

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

**Breeding Biology of the California Least Tern
at Venice Beach, Marina Del Rey, California
in the 2016 Breeding Season**

by
Carlos Jauregui, Joyce Realegueno, Thomas Ryan and Stacey Vigallon

Nongame Wildlife Program, [2016-XX]

Report

To

State of California
Department of Fish and Wildlife

**Breeding Biology of the California Least Tern
at Venice Beach, Marina Del Rey, California
in the 2016 Breeding Season**

**Carlos Jauregui
Joyce Realegueno
Stacey Vigallon
Los Angeles Audubon
P.O. Box 931057
Los Angeles, CA 90093**

and

**Thomas Ryan
Ryan Ecological Consulting
526 West Colorado Blvd.
Monrovia, CA 91016**

Prepared November 18, 2015

INTRODUCTION

Background

The California least tern (*Sternula antillarum browni*) (least tern) is one of three least tern subspecies breeding in North America. It nests from April through August and occurs along the coast from the San Francisco Bay in California to lower Baja California. This subspecies presumably winters in southern Mexico, Central America, or northern South America, although their wintering range remains unknown (Ryan and Kluza 1999, Keane 2001).

Least terns historically nested in several small, scattered aggregations on sandy beaches and salt flats along the California and Baja California coast, although the progressive loss throughout the last century of undisturbed sandy beaches resulted in a severe reduction in both nesting sites and numbers of nesting pairs (Chambers 1908). By the 1940's, least terns were gone from most beaches of Orange and Los Angeles Counties and were considered sparse elsewhere in the state (Grinnell and Miller 1944).

Historic Population Trends

Least terns have nested near Venice Beach since 1894 (Western Foundation of Vertebrate Zoology records). Nesting in the area from that time through 1976 was poorly documented. In 1977, three pairs of least terns nested on the sand at Venice Beach north of the Ballona Creek mouth (Atwood et al. 1977). Beach managers placed emergency fencing around the area to protect the nests and it has remained in the same general location since. This fence has allowed the colony to continue nesting with minimal disturbance (Comrack 2001). Since 1977, Venice Beach has supported up to 16.6 percent of the statewide pairs of breeding least terns and over 30 percent of statewide fledglings (Table 1). However, during the past ten years, the percentage of statewide pairs contributed by the Venice Beach colony has declined from a maximum of 12.4 percent in 1994 to 0.4 percent in 2004. Additionally, the proportion of fledglings produced at the Venice Beach colony declined from 12.4 percent in 1994 to 6.9 percent in 2003, with no productivity in 2003, 2004, and 2005 (Table 1). From 1999 to 2005, this site had failed to fledge young four of seven years. Crows likely caused these desertions in 1999, 2002, 2004, and 2005 (L. Comrack pers. comm.). Following recommendations made by biologists and the California Department of Fish and Game (CDFG), the size of the nesting area was enlarged in March 2006 from 4.2 acres to 7.7 acres (3.3 hectares) and a new fence was installed. In addition, a volunteer monitoring program, neighborhood outreach program, vegetation removal, and habitat study were initiated in 2005 and 2006. Between 2006 and 2008, the site returned to high productivity, producing the highest number of fledglings of any colony in its range in 2007, and was among the top five sites in 2006 and 2008. However, the colony has failed again from 2009-2013, and biologists attributed this to a combination of lack of foraging resources nearby and predation by crows (Ryan and Vigallon 2010, 2010a, 2011, 2012, 2013).

Habitat Selection Study

The study conducted from 2006 to 2009 found that predation by crow exerts an "edge effect," with the heaviest predation on individuals away from the center of the colony and closest to the fence. Nests were less likely to succeed if they were placed within 20 m of the enclosure fence, in grids with fewer than five other nests (<125 nests/ha), more than 5 m from their nearest neighbor and more than 70 m

from the center of the colony. Additionally, least terns were more likely to be predated in areas with less than 5% vegetation cover, and prefer to nest, and are most successful, in areas with 20-40% vegetation cover. The best vegetation management technique was to reduce vegetation to less than 30% cover, but even this was not as successful as areas that are naturally between 5-30% vegetation cover. The least terns also prefer to nest, and are most successful in areas with dunes, although our findings indicate that predation increases with the number of dunes in an area (Ryan et al. 2010).

