State of California
The Resources Agency
Department of Fish and Game
Wildlife Branch

A SURVEY OF THE BELDING'S SAVANNAH SPARROW

(*Passerculus sandwichensis beldingi*)

IN CALIFORNIA 2010

By

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September 2010

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California Department of Fish and Game
South Coast Region
4949 Viewridge Avenue
San Diego, CA 92123

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ABSTRACT

Thirty coastal salt marshes were surveyed for state-endangered Belding's Savannah sparrows (*Passerculus sandwichensis beldingi*; Belding's), 5 March – 26 May 2010. Belding's exhibiting breeding behavior were detected in 29 of these wetlands from Devereux and Goleta Sloughs in Santa Barbara County on the north to Tijuana Slough National Wildlife Refuge on the Mexican border. A minimum total of 3,372 breeding territories was detected during approximately 391 field-hours. This is the highest state total reported since periodic counts began in 1973 and is 7.6% higher than the next highest count, reported in 2006. The Point Mugu subpopulation was again the single largest subpopulation; after doubling in size by 2001, it increased another 28.8% by 2006, and held equal numbers in 2010 comprising 31% of the state 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 shares its habitat.

Zembal, R. and S. M. Hoffman. 2010. A survey of the Belding's Savannah sparrow (*Passerculus sandwichensis beldin*gi) in California, 2010. Calif. Dep. Fish and Game, Wildlife Branch, Nongame Wildlife Program Report 2010-10, Sacramento, CA 17 pp.

INTRODUCTION

The Belding's Savannah sparrow (*Passerculus sandwichensis beldingi*; Belding's) 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 are ecologically associated with dense pickleweed, particularly *Salicornia virginica*, within which most 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 seven surveys of the California population of breeding Belding's 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, and 2006, yielding totals of 2,350, 2,902, and 3,135 pairs, respectively (Zembal and Hoffman 2001, 2006). The purpose of this report is to document the 2010 surveys and update the status and distribution of the endangered Belding's in California.

METHODS

Territorial Belding's were counted in 30 wetlands in coastal southern California, 5 March – 26 May 2010. 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. 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 most of the counts but many other individuals participated. The total observation time expended surveying was approximately 391 field-hours. Refer to the marsh summaries below for the count participants, times, dates, and observations.

RESULTS AND DISCUSSION

The 2010 census resulted in a population estimate of 3,372 pairs of Belding's in 29 marshes (Table 1). This is 7.6% higher than the previous highest population estimate reported in 2006. Eleven of the subpopulations were larger in 2010, compared to 2006 and 18 were smaller. The size of the subpopulation in Mugu Marsh doubled between 1996 and 2001, was another 28.8% larger in 2006, and was estimated at that same number in 2010. Point Mugu accounted for 17% of the state population in 1996, 27.9% in 2001, 33.2% in 2006, and 31% in 2010. 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 2,918 pairs, or 86.5% of the population. Excluding the Mugu subpopulation, the nine marshes held 1,876 territories or 55.6% of the total. Only two additional wetlands held more than 50 pairs each in 2010, accounting for 127 territories, or 3.8% of the total. Finally, 12 marshes housed fewer than 25 pairs, together comprising a total of 130 pairs, or 3.9% of the state population. Although the long-term viability of these little subpopulations may be questionable, it is noteworthy that they 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 4 marshes where they were undetected in 1996; two of these subpopulations persisted into 2010. So the smallest seem to come and go and the issue in each is the paucity of suitable habitat.

