regular clean-up days (thanks Lenny). Access to the marsh is more difficult than it used to be but there are still signs of human and dog encroachment into the marsh. A Belding's nest with two hatchlings was discovered in Shoregrass, *Monanthochloe littoralis,* in the narrow far western reach of the main marsh in 2010; this successful nest would not have been in this narrow belt except for the lack of suitable song sparrow habitat on the marsh edge.

<u>Orange County</u>

Seal Beach National Wildlife Refuge – 311 territories
The Seal Beach NWR was counted on 25, 30 March and 14 April 2015 by Sue Hoffman and Richard Zembal for 14 field-hours. Belding's were found along the narrow edges of the marsh along Kitts Highway and Bolsa Avenue with local concentrations. The muted tidal area north of Bolsa Avenue was not as productive as usual; this may be an artifact of low activity level on the morning of the count there. The number in the Case Road Pond restoration area has doubled to 26 territories and the muted tidal marsh restored in 1980 in the southeast corner continues to harbor a big concentration of about 127 territories, including 31 territories that are located in habitat off the NWR. A large patch of Belding's habitat has developed just off the NWR east of the southeast corner where culverts have greatly improved tidal access. There were smaller concentrations around Nasa and Hog Islands and off Kitts Highway near Pacific Coast Highway (PCH). The total count in the NWR was slightly down from 2010 but still represents the second highest total recorded for the NWR, ranking the Seal Beach subpopulation as the fourth largest in California. This is reflective of successful restoration and ongoing management strategies, which include predator management during the breeding season.

The large-billed Savannah sparrow (*Passerculus sandwichensis rostratus*), a California Species of Special Concern, occurs with the Belding's in some of the wetlands of southern California in winter. Several individuals were observed in the NWR during a winter high tide count in 2015 but no formal survey was done to estimate total numbers.

Sunset Aquatic Park – 9 territories
This little isolated patch of marsh is adjacent to the Seal Beach NWR and was counted by Sue Hoffman (SH) for one hour on 26 April 2015. It is treated separately herein because it is supposed to be included eventually in a restoration plan for the entire Sunset Aquatic Park. It is a small patch of habitat that is probably dependant upon the adjacent refuge for consistent presence of Savannah sparrows.

Bolsa Chica – 343 territories
Bolsa Chica was counted on 25, 26, and 27 March 2015 by Rachel Woodfield, Amanda Gonzalez, Holly Henderson, and Brandon Stidum of Merkel and Associates; Inner and Outer Bolsa were counted by Peter Knapp and RZ on 16 March 2015 for a total of approximately 50 field-hours. The Belding's had been surveyed in Bolsa Chica by the U.S. Fish and Wildlife Service many times since 1986 with a mean count of 175 pairs (1986 – 2006). The 2010 and 2015 counts were much higher than previous counts, 39% greater in 2010 than ever before reported, and 22.5% higher in 2015. This makes Bolsa's the second largest subpopulation in California. It is interesting that the count was this large following the restoration project which caused the inundation of many acres of former Belding's habitat in August 2006. The 2015 total included 29 territories in Inner Bolsa (down from 41 in 2010), no territorial Belding's in Outer Bolsa (down from two territories in 2010), eight territories in the pocket marsh, 14 territories on Rabbit Island, and eight territories on the beach dune built for tern and plover nesting. In spite of turning a significant acreage of former Belding's habitat into fish habitat, the Belding's appear to be doing exceptionally well at Bolsa Chica. The results of annual Belding's surveys at Bolsa Chica can be found on the restoration website www.bolsachicarestoration.org.

Newland Avenue Marsh – 5 territories
This little isolated wetland was surveyed by RZ on 24 March 2015 for 1 field-hour. The Belding's habitat and numbers have greatly fluctuated among counts and were at the poorest and lowest in 2015 with a 69% loss of territories. The pickleweed is maintained poorly by seepage from the flood control channel and is very dependant upon rainfall, which was well below average following five years of drought. More than half of the wetland is heavily invaded by upland weeds and further impacted by human use; bicycle and dog tracks crisscross the site. Homeless folks bivouac on the far end of the property resulting in trampling, trash, and other associated issues. Public ownership of the wetland is needed along with adequate fencing and monitoring of the habitat for implementation of appropriate management measures.