Site Management Plan

Drawing on current and past site monitor's experience and the findings of the nest site selection study completed in 2009 (Ryan and Vigallon 2009a), a site management plan was created to document how the site was to be managed each year. We summarized all aspects of the annual effort to manage the Venice Beach Least Tern colony, addressing volunteer organization, recruitment, training, coordination, public outreach, predation control, habitat management, general maintenance, monitoring during the courtship, incubation and fledgling periods, banding, funding and reports. If the reader is interested in a more detailed discussion of our study methods, this is an excellent source (Ryan and Vigallon 2010).

Overall, the goals of this report are to:

- Document the timing of the nesting cycle.
- Provide estimates of productivity at the colony.
- Document predation and other causes of mortality.
- Provide results of studies examining how the implementation of previous recommendations has affected the productivity of the colony.
- Provide further recommendations based on these results and on observations made during the 2016 nesting seasons to improve productivity at the colony.

METHODS

Colony Preparation

Site maintenance was conducted on March 13, 2016 and we were assisted by local residents, Los Angeles Audubon's Baldwin Hills Greenhouse Program, and 186th Street Elementary School. Vegetation was cleared from grid 4B, 4C, and 4D. Vegetation was not removed from the dunes to prevent destabilizing them. Native vegetation that was removed from the 4B, 4C, and 4D grids was placed in the boundary areas in grids 9F-9C and 10E-10C to help induce dune growth.

Colony Monitoring

The project team conducted site visits from April 11 to August 8th, 2016 to observe and monitor nesting activities. Once the adult least terns arrived, we recorded observations of nest building, courtship, and anti-predator behavior. Nest monitoring consisted of walking through the colony, visually searching the sand surface for nests with eggs. When a nest was encountered, we recorded the contents and mapped the nest. We counted all predated eggs at the site. The project team visited and noted the condition of each nest during each visit. We considered eggs predated if they disappeared within three weeks of detection, were visibly predated, or were missing and other signs of predation (such as crow tracks) were observed. We considered eggs "did not hatch" if they remained in the nest more than 28 days. We considered eggs "presumed hatched" if they remained in the nest a minimum of three weeks, but no more than 28 days, or if they were located at nests that showed signs of hatching such as a pipped eggshell or tracks from chicks. We considered eggs "confirmed hatched" when chicks were observed at the nest or small chicks were observed within 1 m of the nest. For purposes of analysis, we combine presumed and confirmed hatched into "total hatched." We included unknown-outcome nests in nest counts, eggs produced, and mean clutch size calculations, but not in measures of productivity.

We observed heavy use of the enclosure by American Crows and rodent tracks throughout. Crows were observed caching pretzels in the colony. A one egg nest was observed inside the colony but it was predated within the week. A one egg nest was found north, outside of the enclosure but no adult tern was seen caring for it after the first day it was found.

Volunteer Monitoring and Outreach Events

Following the recommendations made in the Site Management Plan (Ryan and Vigallon 2010), the project team recruited volunteer observers from the local community and Audubon Chapters. LA Audubon biologist, Stacey Vigallon, coordinated volunteer recruitment, site maintenance, and monitoring efforts in 2016. The team held four volunteer training sessions between late April and the end of June 2016 for new volunteers, and also met with some volunteers individually to provide training. The project team discussed methods, purpose, and least tern identification. A team of volunteers with previous experience monitoring at the Venice colony initiated their monitoring sessions in mid April.