EIGHT SURVEYS OF TERRITORIAL BELDING'S IN CALIFORNIA, 1973 – 2010

LOCATION	NUMBER OF TERRITORIES							
	1973	**1977**	**1986**	**1991**	**1996**	**2001**	**2006**	**2010**
Santa Barbara County								
Devereux Slough	-	-	-	-	-	-	1	3
Goleta Slough	50	28	50	81	48	68	52	55
Carpinteria Marsh	100	34	74	52	64	75	53	46
Ventura County								
McGrath Beach State Park	-	12	0	1	0	0	0	0
Ormond Beach Wetlands	-	17	20	15	61	33	50	36
Mugu Lagoon	175	250	446	239	400	809	1042	1042
Los Angeles County								
Ballona Wetlands	25	37	32	5	37	13	12	11*
Los Cerritos Marsh	-	5	2	9	4	19	33	23
Orange County								
Seal Beach NWR	125	267	244	138	234	293	289	326
Sunset Aquatic Park	-	6	0	0	0	2	6	4
Bolsa Chica Wetland	40	186	163	110	193	154	201	280
Newland Avenue Marsh	-	-	24	32	20	18	6	16
Huntington Beach Wetlands	-	34	47	19	87	71	117	107
Santa Ana River Marsh -Newport Sl	-	-	0	0	17	36	34	29
Upper Newport Bay	130	83	245	199	252	206	105	268
San Diego County								
Aliso Creek Marsh	-	-	5	5	0	1	0	-
Santa Margarita River Estuary	125	106	107	120	185	172	122	100*
Buena Vista Lagoon	0	5	1	0	0	6	5	0
Agua Hedionda Lagoon	37	16	45	13	29	22	24	18
Batiquitos Lagoon	0	20	47	50	36	66	37	44
San Elijo Lagoon	17	30	31	47	42	75	137	72
San Dieguito Lagoon	0	9	39	39	42	40	58	43
Los Penasquitos Lagoon	160	52	156	108	115	129	203	101
(Mission Bay)								
Kendall-Frost Reserve	-	45	13	9	28	38	21	10
San Diego River	-	70	28	9	8	26	16	7
FAA (Beacon) Island	-	4	0	0	0	4	0	1
(San Diego Bay)								
Paradise Marsh	-	16	19	14	6	7	20	18
Sweetwater Marsh NWR	-	40	118	141	78	93	119	97
F Street Marsh	-	18	8	15	12	9	7	6
South Bay Dikes/Otay River	-	100	70	29	71	102	70	169
South Bay Marine Reserve	-	25	15	42	31	26	21	12
Tijuana Marsh NWR	100	95	225	303	250	289	274	317
TOTALS	**1084**	**1610**	**2274**	**1844**	**2350**	**2902**	**3135**	**3372**

*Estimated

Although Belding's occurred in greatest numbers and densities in marshes with full tidal flushing (Zembal et al. 1987), they did not appear to nest abundantly on frequently wetted substrate. For example, in each of the marshes with remaining higher marsh habitat, there are invariably local concentrations of Belding's therein. High marsh goes on for miles still in some of the marshes in northern Baja California, Mexico but was greatly reduced in southern California because it was the easiest filled and converted to other uses. Most of the high marsh left in southern California 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 early chick survival, particularly during unusually cold, wet springs. 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.

Most of the southern California marshes are flooded during rains and in those with poor tidal exchange, the impounded water lingers. When the rains come late, slowly draining or stagnant impoundments preclude Belding's nesting in vast areas of upper marsh. San Elijo and Los Penasquitos Lagoons are examples but portions of the high marsh in most wetlands are rendered unsuitable after spring rains. Local runoff from increasing development has had the same effect at several wetlands. Batiquitos Lagoon for example, is so wet and poorly draining on the inland edge that many acres of pickleweed are being invaded by freshwater reeds and marsh 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 will not happen due to the constantly wetted substrate, wrong 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 a survey year. Typical observations at Upper Newport Bay are particularly poignant. A Belding's flushed as a song sparrow approached and took over the song perch; a Belding's was chased 40 m; and in the final incidence a song sparrow actually body-slammed a Belding's off a song perch and then sang from the same perch. In most instances, narrow habitat belts and edges near uplands and freshwater marsh are simply not occupied by Belding's. Unless the upper marsh belt is much greater than 10 m across, it will either not be occupied by Belding's or occurrence will be extremely spotty. One incredible exception to this can be observed at the Salt Works in south San Diego Bay. The Belding's habitat there is a few to several shrubs thick and in places there is only the nest shrub. The narrow and sparse habitat there is densely occupied by nesting Belding's because food (brine flies) is extremely abundant and there is no upland habitat for, or competition with song sparrows. Similarly, FAA Island has very poor Belding's habitat but in years with no song sparrows, a few Belding's are there.

Based upon the 2010 surveys, Belding's are doing well within their range in California but particularly at Point Mugu, Seal Beach National Wildlife Refuge (NWR), Bolsa Chica, Upper Newport Bay, Sweetwater Marsh NWR, and Tijuana Slough NWR. This is associated in part with the levels and quality of hands-on efforts at these wetlands. For example, Point Mugu has one of the most active and successful Natural Resources Management programs of any of the coastal wetlands in the southern California Bight. At San Elijo and Los Penasquitos Lagoons the ocean inlets are being monitored and kept open as much as possible. This often minimizes flooding and hyper-saline conditions that greatly reduce Belding's nesting success. Unfortunately, in 2010 mouth closure was again an issue and most of the habitat was simply too

wet for Belding's nests. Territorial displays were well down at the time of the surveys in both of these wetlands. The ocean inlets were in the process of being opened and perhaps there was a greater level of nesting later than what was indicated during the surveys.