Huntington Beach Wetlands – 93 territories
The Huntington Beach Wetlands (HBW) were counted on 6, 24, and 31 March 2015 by RZ for 12 field-hours. These isolated wetlands used to be subject to highly variable rainfall and limited seepage resulting in unpredictable habitat conditions. All but the Beach Boulevard parcel of Newland Marsh have been restored to tidal flushing since the last count. The restoration activities resulted in the loss and inundation of former Belding's habitat, expected temporary affects while the marsh stabilizes. However, the high count of 2006 was maintained in 2010 but totals were down 24% in 2015. The total for Newland Marsh plus HBW was 123 territories in 2006 and 2010, down to 93 territories in 2015. The restored Talbert Marsh, located at the south end of the strip had sufficient recovery of marsh vegetation to accommodate Belding's by the 2006 count,

was a territory stronger by 2010, and added another by 2015. In summary, there were 45 territories (40 in 2010; 41 in 2006) in the Beach Boulevard part of Newland Marsh (fenced parcel adjacent to Beach Boulevard and owned by Caltrans); eight territories (26 in 2010; 35 in 2006) in the Magnolia Marsh (patch north of Magnolia Street); 35 territories (37 in 2010; 38 in 2006) in the Brookhurst Marsh; and five territories (four in 2010; three in 2006) in the Talbert Marsh.

Most of the 2015 reduction was in Magnolia Marsh (the most recently restored) and in the isolated and parched piece of Newland Marsh. It should also be noted however, that these reductions were offset in the immediate vicinity with increases in the lusher piece of Newland Marsh and in the adjacent Santa Ana Marsh where a 20 territory increase resulted in near maintenance of the overall HBW population. The total HBW population from Beach Boulevard through the Santa Ana Marsh was 147 territories in 2015, 152 territories in 2010, and 157 territories in 2006. Human and pet trespass into the HBW is significantly less than in former times and the habitat quality will improve slowly over time. The Huntington Beach Wetlands Conservancy owns and manages 118 acres of the remaining 300 acre wetlands, has implemented plans for restoration by improving tidal access and providing management, and is working to secure and restore the remainder.

Santa Ana River Marsh (Newport Slough) – 49 territories
Santa Ana River Marsh was surveyed on 19 March 2015 by RZ for 3.5 field-hours. This is a restoration success story for Belding's and this little wetland. Prior to 1996, the only Savannah sparrows detected in the wetland were of the inland, non-endangered race. New tide gates and culverts were installed, transforming the desiccated, isolated wetland into a healthier marsh. Ownership is still under the U.S. Army Corps of Engineers (Corps) who are working on a management plan. The area is fenced but the fence is breached with holes cut by trespassers as soon as fence repairs are completed. Trash heaps, makeshift shelters, and gear associated with homeless encampments are distributed territorially in the thick shrub cover, largely, brilliantly big saltbush, *Atriplex lentiformis*, on the wetland edge. The trash is cleaned up periodically but the homeless and their trash and other issues return as soon as the very day of clean up. There is a trailer park and other housing that lines the main tidal channel on the south edge; people boat in the channels and occasionally romp in the marsh. Dogs access the marsh from the housing. A 5-acre island was originally built in 1992 for nesting endangered California least terns, *Sternula antillarum browni*, but became a weed field. The fence around it was repaired by the Corps and it has been cleared of weeds a few times, first by Santa Ana Watershed Association (SAWA) and volunteers in 2008 but no tern nesting resulted. With the Huntington Beach Wetlands, this property is another piece of what used to be a much larger wetlands system, some 3,000 acres at the mouth of the Santa Ana River.

Loren Hays, first reported a lone singing male on 10 February 2006 at the south end of the Santa Ana River Marsh (connected by the main channel) in a small remnant patch of pickleweed on the north side of Pacific Coast Highway adjacent to Cappy's Cafe in Newport Beach. In memory of Loren, the patch was checked again in 2010 and again held a singing male, but not in 2015. Trespassers, mostly walking their dogs have rendered this patch unsuitable.