A total of 36 people signed up to monitor the tern colony, and 34 completed at least one monitoring session during the nesting season. Each volunteer observed the colony for a one-hour period at the same time once per week, and volunteers who were local residents also sent in reports of tern presence/absence while they were out on the beach near the colony participating in other activities. Volunteers reported their observations via e-mail, text, or phone to Ms. Vigallon, who conveyed urgent

reports immediately to Mr. Ryan and summarized each week's observations in a brief report to Mr. Ryan and management agencies. Volunteers monitored the colony from April 13 to August 17. There was an average of 12 visits per week (range=1-23), totaling 230 monitoring sessions and approximately 201 people-hours spent observing the Venice colony. Despite few nests and low tern numbers, volunteers continued monitoring colony use by any remaining adult least terns, adult and fledgling least terns stopping over from other colonies, and the crow population at and adjacent to the colony. This season, in order to better understand the movement of least terns between the Venice colony and Malibu Lagoon, a small team of volunteers also monitored Malibu Lagoon from mid-April to mid-August. Volunteers used a data form and protocol adapted from those used at the Venice colony and completed 34 monitoring sessions totaling 50 people-hours.

Colony maintenance tasks for 2016 were again completed by students and community members under the supervision of project staff. On March 13, 2016 students and community members (29 people total) collectively completed over 32 hours of maintenance in the colony. On September 25, 2016, a total of 106 participants collectively contributed 250 hours to colony maintenance tasks. Local community members, Toyota employees, and students, staff, and parents from five different Los Angeles Unified public schools were represented at the event. In total, we documented that volunteers spent approximately 530 hours assisting with the Venice colony in some capacity between March and October 2016.

In addition to volunteer activities, the team also coordinated outreach activities to promote least tern conservation. These included in-school presentations at several local public schools and outreach tables at the Los Angeles County Natural History Museum, Cabrillo Marine Aquarium, and other locations in Los Angeles. Staff established a contact within the Marina Peninsula Community Council to engage local residents in tern monitoring activities. And, early in the nesting season, we reached out to the local dog-owner community via social media to encourage dog-walkers in the area to avoid the beach surrounding the Venice colony.

Population Parameters

The project team estimated the total number of breeding pairs by subtracting an estimate of re-nesting pairs from the total number of nests.

Banding

No banding was conducted in 2016 as no chicks hatched.

Predation and Disturbance Monitoring

The project team monitored predation through personal observations during the colony monitoring, egg shocking station inspections, and by reports from the team of volunteer observers. Predation rates were totaled by adding the number of predated eggs found within and outside the colony. Volunteers also reported helicopters flying below 500 feet over the colony enclosure, as well as other human related disturbances they observed.

Results and Discussion

Table 1. The Numbers of Pairs, Nests and Fledglings at the Venice Beach Least Tern Colony 1977-2016.

Year	Number of Pairs ^a	Percent of Statewide Pairs ^b	Number of Nests	Number of Fledglings	Fledglings Per Pair	Percent of Statewide Fledglings ^b
1977	35	4.10%	N/A	30	0.86	5.70%
1978	68	8.20%	N/A	75	1.1	17.90%
1979	88	8.80%	N/A	140	1.68	20.10%
1980	158	13.50%	N/A	240	1.52	31.20%
1981	150	15.40%	N/A	195	1.3	23.40%
1982	170	16.60%	N/A	60	0.35	11.70%
1983	145	12.10%	N/A	140	0.97	15.70%
1984	83	8.60%	N/A	94	1.13	18.10%
1985	96	9.40%	N/A	113	1.18	17.30%
1986	104	10.80%	N/A	113	1.09	12.80%
1987	109	11.70%	N/A	82	0.75	13.00%
1988	165	13.20%	N/A	192	1.16	17.00%
1989	137	11.00%	N/A	134	0.98	17.50%
1990	206	12.10%	N/A	279	1.35	17.30%
1991	198	10.80%	N/A	200	1.01	11.20%
1992	229	10.90%	275	245	1.07	17.40%
1993	246	10.60%	219	288	0.85	14.20%
1994	345	12.40%	345	224	0.65	12.40%
1995	310	11.90%	354	44	0.14	4.10%
1996	271	8.00%	361	92	0.33	4.60%