In comparing the 2010 and 2006 survey results, there were 24% more wetlands with reduced numbers of Belding's than with increased or steady population sizes. However, most of those reductions were quite small except at San Elijo and Los Penasquitos. Eighteen marshes held a total of 296 fewer Belding's while 11 marshes increased collectively by 533 breeding pairs. The reductions varied from 1 to 22 territories at individual wetlands but for two, San Elijo Lagoon and Los Penasquitos Lagoon with 65 and 102 fewer territories, respectively. Most of the substrate under the Belding's habitat in both of these wetlands was submerged and had been for some time due to complete or partial closure of the ocean inlets to each. Although both ocean inlets were being mechanically excavated at the time of our surveys, reestablishment of tidal influence may have happened too late in the 2010 nesting season for the Belding's to take full advantage.

Based upon the 2010 observations in 32 coastal wetlands, the most critical management issues for the Belding's remain the maintenance or enhancement of tidal flushing, and the control of sediment, people, their pets, and exotic predators. However, there have also been many accomplishments in securing, restoring, and managing our coastal wetlands. As a result, the overall population trend has been positive and there were more than three times as many breeding Belding's in 2010 as were documented in 1973.

THE MARSHES

Santa Barbara County

Devereux Slough – 3 territories
The 158 acre Coal Oil Point Reserve, University of California Natural Reserve System is currently the northernmost breeding site for *P. s. beldingi*. Public access is prohibited from the Reserve. Mark Holmgren and Dr. Cristina Sandoval, Coal Oil Point Reserve Manager surveyed the slough in 3.5 hours on 5 May 2010. Three Savannah Sparrow territories were detected at the north end of the Devereux Slough, which retains the largest stand of *Salicornia*.

Belding's are known to maintain territories on Devereux Slough since 1993 and they have bred when conditions permit. In 2010, prolonged inundation of the slough killed approximately 30% of the *Salicornia*. The slough finally drained in late April. Predator control providing relief for breeding Snowy Plovers may also benefit the Belding's on the reserve.

Goleta Slough – 55 territories
Goleta Slough was surveyed by Mark Holmgren on 12 and 20 May 2010 for 3.25 field-hours. The primary survey on 20 May was conducted at relatively low tide with little tidal fluctuation during the survey. Approximately 12% of the suitable habitat was not surveyed. The total territories actually counted were 49, leading to a population estimate of 55 territories when adjusted for the suitable habitat that was not covered.

Since 2006, changes have occurred in the slough. The extent of tidal influence has increased as a result of: 1) Lengthening and restructuring of a tidal channel at a 2:1 bank grade accompanying a runway overrun relocation project; and 2) A small basin was re-engineered to accept tidal flow, part of an experiment to examine bird colonization likely to occur if additional non-tidal areas were to be similarly re-engineered. Combined, these actions introduced approximately 7 acres of additional tidal, *Salicornia*-dominated marsh habitat. Impending restoration of another 10 acres

to tidal habitat should benefit the Belding's. Sedimentation continues to promote habitat conversion in tidal basins from pickleweed-dominated to upland vegetation. Balancing the opportunities for habitat restoration and enhancement with the constraints of a municipal airport remains the greatest long-term challenge to management of Belding's habitat on this estuary.

Carpinteria Marsh – 46 territories
Carpinteria Marsh was counted by Peter Gaede on 28 April 2010 for 3 field-hours. The sparrows were concentrated in the northwestern section of Basin III (western-most basin) and in the eastern portion of Basin II (this is the central of the three larger basins and located just west of Santa Monica Creek), where tidal influence was lowest. Distribution of 2010 territories was similar to those found during the 2006 surveys, but with fewer territories in the northwest section of Basin III and at the end of the Estero Way Extension (also Basin III). The Nature Park, comprising the eastern-most patch of marsh was not surveyed in 2006, but was surveyed in 2010, and an additional five territories were found.

PG visited Carpineria Marsh approximately three times each month during the past eight years to conduct general bird surveys. Avian predators (mammals) routinely observed included both red fox, *Vulpes fulva* (photographed) and raccoon, *Procyon lotor*. Red fox have bred at the marsh in the past, and tracks are ubiquitous and easily found along the dirt roads dividing the marsh basins. During the pat 5 to 6 years, PG has observed this species during approximately 1 out of every 3 visits. He also frequently encounters bird remains; kills by mammalian predators (sheared feathers, etc.) that are almost certainly the result of red fox predation. Little evidence of feral cats is currently seen. Carpinteria Marsh remains in dire need of active management, particularly control of non-native predators.