Upper Newport Bay Ecological Reserve – 278 territories
Upper Newport Bay Ecological Reserve was surveyed on 8, 10, 12, and 15 April 2015 for 21 field-hours by Diane Zembal and RZ. Most of the birds, 184 territories (177 territories in 2010), were observed in the high marsh on the northwest side of the bay above the breached salt dike and below the Muth Center toward Jamboree Road (98 territories) and directly across the main channel toward Back Bay Drive (86 territories). The high marsh associated with the three islands and adjacent shore in the lower bay held a total of 65 territories. The largest expanse of Belding's

habitat is located between the old salt dike and Jamboree Road. Most of the high marsh habitat along the edges of the bay is too narrow and heavily influenced by fresh water habitats to support many Belding's. The high marsh edge is bordered by uplands and freshwater marsh with abundant song sparrows and other birds that out-compete Belding's for use of the habitat. The 2015 count was 4% higher than the 2010 count, which was 155% higher than the 2006 count, and 6.3% higher than the next highest count taken in 1996. This subpopulation ranked as the fifth largest in California in 2015 and 2010.

Issues at Upper Newport Bay include human and pet trespass into the marsh and a lack of predator monitoring and management. However, the status of endangered birds was tracked for Belding's, light-footed clapper (Ridgway's) rails (*Rallus obsoletus levipes*), and California least terns in 2015; invasive plants were identified and removed by agency personnel and volunteers; and land management planning is underway including invasive plant control and restoration components. Dredging occurred in the bay in late 1998, again in 2006, and was ongoing in 2008 - 2010. This project resulted in removal of accumulated sediments and creation of additional channels to benefit salt marsh species. The dredged basins are expected to refill with sediment over 20 years (weather-dependant) at which time dredging will again be necessary. The long term benefits were deemed by the oversight agencies to outweigh the short term impacts of noise, mechanical disturbance, and habitat destruction which proceeded throughout the 2008, 2009, and 2010 nesting seasons and could again in the future; a more desirable plan should be developed to balance sediment inputs with sea level rise.

San Diego County

Aliso Creek Marsh – 0 territories
In 1984, there were 11 territories in this remnant salt marsh that sits in a sump behind the beach, sustained by seepage. This area is used for military training and has not been accessed in many years including 2015 to properly observe for Belding's or habitat suitability.

Santa Margarita River Lagoon – 153 territories
The Santa Margarita River Marsh was surveyed on 1 July 2015 by SH and RZ over 7 field-hours. The 2015 count was a 25% increase over the last comprehensive survey conducted in 2006 but 12% lower than the 2001 total and 21% under the high count in 1996. The saltpan habitat and pickleweed behind the beach are being sustained by seepage and rainfall. The Belding's still occupy the bands and isolated clumps of pickleweed on the saltpan and along the hind dune (30 territories), around the south seasonal pond (23 territories), and were concentrated in the remnant pickleweed along the lagoon nearest the hind dune channel (56 territories). The salt marsh vegetation shows the signs of regular river mouth closure and the accompanying swings in environmental and habitat conditions. There have been years when large areas of the pickleweed and substrate were too wet for successful nesting by Belding's and other years when it was too dry. For example, in 2006, a year with late rains, the Belding's suffered a 29% population reduction due to prolonged habitat submergence.

Buena Vista Lagoon – 0 territories
Buena Vista Lagoon was surveyed on 28 March 2015 by SH and RZ for a total of 4 field-hours. The formerly occupied salt marsh vegetation forms a narrow veneer along high spots bordering the dominant cattails and bulrushes on the islands and in the north-east corner of the inner lagoon. The freshwater marsh and song sparrows have encroached enough into the pickleweed bands to preclude Belding's. The fenced patch adjacent to Highway 78 that contained one territory in 1986, and two in 2006, was too soggy for Belding's nesting in 2010 and still unoccupied in 2015. SH had a brief, possible Belding's sighting in the southeast corner of the inner lagoon but no

display of territoriality. Elsewhere in the central lagoon between the freeway and Pacific Coast Highway there is an edge of robust pickleweed along some of the brackish marsh but the habitat is too narrow and disturbed by fishermen and other visitors to support breeding Savannah sparrows. The highest potential for restoration is on the island edges and in the north-east quarter of the inner lagoon. Important habitat enhancement could be achieved with continued control of invasive plants, containment of reeds, and the cleanup of trash and homeless encampments. However, brackish marsh has invaded most of the pickleweed belts to the detriment of the Belding's in Buena Vista.