Year	Number of Pairs ^a	Percent of Statewide Pairs ^b	Number of Nests	Number of Fledglings	Fledglings Per Pair	Percent of Statewide Fledglings ^b
1997	375	9.40%	400	263	0.7	8.20%
1998	383	9.20%	387	200	0.52	7.30%
1999	43	1.20%	50	0	0	0.00%
2000	274	5.90%	308	150	0.55	3.90%
2001	295	6.90%	348	388	0.91	8.50%
2002	2	0.10%	2	0	0	0.00%
2003	348	5.10%	371	181	0.52	6.90%
2004	24	0.40%	24	0	0	0.00%
2005	105	1.50%	90	0	0	0.00%
2006	276	3.90%	384	266	0.97	7.3 - 10.3%
2007	453	6.5 - 6.7%	546	413	0.91	15.6 - 18.0%
2008	468	6.1 - 6.7%	928	296	0.63	11.5 - 13.1%
2009	295	4.0 - 4.1%	344	0	0	0%
2010	93	1.40%	164	0	0	0%
2011	14	<1%	28	0	0	0%
2012	14	<1%	28	0	0	0%
2013	15	<1%	30	0	0	0%
2014	66	1.10%	81	79	1.2	3.50%
2015	40	<1%	15	0	0	0%
2016	2		1	0	0	0%

^a Values are number of least tern nests minus estimated number of renesting pairs.

^b Percent of statewide total of nesting pairs and fledglings, derived from means of ranges presented in annual reports prepared for the California Department of Fish and Game (see Marschalek 2008). The Venice Beach site is one of approximately 38 sites statewide.

N/A – not available

Table 2. Summary of least tern population estimates in 2013-2016.

Month	Volunteer Population Estimate Peak (Average)				Biologists' Population Estimate				Number of Nests Present			
	2013	2014	2015	2016	2013	2014	2015	2016	2013	2014	2015	2016
April	31	25	25	42	15	60	11	40	0	0	0	0
	(14.9)	(9.4)	(10.3)	(16.5)								
May	60	149	79	50	50	76	29	41	3	10	9	2
	(16.1)	(42.9)	(20)	(11.55)								
June	75	81	17	35	64	80	25	30	11	14	3	0
	(13.8)	(22.2)	(4.3)	(4.14)								
July	19	120	11	44	7	150	8	35	1	51	0	0
	(2.71)	(63.6)	(0.8)	(4.1)								
August		120	0	2	NS	120	0	0	0	0	0	0
	NS	(45.3)	0	(0.36)								

2016 Population Estimate

Least Terns were first seen at the Venice Beach Colony on April, 9th, 2016, about 12 days earlier than 2015. Their population was highest between April 27- May 19 with a peak of 41 individuals. Numbers declined between May 23 and May 26. On June 2, 22 individuals were observed and again numbers dropped. Between June 20-July 5 there was another peak with a high of 35 terns. No terns were observed after July 5.

Table 3. Summary of Nesting Statistics 2008-2016.