Ventura County

McGrath Beach State Park - 0
The small wetland at the park shifts over time between freshwater marsh and pickleweed. It was checked briefly by RZ on 8 May 2010. Occasionally in the pickleweed stage, Belding's are detected. The potential for restoration is low. The adjacent Santa Clara River and proximal Ventura River mouth have patches of pickleweed as well, within which Belding's are occasionally reported. The patches of habitat are so narrow that territorial song sparrows preclude the Belding's from becoming firmly established.

Ormond Beach Wetlands – 36 territories
Ormond Beach was covered by Martin Ruane on 21 June 2010 in about 5 hours and he observed 21 territories along the beach and an additional 15 territories on The Nature Conservancy (TNC) property located west of the Oxnard Drainage Ditch #3, west of the Edison/Reliant Power Plant. 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. The 2010 total was down 28% from 2006 which had been up by 51.5% from 2001; the current population estimate is down 41% from the high in 1996. Previously, there has been very little control of human activity and off-leash dogs on the beach at Ormond Beach. Hartley (2010) reports that: "The biggest issue with human activity on Ormond Beach in 2010 was trash left on the beach. This attracts predators and contributes to the predation problem. Problems with transients were much less of a problem than in past years. No homeless people lived in the dunes by the nesting area as they did in 2009." and "Between May 1 and September 1 a total of 116 dogs were recorded entering the beach from the Arnold Road parking lot. Observations were made between the hours of 6:30 am and 1:30 pm Monday through Saturday each week. This data does not account for any dogs that entered Ormond Beach via Hueneme

Beach. Compared to data collected in 2008 and 2009, there has been a downward trend each year in dog visits to the beach. For the same time period in 2008 there were 468 dogs entering the beach and in 2009 there was 263. In early 2009, Oxnard City Animal Control started ticketing dog owners with off-leash dogs and has continued the practice in 2010."

Mugu Lagoon (Naval Base Ventura County) – 1,042 territories
Mugu Lagoon was surveyed on 9, 21 – 24, 29, 30 March and 7, 12, 13, 16, 17, 20 April 2010 by Carly Gocal, Sue Hoffman, Michelle Kuter, Nate Lang, Martin Ruane, and Dick Zembal, totaling over 14 field-days and approximately 65 hours of observation. There were 345 territories in the eastern arm of the lagoon, 337 territories in the central arm, and 360 territories in the western arm.

Two hundred thirty-three additional territories were observed during the 2006 surveys compared to 2001 and the same total was counted and reported in 2010. This represents 31% of the entire state population. More than twice as many Belding's were tallied in 2001, compared with the previous highest count taken in 1996. 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. Unfortunately, there are signs of enough sedimentation to render much of Mugu marsh under muted tidal regime, resulting in the hydrological equivalent of high marsh. This habitat is great for the Belding's in the short term but may eventually lead to loss of marsh with upland encroachment.

Los Angeles County

Ballona Wetland (Playa del Rey) – 11 territories
Ballona Wetland, also known as Playa del Rey, was visited briefly from the road by RZ on 15 March 2009 for 4 field-hours. All of the territorial Belding's were in the wetland between Culver Boulevard and Ballona Creek. A few non-singing individuals have been observed in the past in the wetland south of Culver Boulevard. This little wetland is in major need of restoration and management, the planning for which is still underway. The quality of the habitat has actually improved slightly because of recent modifications to the tide gates from Ballona Creek. The water level was raised by 0.2 m. Populations of non-native plants decreased in the marsh with the increased tidal flushing and the vigor of the pickleweed appears to be improving along the north-south channel from the tide gate. Non-native predators (red foxes and feral cats) remain a pervasive problem at Ballona.

Los Cerritos – 23 territories
Los Cerritos Marsh was surveyed on 9 April 2010 by RZ for 3 hours. The numbers were up in 2006 by 73.7% from 2001 levels which was the previous high count. The numbers were very similar in 2010 when 23 territories were detected in the main marsh compared to 26 in 2006. 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. Tidally-deposited trash is problematic but dealt with through regular clean-up days. Access to the marsh is easy and there are 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 marsh.

Seal Beach National Wildlife Refuge – 326 territories
The Seal Beach NWR was counted on 13 April 2010 by Bill Cullen, Lori de la Cuesta, Kirk Gilligan, Sue Hoffman, Bob Schallman, and Richard Zembal for 18 field-hours. Many of the Belding's were concentrated in the rank pickleweed under muted tidal regime north of Bolsa Avenue (130 pairs), including 12 pairs on the edge of the 3 islands in the north restoration area. There were also concentrations around Nasa and Hog Islands and in the southeast corner of the NWR in the area restored in 1980. 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. This is the highest total recorded for the NWR, 11.3% greater than in 2001, the previous high count and makes the Seal Beach subpopulations the second 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 during a winter high tide count in 2010 but no formal survey was done to estimate total numbers.