Agua Hedionda Lagoon – 17 territories
Agua Hedionda was surveyed by Christine Harvey, John Konecny, SH, and RZ on 28 March and 25 April 2015 for 12 field-hours. All of the territorial Belding's were detected on the inland edges of the inner lagoon. The habitat and Belding's were concentrated in a sparse higher Salicornia belt wedged between encroaching fresh water marsh habitat along the inland drainages and the more tidal marsh, a few hundred meters inland of the lagoon. The survey revealed one fewer territory than in 2010, which was 25% down from 2006.

Regular dredging keeps this lagoon open to the ocean giving it a very high potential for restoration of salt marsh habitat. However, tidal access, although consistent, appears to be heavily muted probably due to the narrowness of the maintained ocean entrance and tidal access under the freeway. Human trespass, off-road bicycles, and dogs off-leash are regular and continuing problems. The Department of Fish and Wildlife successfully eradicated *Caulerpa* (killer algae) which threatened aquatic life and habitats and has installed low fencing on the south side of the wetland, which is helping to a degree. There are still migrant farm worker encampments on the south side and folks regularly trespassing from the heavily-used paddle boarder and kayaker public access from Bayshore Drive. The Department is working on control of the salt marsh invasive plant, Algerian sea-lavender, *Limonium ramosissimum*, but much of the former Belding's habitat in the upper end is *Limonium* turf with sparse emergent pickleweed, encroaching brackish marsh hosting song sparrows, or otherwise too heavily tracked and disturbed for Belding's.

Batiquitos Lagoon – 58 territories
Batiquitos Lagoon was surveyed by SH, Carolyn Lieberman, and RZ on 28 March, 18 April, and 20 May 2015 for 23 field-hours. Belding's were concentrated in the northeastern corner (23 territories) and central northern edge (20 territories) of the inner lagoon. There were small numbers of territorial Belding's utilizing edge habitat on the eastern and western tern islands. Pickleweed expanded into previously brackish marsh areas and the Belding's nearly doubled between 1996 and 2001. Brackish edge surged in 2006 and there was a 44% reduction in Belding's numbers with a slight increase of 19% in 2010, and a 32% increase in 2015 following several years of reduced runoff and receding brackish marsh with the drought conditions. Most of the lagoon has a pickleweed belt that is too narrow and influenced by uplands, freshwater, or brackish marsh to adequately accommodate Belding's. Where the pickleweed belt is amply wide on the eastern edge of the lagoon, most of the habitat had standing water under it and the pickleweed-dominated upper marsh is reverting to brackish marsh, fed cyclically by storm and urban run-off. There also was good upper marsh habitat historically located adjacent to Pacific Coast Highway that was dredged as part of the restoration project to increase fish habitat, or that has eroded due to tidal action. No territorial Belding's were observed in the basins west of the 5 Freeway.

San Elijo Lagoon – 105 territories
San Elijo Lagoon was counted by Sue Hoffman, John Konecny, and RZ on 21 March; and by Thomas Myers, Robert Patton (RP), and Geoff Rogers on 24 and 27 April 2015 for approximately 36 field-hours. The lagoon is subject to periodic closure and mechanical reopening; the flooding of habitat during closure was at issue in 2010 when a 47% reduction from the 2006 count was documented with closure of the ocean inlet during the height of the breeding season. The maintenance of consistent tidal influence and estuarine conditions for more than 7 years prior to the 2006 survey resulted in the highest count on record for San Elijo. The excavators were at work re-opening the estuary as we conducted the final piece of the 2010 survey in April, perhaps too late for Belding's nesting but since then, consistent flushing has led to significant cordgrass colonization of the lower marsh and good conditions for breeding resident birds. The 2015 count was 46% higher than in 2010 but still 32 territories lower than in 2006. The habitat and Belding's were most abundant in the central basin with 58 territories; 29 territories were detected in the east basin and 18 were detected in west basin. Increasing cover of *Spartina* in the west and central basins has reduced tidal mudflat habitat and is encroaching into *Salicornia* habitats. *Salicornia* habitat in the western portion of the east basin has been increasing as brackish/freshwater species have thinned as a result of regular tidal influence, but the reverse is true in the eastern portion of the east basin.