Statistic	2016	2015	2014	2013	2012	2011	2010	2009	2008
Total Nests	2	15	81	15	14	28	164	295	928
Estimated Re-nesting least terns	0	0	60	0	14	14	71	0	460
Total Estimated Nesting Pairs ^a	2	15	66	15	14	28 ^b	93 ^b	295 ^b	468
Total Eggs	2	15	120	15	14	28	165	585	1236
Mean Clutch Size (mean eggs per nest)	1	1.00 _b	1.48	1.00 _b	1.00 _b	1.00 _b	1.01 _b	1.77 _b	1.33
Number of Eggs Hatched	0	0	79	0	0	0	0	0	476
Hatching Success (eggs hatched of total eggs)	0%	0%	65.80%	0%	0%	0%	0%	0%	38.50%
Eggs lost to Predators	1	15	41	15	14	28	165	585	720
Percent of Total Eggs Lost to Predators	50%	100%	34.20%	100%	100%	100%	100%	100%	58.30%
Eggs abandoned and/or infertile	1	0	0	0	0	0	0	0	35
Percent of Total Eggs Abandoned/Infertile	50%	0%	0%	0%	0%	0%	0%	0%	2.80%
Known Mortality (dead chicks and fledglings)	0	0	2	0	0	0	0	0	134
Percent Mortality (of total chicks hatched)	0%	0%	2.20%	0%	0%	0%	0%	0%	21.2

Statistic	2016	2015	2014	2013	2012	2011	2010	2009	2008
First Fledgling count	0	0	55	0	0	0	0	0	124
Second Fledgling count	0	0	55	0	0	0	0	0	183
Third Fledgling count	0	0	14	0	0	0	0	0	17
Total Fledglings counted^c	0	0	79	0	0	0	0	0	296
Fledglings per Nest	0	0	0.97	0	0	0	0	0	0.32
Fledglings per Hatched Egg (chick survival)	0	0	0.9	0	0	0	0	0	0.62
Fledglings per Pair	0	0	1.2	0	0	0	0	0	0.63

^a The estimated number of pairs is the total number of nests, minus the estimated number of nests initiated by renesting pairs (from the same or other sites). This is impossible to determine accurately without uniquely banded birds and varies from site to site and year to year. However, based upon expected renesting after the loss of eggs and young to predation, abandonment, and natural mortality, the estimated number of renesting least tern pairs at Venice Beach in 2007 was 97.

The number of pairs is used to derive a statewide population estimate. Although less accurate than the number of nests, it is generally a better indicator of population status, as nest numbers will be high during years of high nest predation followed by renesting.

^b Both the number of eggs and estimated numbers of nests were derived from observation of predation events. This provided us with a measure of the number of eggs removed from the colony by crows. This was then divided by the mean clutch size (1.98) provided by Massey and Atwood (1981) to estimate the number of nests. The mean clutch size presented here is the summary of observed nests.

^c See Methods section of text.

2016 Nesting Activity

Nest Timing

Courtship activities were noted shortly after April 9. These included fish exchanges and courtship flights between adults. The first nest inside of the colony was placed on or before May 20, but there was predation by crows by May 23. On May 21, Stacey Vigallon and volunteers on a Snowy Plover survey found a tern nest outside of the colony on the northern stretch of the beach. It was quickly fenced off by Beaches and Harbors and monitored almost daily by biologists and volunteers. An adult tern was not seen near or on the nest after the date of its discovery. The last day the egg was present at the site was June 20. And on June 22, Stacey Vigallon observed that the egg was gone and there were crow tracks in the immediate area.

Productivity

Based on these observations, we estimate that at least 2 eggs were produced by least terns in 2016 (table 3). One was predated and the other was abandoned. The nest inside the colony was

predated within a week and the nest outside the colony was observed, without an adult tern present, for at least a month before it was predated. No chicks hatched and no young fledged in 2016.

Predation and Human Disturbance

Predation

In 2016, American Crows were the most common predator observed during monitoring sessions. The only egg discovered at the colony was found predated 3 days after its discovery. The egg found outside of the colony was gone about a month after its discovery with crow tracks observed at the site. Other potential predators observed within the vicinity were Great Blue Heron, Night Heron, domestic dogs, cats, and rat tracks.

In 2016, we observed higher crow presence in April, May, and June than in previous years. It then returned to similar numbers as previous years in July and August. We suspect the increase of crow presence is due to a feeding station nearby that laid out peanuts for crows. After the biologist spoke with the person about not using peanuts to feed the birds, they then started using peanut butter filled pretzels. This may have contributed to the increase of rodent tracks this year.