Sunset Aquatic Park – 4 territories
This little isolated patch of marsh is adjacent to the Seal Beach NWR and was counted by RZ for one hour on 9 April 2010. 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 Belding's.

Bolsa Chica – 280 territories
Bolsa Chica was counted on 24 and 25 February (survey 1) and 30, 31 March and 2 April 2010 (survey 2) by Melissa Booker, Amanda Gonzales, Antonette Gutierrez, Bonnie Peterson and Rachael Woodfield except for Inner and Outer Bolsa which were counted by Peter Knapp and RZ on 2 April and RZ on 31 March and 8 April 2010 for a total of approximately 70 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 counts were much higher than any previous count and 39% greater than the previous high reported in 2006; this makes Bolsa the fourth 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. In summary, the **2010** (2006) totals were: Inner Bolsa had **41** (19) territories; Outer Bolsa had **2** (11) territories; cells 30–42, 63 had **78** (67) territories; cells 50–55, 59, 60, 67 had **27** (17) territories; cells 45-49, 61, 62 had **57** (39) territories; and cells 2-29 (about half this area has been under water since just after the 2006 count) had **75** (48) territories. The highest of the two spring 2010 counts is recorded herein (237 territories in February); the March/April survey totaled 199 territories excluding Inner and Outer Bolsa. In spite of turning a significant acreage of former Belding's habitat into fish habitat, the Belding's appear to be doing well at Bolsa Chica.

Newland Avenue Marsh – 16 territories
This little isolated wetland was surveyed by RZ on 22 March 2010 for 1 field-hour. Between the 2001 and 2006 surveys, there was a 67% reduction in territorial Belding's but they rebounded 167% by 2010. The pickleweed is maintained poorly by seepage from the flood control channel and is very dependant upon rainfall which was above average in 2010. More than half of the wetland is heavily invaded by upland weeds. The wetland is used as a neighborhood playground;

bicycle and dog tracks crisscross the site. A tent was pitched under the one large *Myoporum* tree on the edge of the property and two new, mismatched bicycles were stashed nearby. 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 – 117 territories
The Huntington Beach Wetlands (HBW) were counted on 17, 18, 22, and 23 March and 14 May 2010 by RZ for 14 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 have been restored to tidal flushing since the last count. This caused concern that the Belding's habitat would be lost to inundation but as of the 2010 count, the high count of 2006 was maintained. The total for Newland Marsh plus HBW was 123 territories in 2006 and 2010. The restored Talbert Marsh, located at the south end of the strip had sufficient marsh vegetation to accommodate Belding's by the 2006 count and was a territory stronger by 2010. In summary, there were: 40 territories (41 in 2006) in the Beach Marsh (fenced parcel adjacent to Beach Boulevard and owned by Caltrans); 26 territories (35 in 2006) in the Magnolia Marsh (patch north of Magnolia Street); 37 territories (38 in 2006) in the Brookhurst Marsh; and 4 territories (3 in 2006) in the Talbert Marsh. Human and pet trespass into these wetlands is significantly less than in former times. The Huntington Beach Wetlands Conservancy owns and manages 118 acres of the remaining 300 acre wetlands and has implemented plans for their restoration by improving tidal access and providing management.

The HBW were imperiled in 2010 by El Nino conditions that resulted in sand deposition that closed off the ocean inlet to the wetlands. Through multiple partnerships proper permits were obtained and the County of Orange re-opened the channel, restoring the lifeline of a coastal marsh, tidal flushing. Although the ocean's influence was cut off from the wetlands for several weeks during the critical nesting season for Belding's, a re-count in Brookhurst Marsh revealed the same number of territorial Belding's in May as had been on territory in March prior to the closure.

Santa Ana River Marsh (Newport Slough) – 29 territories
Santa Ana River Marsh was surveyed on 5 March 2010 by RZ for 3 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) and management has mostly been voluntary and organized by the Santa Ana Watershed Association (SAWA) in cooperation with the Corps and other groups. The area is fenced but the fence is often in disrepair, and there are usually holes cut by trespassers. Trash heaps, associated with homeless encampments are often encountered in the thicker shrub cover on the wetland edge. The trash is cleaned up periodically but the trash and homeless issues are ongoing. 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 was cleared of weeds by SAWA and volunteers in 2008 but no 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 Restaurant in Newport Beach. In memory of Loren, the patch was checked again in 2010 and again held a singing male.