San Dieguito Lagoon – 18 territories
San Dieguito Lagoon was surveyed by Robert James on 13 and 16 April 2015 for 8 field hours. The number of observed territories was only 42% of the number detected in 2010, with generally consistent reductions throughout the survey area. Eleven Belding's were detected in the main area of the marsh west of I-5, mostly along the western and southern edges. Most of the remaining birds were located northeast of I-5 and the San Dieguito River, near the shopping center. A variety of invasive species are still present along some of the marsh edges and on the large island in the southwestern marsh, such as mustard (*Brassica nigra*), crystalline iceplant (*Mesembryanthemum* sp.), and tree tobacco (*Nicotiana glauca*). An area of about two acres along the southwestern upland marsh edge has a substantial erosion problem that needs correction; the current effort is insufficient. Succession to brackish marsh is occurring in the eastern portion of the habitat, just east of San Andres Drive, and *Salicornia* habitat to the east does not appear to have yet developed sufficient cover to support nesting Belding's. Wetland restoration near the end of the Coast to Crest Trail will also add some habitat, eventually.

As with most other recent coastal wetland restoration projects, the emphasis in San Dieguito was on tidal access and prism volume; formerly-occupied *Salicornia* habitat is now inundated more regularly and suitable replacement upper marsh will take a lot of time to develop. Hopefully, ample breadth was left in the potential upper marsh zone between the higher tides and the abundant existing and newly planted song sparrow habitat on the upland edges.

Los Penasquitos Lagoon – 105 territories
Los Penasquitos Lagoon was surveyed by SH and RZ on 11 April and Christine Harvey, John Konecny, and RZ on 25 April 2015 for 21 field-hours. The count total was about the same as in 2010 but only about half of the high count in 2006. Belding's were most abundant on the inland side of the railroad track toward the south end and between the railroad and PCH on the northern end. The ocean inlet was being mechanically re-opened during April with equipment and spoil mounds in place during the counts. The marsh was extremely dry but may not have been so for very long. The Belding's were concentrated on higher ground, nearest active tidal creeks; farther inland, the marsh was cracked and parched.

Los Penasquitos Lagoon is still largely a lagoon and subject to dramatic fluctuations in drying and ponding although efforts are currently being made to keep the inlet open; the number of Belding's documented in 2006 was a testament to some past success with that. Late rains still flood the inland pickleweed marsh and preclude nesting in some areas particularly when the mouth is closed and there is nowhere for the water to drain. The southernmost marsh is gradually becoming more brackish. If it is ever possible to establish a consistent hydrologic regime in Los Penasquitos, it would be of great benefit to Belding's and other wildlife.

Mission Bay

Kendall-Frost Reserve – 26 territories
The University of California's Kendall-Frost Reserve was surveyed by SH, Isabel Kay, and RZ on 11 April and 6 May 2015 over 12 field-hours. This is more than double the number of territories detected in 2010 and a 24% increase over 2006. In the past, Belding's were generally concentrated around the high salt flat on the inland edge of the marsh near Campland on the north side of the Reserve and on berms near the trailer, below the apartments, and separating the main marsh from the restoration area. In 2015, they were all over the marsh, even territorial in middle and low marsh habitats. This phenomenon appears to be in response to wetter conditions in the high marsh and the abundance of small predators regularly accessing the high marsh berms and edges, conditions that apparently led to adaptation in Belding's nest placement. Classic Belding's nests are placed on or barely above the ground in drier high marsh. Some of the nests in the Reserve are now elevated to the marsh canopy under the cover of small flotsam deposits, particularly associated with dodder.