In 2016, in collaboration with Biologists from Loyola Marymount University’s Center for Urban Resilience we have been deploying and studying aversion through the use of electrified eggs.

Table 4. Crow activity near and within the least tern colony in 2005 to 2015.

Average Obs.	2005-15 Average	2005-15 Std. Dev.	2005-15 Min	2005-15 Max	2013	2014	2015	2016
Apr	6.3	2.79	1.3	11	11	6	8.3	
May	5.4	2.14	2.6	10.5	5.6	10.5	6.4	22.5
Jun	5.7	3.3	1.5	13.7	7.5	13.7	8.5	19.2
Jul	4.4	2.16	1	7.2	7.2	7.2	5.6	5.3
Aug	5.9	2.41	3	8.9	ns	5.9	8.9	5.5
Flying Over/hr.	2005-15 Average	2005-15 Std. Dev.	2005-15 Min	2005-15 Max	2013	2014	2015	2016
Apr	5.9	4.98	1.1	19.2	19.2	4.8	7.3	
May	4.1	1.83	1.5	8.5	4.1	8.5	4.8	4
Jun	3.8	2.37	0.6	8.1	5.3	8.1	7.7	6

Jul	2.4	1.57	0.3	4.5	4.3	4.3	4.5	1.3
Aug	2.9	1.63	0.6	5.4	ns	3.9	5.4	0
Landing/ hr.	2005-15 Average	2005-15 Std. Dev.	2005-15 Min	2005-15 Max	2013	2014	2015	2016
Apr	3.2	2.59	0.5	8.6	8.6	0.8	7.3	
May	2.8	1.8	1.5	7.6	3.4	7.6	3.6	6.9
Jun	2.5	2.28	0.5	7	5.1	7	5.7	5.3
Jul	1.7	1.39	0	3.8	3.4	3.8	3.1	2.7
Aug	2.1	1.77	0.2	4.2	ns	3.3	4.2	4
Eggs Removed /hr.	2005-15 Average	2005-15 Std. Dev.	2005-15 Min	2005-15 Max	2013	2014	2015	2016
Apr	0	0	0	0	0	0	0	
May	0.1	0.14	0	0.4	0	0	0.1	0.1
Jun	0.1	0.16	0	0.4	0	0.1	0	0.1
Jul	0.3	0.94	0	3	0	0	0	0
Aug	0.1	0.13	0	0.3	ns	0	0	0

Human Disturbance

Historically, the most frequently reported human disturbance events have involved helicopter flyovers and Fourth of July fireworks. Those have continued onto 2016. Off leash dogs continue to be a common observation as well, with 646 off leash dogs and 511 on leash dogs reported on the beach. Most were observed east of the colony between the colony and the breakwater. Other observations are of a surf camp, and homeless camping.

In 2016, there were 230 total observations but not all volunteers provided consistent data on human use. But, some general trends can still be noted during the 18 consecutive weeks of volunteer monitoring. The largest number of people present on the beach during one observation period was 327, with the highest levels of activity counted on the west side of the colony. Volunteers reported the presence of vehicles during 35% of observation sessions, with the highest number of vehicle observations located on the west side of the colony. The presence of helicopters was reported during 28% of observation sessions. Small drones were also reported over or near the colony during the

following dates: May, 14, May 20, May 25, May 30, May 31, June 11, June 12, July 3, July 24, and August 7. Volunteers recorded the presence of dogs on the beach on or along walkways during 71% of observation sessions: on leash dogs were recorded during 53% of observation sessions, and off leash dogs were recorded during 57% of observation sessions. Dogs were observed more frequently on the east side of the colony, near the residences.