Upper Newport Bay Ecological Reserve – 268 pairs
Upper Newport Bay Ecological Reserve was surveyed on 1-5, 17, 20, 29 March and 16, 19, 20, 23 April 2010 for 29 field-hours by RZ. Most of the birds (177 territories) 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 (132 territories) and directly across the main channel from there (45 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 2010 count 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 2010.

Issues at Upper Newport Bay include human and pet trespass into the marsh and a lack of predator monitoring and management. However, there were surveys of Belding's, light-footed clapper rails (*Rallus longirostris levipes*) and California least terns in 2010. Invasive plants are periodically identified and removed by agency personnel and volunteers. Land management planning is underway including invasive plant control and restoration components. Dredging occurred in the bay in late 1998, again in 2006, and ongoing in 2008 - 2010. This project, when completed, should result in removal of accumulated sediments and creation of additional channels that will 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 unabated throughout the 2008, 2009, and 2010 nesting seasons.

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. Since then, military vehicles and personnel have moved through the marsh often enough to destroy or critically disturb most of it. The bit of pickleweed marsh that remains is disturbed too regularly to support breeding Belding's as observed by Zembal on 5 May 2006.

Santa Margarita River Lagoon – 100 territories
The Santa Margarita River Marsh was surveyed on 18 May 2010 by RZ over approximately 3 field-hours from the edge of the freeway; the count is only an estimate due to issues of access onto Camp Pendleton. The saltpan habitat and pickleweed behind the beach are being sustained by seepage and rainfall. The mouth of the river has been mostly closed to the ocean since 1987. This has led to the periodic submergence and destruction of what used to be lush Belding's habitat along the river edge. This wide swath is now brown and dead but used to sustain as many as 72% of the Belding's at the river mouth. The Belding's still occupy pickleweed clumps on the saltpan and along the hind dune, and are concentrated in the remnant pickleweed along the lagoon nearest the hind dune channel, but they are not sustaining their former numbers. River mouth closure is accompanied by wide swings in environmental and habitat conditions. There have been years when most of the pickleweed and substrate were too wet for successful nesting by

Belding's and other years when it was far too dry. As a result, in 2006 (a year with late rains), the Belding's suffered a 29% population reduction.

The river mouth once sustained far more productive estuarine conditions for a wide variety of wildlife, birds and fishes in particular. It is now a shallow lagoon that is being allowed to gradually fill with sediment. Approximately 30 % of the formerly most viable habitat is now covered in upland weeds. The former density of Belding's in this habitat was not exceeded anywhere in its range.

Buena Vista Lagoon – 0 territories
Buena Vista Lagoon was surveyed on 20 April 2010 by 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. Elsewhere in the central lagoon between the freeway and Pacific Coast Highway there is an edge of robust pickleweed along much of the brackish marsh but the habitat is too narrow and disturbed by fishermen and other visitors to support breeding Belding's. The highest potential for restoration is on the islands 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 therein. However, the pendulum has swung from salt toward brackish marsh to the detriment of the Belding's in Buena Vista.

Agua Hedionda Lagoon – 18 territories
Agua Hedionda was surveyed by John Konecny and RZ on 20 and 30 April 2010 for 11 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 25% fewer territories than in 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 although Caltrans recently installed formidable fencing on the north edge that will be a challenge for trespassers. The Department of Fish and Game 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; some of these folks were claming adjacent to Belding's habitat during one survey visit. 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 is *Limonium* turf with sparse emergent pickleweed and inadequate nest cover for Belding's.

Batiquitos Lagoon – 44 territories
Batiquitos Lagoon was surveyed by Sue Hoffman and RZ on 18 February; 20, 27 March and 24 April 2010 for 27 field-hours. Seventy-seven percent of all territories were in the eastern 20% of the inland lagoon. With the restoration and management of the lagoon toward a fully tidal system, pickleweed expanded into previously brackish marsh areas and the Belding's nearly doubled between 1996 and 2001. Then in 2006 there was a 44% reduction followed by a slight increase of 19% in 2010. Most of the lagoon has a pickleweed belt that is too narrow and

influenced by uplands or freshwater 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 by increased 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 fisheries habitat, or has eroded due to tidal action.

San Elijo Lagoon – 72 territories
San Elijo Lagoon was counted by Sue Hoffman, John Konecny, and RZ on 20 and 27 March and 24 April 2010 for approximately 31 field-hours. This is a 47% reduction from the 2006 count and attests to the negative effects of closure of the ocean inlet. The re-establishment of constant 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 during the previous survey. The excavators were at work re-opening the estuary as we conducted the final piece of the 2010 survey in April, perhaps in time for late nesting in previously inundated habitat. The habitat and Belding's were most abundant in the central lagoon although much of the habitat was inundated in all three lagoons.