The Kendall-Frost Reserve is extremely isolated from supporting habitats or corridors resulting in an abundance of small and medium-sized predators. Native top carnivores can no longer regularly access this little wetland and so their natural regulation of smaller predators is not happening. Cat tracks are observed regularly on the saltpan that is lined with the best of the Belding's former habitat in the Reserve. Raccoon tracks can be found there and all the way out to the bay's edge. An effective barrier to animals that have been relocated or rehabilitated and released on the marsh edge, or abandoned or allowed to roam "free" by owners, would help protect the Belding's and other wildlife in this little wetland. The California Department of Fish and Wildlife has secured funding in recent years for predator management and should be encouraged to continue a program that includes these much needed measures, with consistent and timely annual implementation of predator control.

San Diego River – 9 territories
The terminus of the flood control channel was counted by RZ on 12 March and 11 April 2015 over 5 field-hours. This is two territories more than was documented in 2010. Salt marsh vegetation again dominates the flats west of Interstate 5 but the dominant plant is *Jaumea carnosa*, pickleweed stands are few and small, and cordgrass (*Spartina foliosa*) maintains dominance in the western third of the marsh. Salicornia lush enough to support Belding's nests is limited to the south fringe of the channel, a few high spots, and amongst the dunes at the far west end near Dog Beach (2 territories). In or adjacent to many potential habitat patches, there are territorial song sparrows present, not Belding's. The river would be a great spot to attempt a restoration of high marsh pickleweed stands up the edge of the channel in earthen-filled riprap.

Prior to 1980 the vegetated flats were dominated by pickleweed (Zedler 1982). Following heavy rainfall and prolonged releases of fresh water from El Capitan Reservoir, cattails almost totally replaced the pickleweed for a brief period. The pickleweed has not recovered to its former extent. Since then, when the freshwater marsh periodically invades and then recedes, the *Jaumea* prevails

in the subsequent salt marsh phase. The periodic disturbance and brackish conditions have apparently favored *Jaumea* and cordgrass over pickleweed.

A previously unknown population of the endangered salt marsh bird's beak, *Cordylanthus maritimus maritimus*, was discovered on a dune trail out from the parking lot at Dog Beach. Unfortunately, the stand of several hundred plants is threatened by encroaching, non-native Algerian sea-lavender, *Limonium ramosissimum*, which is forming a thick mat in the midst of the colony, crowding out the bird's beak. A restoration project should be attempted.

FAA (Beacon) Island – 0 territories
FAA Island was scrutinized by Jennifer Jackson incidental to monitoring of the island for nesting California least terns. Management of the island for least terns includes vegetation control. Care used to be taken to avoid the veneer of vegetation around the edge of the island for the Belding's sake but in 2006, vegetation was much reduced and the Belding's were gone. A lone male was observed singing in 2010 but that is now considered unusual.

San Diego Bay

Paradise Marsh – 22 territories
Paradise Creek Marsh was counted by RZ on 5 May 2010 for 2 field-hours. This is two territories higher than in 2006, the previous high count, and includes 5 territories in the "Connector Marsh" which was not occupied until the 2010 count. The Belding's are doing well compared to the low counts of 1996 and 2001. Salt marsh bird's beak has also abundantly colonized the Connector Marsh. The pickleweed is not extensive but there are several high spots covered in lush upper marsh vegetation along the edge of the main tidal channel and on the little islands in the Connector Marsh. However, this little wetland is very narrow and heavily impacted by the noise of Interstate 5. The freeway is loud enough to mask cues from predators. Raccoon and coyote tracks were abundant. There were abundant signs of people and dogs in the marsh and along its edge which is a regularly-traveled trail. Homeless people and encampments were encountered along the survey route and there were trash heaps and fire pits. The palm fronds, acacias, *Myoporum*, and coyotebush along the abandoned railroad tracks and adjacent uplands are still providing great cover for the homeless.