On or before June 10, 2014, a local resident on Union Jack Street approximately 350 feet north of the colony began feeding crows shelled peanuts by scattering them each day on her driveway. Biologists found these peanuts being cached throughout the colony. Biologists observed crows flying into the colony with these peanuts on most days. Both the USFWS and California Department of Fish and Wildlife were contacted in both 2014 and 2015. Upon receiving information that neither agency intended to take action, the Colony Biologist contacted the resident on June 23, 2015 and she agreed to stop feeding peanuts and only feed sunflower seeds. During the 2016 season, biologists found fresh peanut shells inside of the colony and observed crows caching pretzels inside of the colony as well. Upon further investigation, biologists found the same feeding station as was discovered in 2014, with a spread of sunflower seeds and pretzels. A second feeding station was also providing peanuts to crows and other wildlife.

Band Reports and Banding

Band Reports

No adults were captured at Venice in 2016.

Banding

No chicks hatched in 2016, therefore none were banded.

Recommendations

For this, and future reports, we refer to the *Site Management Plan for the Venice Beach Least Tern Colony Marina Del Rey, California* (Ryan and Vigallon 2010) for general recommendations that have frequently been carried through on previous reports. Here we make recommendations that in some way expand upon the Management Plan.

1. We recommend that shock aversion continue to be used at the Venice Colony. Colony biologists suggest that the ultimate cause of a lack of productivity at the colony is a lack of adult diurnal attendance, likely caused by a lack of prey availability near the colony. The American Crows opportunistically then feed on the eggs in the absence of the adults. In years with higher adult attendance, crow predation is still a problem, but typically only accounting for 20-30% of egg loss.
 - a. We suggest that the aversion appears to reduce transient crows repeatedly feeding at the colony. The local crows appear to be able to investigate and defeat the aversion nests relatively quickly. Both local and transient crows repeatedly feeding at the colony. But when the continuous presence of cached food items presents itself within the nesting area then repeated crow foraging activity is reinforced. Once expanded numbers of crows are attracted to the nesting area to forage, then the successful eating

of even a few actual tern eggs is reinforced and mimicked by associated crows. . (We have no evidence of this being the case, in fact evidence from 2014 supports just the opposite). In order to overcome this, in 2017, we recommend using large number (200+) of dummy eggs painted like least terns eggs. The hope is that this saturation will confuse the crows and reduce their foraging efficiency the likelihood of positive reinforcement; making least tern eggs a less attractive food item.

2. We recommend creating a community outreach program to make people aware that pet food kept outside and uncovered trash and garbage attract crows. Also, confirm that all trash cans have covers as part of the early March assessment.
3. We recommend continuing to work with local residents to discourage supplemental feeding of crows using peanuts, pretzels, and other high energy, attractive food sources.
4. We recommend investigating other measures to harass crows that land on the colony. Ideas discussed in the past have been burning lasers and paint-ball guns.

ACKNOWLEDGEMENTS

We would like to thank the following volunteers for participating in Least Tern monitoring in 2016 at the Venice Colony:

Adriana Baltazar	Joyce Realegeno
Aleks Krotoski	Judith Thompson
Ben Hammersley	Julie Gonella
Carol Muchin	Katie Lulla
Charlotte Maddela	Kei-Lwun Yee
Dorothy Steinicke	Laurel Jones
Edgar Pedroza	Mary Cruz
Felisha Wong	Sofia Conti
Gil Conn	Susan Considine
Grace Murayama	Suzanne Ely
Greg Gladkov	Tara Treiber
Hank Borenstein	Vanessa Lulla
Jane Beseda	Anthony Maddela
Janie Russell	Audrey Bell
Jerry Muchin	Isabel Carrel
John Rowden	Malena Bell
Josephine van Willigenburg	Susan Maddela

Many thanks also to Toyota, Dorsey High School, ASE, Gardena High School, and 186th Street Elementary School for their continued participation in habitat restoration at the colony. We would like to thank Environment for the Americas for partnering with Los Angeles Audubon to provide an internship that allowed Joyce Realegeno to help serve as a field technician. We would like to thank the Disney Worldwide Conservation Fund for providing financial support for this project during the 2016 season. And, we would like to commend the efforts of our returning field technician, Carlos Jauregui.