San Dieguito Lagoon – 43 territories
San Dieguito Lagoon was surveyed by Robert James on 7 and 8 April 2010 for 6.5 field-hours. The number of observed territories was about a 26% decrease from 2006; however, the number was about the same as in the four surveys prior to that year. Twenty-seven Belding's (about 63%) were detected in the main area of the marsh, mostly along the western and southern edges. Thirteen territories were found in habitat patches inland of the I-5 freeway. Freeway iceplant, *Carpobrotus edulis*, and other invasive species (such as pampas grass, *Cortaderia jubata*) frequently occur along the marsh fringe. A major habitat restoration is underway by Southern California Edison and other agencies, but the *Salicornia* has not yet developed to support more Belding's. If the lagoon remains tidal, habitat conditions should greatly improve over time for Belding's.

Los Penasquitos Lagoon – 101 territories
Los Penasquitos Lagoon was surveyed by Sue Hoffman, John Konecny, and RZ on 27 March and 30 April 2010 for 13 field-hours. The count total represents a 50% reduction from the high count in 2006. Belding's were most abundant on the inland side of the railroad track toward the south end; most all other habitat was under water. The ocean inlet was being mechanically re-opened during the later count.

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 – 10 territories
The University of California's Kendall-Frost Reserve was surveyed by Jeff Gicklehorn, Isabel Kay, John Konecny, and RZ, mostly on 13 March and 29 April 2010 over 17 field-hours. This is a 52% reduction from the number of territories detected in 2006. Belding's have usually been concentrated around the high salt flat on the inland edge of the marsh near Campland on the north

side of the Reserve; there were only 4 territories there in 2010. The rest were on berms near the trailer, below the apartments, and separating the main marsh from the restoration area.

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 were observed all over the saltpan associated with the best of the Belding's habitat in the Reserve. An effective barrier to animals that have been relocated or rehabilitated and released on the marsh edge, abandoned or allowed to roam "free" by owners would help protect the Belding's and other wildlife of this little wetland. To be effective, this would require new fencing, enforcement of prohibition of animal dumping, and predator management to protect nesting listed species.

San Diego Flood Control Channel – 15 territories
The Flood Control Channel was counted by John Konecny and RZ on 6 and 29 April 2010 over 14 field-hours. This is one territory fewer 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 (7 territories). In many potential habitat patches, there are territorial song sparrows present, but not Belding's.

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 salt marsh bird's beak. A restoration project will be attempted.

FAA (Beacon) Island – 1 territory
FAA Island was counted by Jennifer Jackson on 9 June 2010, incidental to monitoring of the island for nesting California least terns. Management of the island for least terns includes vegetation control. Care is usually 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, which is now considered unusual.

San Diego Bay

Paradise Marsh – 18 territories
Paradise Creek Marsh was counted by RZ on 5 May 2010 for 2 field-hours. This is two territories down from 2006 and includes 6 territories in the "Connector Marsh" that were not occupied in 2006. 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. Several homeless people were encountered during the survey route and there were encampments with mounds of trash and fire pits. The palms, acacias, and *Myoporum* along the abandoned railroad tracks should be removed as part of the Fish and Wildlife Service's management of the NWR.

Sweetwater Marsh National Wildlife Refuge – 208 territories
The Sweetwater Marsh was surveyed by RZ mostly on 5 and 26 May 2010 for 9 field-hours. Belding's were territorial along the larger creek and channel margins and particularly abundant in the extensive high marsh on the inland third of the wetland where salt marsh daisies (*Lasthenia glabrata coulteri*) still abound in the spring. The count was 75% higher than in 2006, comprising the highest survey total for the Sweetwater NWR, and ranking it the sixth largest subpopulation in California for 2010. The NWR is a high marsh with extensive suitable habitat for Belding's. Trespass and feral animal problems are dealt with on a regular basis by the NWR staff and the wetland inhabitants have benefited. Trash is still a problem because very large chunks of old hulls and other such bulky objects wash up into the marsh from wind lap and tidal action. Some of these objects are so large that they do great damage to the marsh but are extremely difficult to remove. Three nests with eggs were encountered; one was built of and under *Frankenia*.

"F" Street Marsh – 6 territories
"F" Street Marsh was surveyed by RZ on 26 May 2010 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 by excavating out the uplands between them. It is now too small and isolated to offer the resident Belding's much security.