Sweetwater Marsh National Wildlife Refuge – 222 territories
The Sweetwater Marsh was surveyed by SH and RZ on 27 March and 18 April 2015 for 12 field-hours. Belding's were territorial along the higher sides of the creek channels and concentrated in the extensive high marsh on the inland third of the main marsh and northern edge of the Vener Pond area and E Street Marsh. The count includes 35 territories in the E Street Marsh but does not include many birds around the "D" Street Fill, which was only covered from a distance from the south rather than surveyed onsite. The 2015 count was the highest on record for the Sweetwater NWR, 6.7% larger than in 2010, ranking it again as the sixth largest subpopulation in California. Trespass and feral animal problems are constant issues dealt with by the NWR staffs. One of several nests with eggs examined by RZ was built very thick and suspended in the pickleweed canopy.

"F/G" Street Marsh – 9 territories
"F" Street Marsh was surveyed by RZ on 18 April 2015 for 1 field-hour. This little wetland is separated from Sweetwater Marsh by a few hundred meters of uplands and a road. It is still romped through occasionally by people and pets but not so much as in the past. Tidal access is through a culvert which is kept functional, maintaining some tidal flushing. This marsh should be

connected with the Sweetwater Marsh by excavating out the uplands between them. It is now too small and isolated to offer the resident Belding's or the occasional rail much security.

South San Diego Bay – 158 territories
The marsh veneer along the Western Salt Company Dikes and Otay River (Salt Works) in south San Diego Bay was surveyed by Thomas Myers, RP, and Geoff Rogers on 19, 20, 22, and 29 April 2015 for 33.1 field-hours. The survey total represents a minor 6.5% decrease from the high count in 2010 and again places the Salt Works as the seventh largest subpopulation in 2015. The count included 24 territories in the Chula Vista Wildlife Reserve. This area, on the immediate north of the Salt Works comprises two large cells that face and are connected to the J Street Marsh. A restoration project there in 2010 to 2011 succeeded in creating more diverse habitat in these two tidal basins. Since the project, lower saltmarsh habitat and *Spartina* have increased, and mid- to upper saltmarsh vegetation has increased in height and density. The counts in the Salt Works proper included 18 territories along north shore, 23 along Palomar St tidal channel, 32 along interior levees, 32 along Otay River channel adjacent to interior pond complex, 16 along the east side of the western ponds restoration area and Otay channel, and 26 along the west side of the western ponds and Emory Cove, but not including ponds 10A and 20A. Prolonged drought had reduced the *Sueda* and *Mesembryanthemum* along the top of the interior levees affecting sparrow distribution there. Sparrows in the western ponds restoration area were limited to the outer perimeter since the interior is flooded at high tide. The restoration plan for the Salt Works as part of the South San Diego Bay NWR likely will result in increased marsh vegetation and Belding's habitat over time.

South Bay Marine Reserve – 30 territories
The Marine Reserve was surveyed by RZ on 18 April 2010 for 1.5 field-hours. Belding's were very active over the entire wetland as compared to later in the month when RP visited the site and noted less than half as much activity. This area has high restoration potential but it is in need of management and security from the encroachment of humans and their pets. The Reserve should greatly benefit from adjacent restoration activities on the NWR.

Tijuana Slough National Wildlife Refuge – 318 territories
The Tijuana Marsh was surveyed by SH and RZ on 27 March and 6 May 2015 and south of the river by Thomas Myers, RP, and Geoff Rogers for 38 field-hours. This is 1 territory greater than in 2010, and so is the new high count, again ranking Tijuana Slough NWR subpopulation as third largest in California in 2015. There were 174 Belding's territories in the Oneonta Lagoon section north of the river and 144 territories to the south of the river. On the Border Field State Park side, there were 43 territories south of the horse trail and 101 north of the trail. Sedimentation and runoff has resulted in decreased *Salicornia* health, density, and acreage, and increasing loss of habitat to encroaching brackish/freshwater, riparian, and upland species.

Tijuana Marsh is a center for wetland research, restoration, and management activity. Some of these efforts are focused upon sedimentation and contaminants, which are issues of major concern for the endangered species of the wetland. Tracking sediment accrual and ensuring that the river mouth remains open with a strong tidal prism is ongoing and must remain a high priority. A repeat of the ecological disaster of 1984 when the river mouth closed and estuarine function ceased must be avoided. It is equally important to continue working with Mexico to curtail other water quality issues in the Tijuana River.

RECOMMENDATIONS

It is important to re-examine the abundance and distribution of the Belding's Savannah sparrow on a regular basis. Monitoring the status of this endemic resident in the field also provides the opportunity to observe any changes in the conditions of the coastal wetlands in California. The state-wide survey was conducted every 5 years from 1986 to 2006. We did the 2011 count in 2010 to simplify the schedule for the upcoming bidecadal statewide surveys and recommend that these surveys be continued in 2020 and every five years thereafter.

Walking the edges of the wetlands of coastal southern California revealed: evidence of increased human activity, good and bad; the pervasion of Algerian sea-lavender in the upper marsh edges particularly in Orange and San Diego Counties; lack of vigor in isolated upper marsh habitats because of the drought; ocean inlet closure and flooding effects on Belding's habitat; loss of pickleweed marsh suitability for Belding's in some newly-restored wetlands; invasion of pickleweed by brackish marsh fueled by urban runoff; narrow belts of lush pickleweed that are unoccupied because song sparrow habitat was planted on the immediate edge; and increased inundation resulting in localized concentrations of Belding's nesting in many wetlands.

Recognizing the current scarcity and vulnerability of high marsh habitat, the less frequently inundated upper zone should be disproportionately abundant in marsh restoration plans. This would help to reverse historic loses of Belding's habitat, require less grading, and provide areas for the marsh to retreat with rising ocean waters. Even when ample upper marsh is built into a restoration project, the increased tidal amplitude will affect Belding's habitat and numbers will likely decline in the short term in that wetland (e.g., San Dieguito). Recovery could require a decade or more and will happen more quickly with active restoration; planting once and then monitoring the result is not as good a strategy as ongoing, adaptive re-vegetation. The best strategy for Belding's would be to protect those areas of concentrated activity in place. Nearly every occupied wetland has one or more, sometimes quite small, areas of very concentrated nesting. If these hotspots are to be sacrificed for the overall health of the wetland, a demonstration of the net effect on Belding's should be done to show how they fare in both the short and long term at that wetland.

Uplands that lie directly adjacent to tidal marshes will become increasing important in the future as sea level continues to rise. Adjacent uplands and viable connections with larger open spaces are important components of ecologically functional wetlands. Restoration projects still involve heavy loss of existing occupied habitat and the removal of massive quantities of dredge spoil that might better be incorporated on the edges of the project. Revegetation along the edges of a coastal wetland should focus on pickleweed and higher marsh grasses.

Where the encroachment of freshwater marsh is not desirable, managers should consider cutting small tidal creeks through the upper marsh to establish better drainage and tidal access. If done properly, this would benefit several wetland birds including the Belding's Savannah sparrow and the endangered light-footed clapper (Ridgway's) rail. Cutting small tidal creeks would also be beneficial through extreme high marsh, isolated upper marsh, and salt pan in most wetlands. The new creeks would provide additional tidal access, habitat vigor, and foraging opportunities for Belding's and shorebirds.

Resource Agencies should provide more consistent and specific guidance to Friends of the Wetlands groups for the management of the wetland they oversee. There are numerous projects that could be implemented to benefit Belding's if funding is available. Weeding is a primary example of an activity that is labor intensive and could be conducted to some extent by Friends

Groups even without funding but with guidance. For example, a significant amount of former nesting habitat at Agua Hedionda has been rendered unsuitable for Belding's, having been invaded by Algerian sea-lavender. Caught early, the magnitude of problems like this would be far less severe. Often, the activities of oversight groups are confined to the wetland edges and focused upon upland shrublands with marginal benefit to Belding's at best.

Lastly, it is widely recognized that the full value of a tidal system is most fully realized when tidal exchange is maintained. There are many wetlands within the range of the Belding's whose functions are periodically compromised by closure of their ocean inlets. Managers and responsible agencies should establish the wherewithal to react on an as-needed basis, the required standing permits, and funding for the emergency work needed to re-open lagoons. Furthermore, re-opening should be timed to accommodate Belding's Savannah sparrow breeding. In some wetlands, like San Elijo Lagoon this is already happening.

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