Western Salt Company Dikes/Otay River Mouth – 169 territories
The marsh veneer along the Western Salt Company Dikes and Otay River (saltworks) in south San Diego Bay was surveyed by Brian Collins on 5, 7, and 10 May 2010 for 10 field-hours. The survey total represents a 141% increase over the 2006 count, places the saltworks as the seventh largest subpopulation in 2010, and hopefully attests to improving conditions there. The Belding's were concentrated along the outer Otay River Channel and in a thick patch of *Salicornia* on the northeast extreme of the saltworks. This later site is along a small creek that runs south from the channel out of the San Diego Gas & Electric facility. The habitat along the outer edge of the saltworks has supported numerous territories in the past but the habitat was very sparse with isolated *Salicornia* and shrubby weeds scattered widely. The occupied habitat has always been a narrow belt with very marginal marsh vegetation. However, the NWR plan for the saltworks as part of the South San Diego Bay NWR should result in increased marsh vegetation and Belding's habitat over time.

South Bay Marine Reserve – 12 territories
The Marine Reserve was surveyed by Sue Hoffman and RZ on 6 April 2010 for 3 field-hours. Belding's were only territorial in the southern portion of the wetland; the northern half is covered in sparse *Salicornia* that is too frequently inundated to support Belding's. This area has a very high restoration potential but it is in dire 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 – 317 territories
The Tijuana Marsh was surveyed by Sue Hoffman and RZ on 6 April and 18 May 2010 for 21 field-hours. This is 16% higher than in 2006, 5% higher than the next largest count in 1991, and ranked Tijuana Slough NWR subpopulation as third largest in California in 2010. There were 109 Belding's territories in the Oneonta Lagoon section north of the river and 208 territories to the south of the river.

Tijuana Marsh has become a center for wetland research, restoration, and limited 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, removing sediment bottlenecks, and ensuring that the river mouth remains open and the tidal prism remains nearly full, should be a very 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 monitor the abundance and distribution of the Belding's on a regular basis. The status of this little pickleweed endemic is one of the better indicators of the conditions and health of the occupied wetlands. The state-wide survey has been conducted every 5 years since 1986. It is recommended that this be continued hereafter except that we changed this count which should have been conducted in 2011 to 2010. This will make it easier for the aging count participants to anticipate the following counts in 2015, 2020, etc.

Recognizing the disproportionate destruction of high marsh habitat, the infrequently inundated upper zone should be focused upon and planned for disproportionately in marsh restoration plans. This would help compensate for some of the historic loses of Belding's habitat, require the least grading of all the marsh zones, and provide areas for marsh vegetation to spread when sea level rises. When ample upper marsh is not part of a restoration project and tidal amplitude is broadly increased, Belding's will decline in the short term in that wetland and perhaps require a decade to recover since it can take that long for adequate cover to develop. Some populations might never recover if the higher marsh acreage is scant. Uplands adjacent to tidal marshes will become increasing important in the future as sea level rise is increasingly manifest. Adjacent uplands and viable connections with larger open spaces are important components for ecologically functional wetlands. Modern day restoration projects still involve huge, expensive dredging operations, some of which may be counter-productive.

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 and the endangered light-footed clapper rail. Cutting small tidal creeks would also be beneficial through extreme high marsh, isolated upper marsh, and salt pan in several wetlands including Upper Newport Bay, the Santa Margarita River, and Agua Hedionda. The new creeks would provide additional tidal access, habitat vigor, and foraging opportunities for Belding's.

Millions of people make southern California their home and most of them clamor for recreational opportunities and other enjoyments provided by open space. Thousands of these people live on the edges of our wetlands, impacting them in many ways. Many of these people would gladly be part of a solution for the issues reported in "The Marshes" herein and the other problems

confronting our wetlands and wetland wildlife. Vesting the public in their neighborhood wetland is something that numerous "friends" groups have already begun in an excellent way. However, most of them do not have the training or expertise available to them to prioritize and implement sound adaptive management strategies. The wildlife agencies should focus on filling that gap, where it exists, and in coordinating a range-wide strategy for the management of the Belding's.

It is also imperative that funding be allocated for the implementation of that management strategy. There are numerous projects that could be implemented to benefit Belding's immediately except for the lack of funding. Weeding is a primary example of activity that is labor intensive but could be conducted by "Friends" or contractors, if funded. 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. Department of Fish and Game South Coast Region staff are currently coordinating with the Pesticide Investigation Unit on the use of herbicide treatments that are showing promising results for the eradication of Algerian sea-lavender.

Lastly, it is widely recognized that the full value of a tidal system is realized only 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 must establish systems, the required standing permits, and funding for the emergency work needed to re-open lagoons as needed. Furthermore, re-opening should be timed to accommodate Belding's breeding.

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