LITERATURE CITED

- Atwood, J., P. Jorgensen, R. Jurek, and T. Manolis. 1977. California least tern census and nesting survey, 1977. Nongame Wildlife Invest., Final Report. California Department of Fish and Game, Sacramento, CA.
- Chambers, W.L. 1908. The present status of the least tern in Southern California. *Condor* 10:237.
- Comrack, L. 2001. Venice Beach least tern colony enlargement and fence replacement. California Department of Fish and Game Report. November 29, 2001.
- Grinnell, J., and A.H. Miller. 1944. The distribution of the birds of California. *Pacific Coast Avifauna* 27.
- Keane, K. 2001. Breeding biology of the California least tern in Los Angeles Harbor, 2001 season. Prepared for the Port of Los Angeles, Environmental Management Division, under contract with the Port of Los Angeles, Agreement No. 2142.
- Marschalek, D.A. 2009. California least tern breeding survey, 2008 season. California Department of Fish and Game, Wildlife Branch, Nongame Wildlife Program Report, 2009-02. Sacramento, CA. 23 pp + appendices.
- Massey, B. W., and J. L. Atwood. 1981. Second-wave nesting of the California least tern: Age composition and reproductive success. *Auk* 98: 596-605.
- Ryan, T. P., and D. A. Kluza. 1999. Additional records of the least tern from the west coast of Mexico. *Western Birds* 30: 175-176.
- Ryan, T.P., and M.D. Taylor. 2004. Breeding biology of the California least tern in Venice Beach, 2004 breeding season. Prepared for the California Department of Fish and Game, Keane Biological Consulting, Long Beach, CA.
- Ryan, T. P. 2005. Breeding biology of the California least tern in Venice Beach, 2005 breeding season. Prepared for the California Department of Fish and Game, Keane Biological Consulting, Long Beach, CA.
- Ryan, T. P. 2006. Breeding biology of the California least tern in Venice Beach, 2006 breeding season. Prepared for the California Department of Fish and Game, Foothill Associates, Stevenson Ranch, CA.
- Ryan, T. P., L. Seckel, and S. Vigallon. 2007. Venice Beach least tern colony habitat improvement and restoration study: 2006-07 preliminary results. Prepared for the California Department of Fish and Game, Office of Oil Spill Prevention and Response, SWCA Environmental Consultants. South Pasadena, CA.
- Ryan, T. P., and S. Vigallon. 2010, G. Dunno, S. Magier, and A. Delnevo. Venice Beach least tern colony habitat improvement and restoration study: 2006-09. Prepared for the California Department of Fish and Game, Office of Oil Spill Prevention and Response, Ryan Ecological Consulting. Pasadena, CA.
- Ryan, T. P., and S. Vigallon. 2010. Site Management Plan for the Venice Beach least tern colony, Marina Del Rey, California. Prepared for the California Department of Fish and Game, Office of Oil Spill Prevention and Response, Ryan Ecological Consulting. Pasadena, CA.
- Ryan, T. P., and S. Vigallon. 2013. Breeding Biology of the California Least Tern at Venice Beach, Marina Del Rey, California in the 2013 Breeding Seasons. Prepared for the California Department of Fish

and Game, Office of Oil Spill Prevention and Response, Ryan Ecological Consulting. Monrovia, CA.

Ryan, T. P., S. Vigallon, G. Dunno, S. Magier, and A. Delnevo. 2010. Venice Beach Least Tern Colony Habitat Improvement and Restoration Study, 2006-2009. Prepared for the California Department of Fish and Game, Office of Oil Spill Prevention and Response, Sacramento, CA, Ryan Ecological Consulting, Pasadena, CA. 34 pp.

Thompson, B. C., J. A. Jackson, J. Burger, L.A. Hill, E.M. Kirsch, and J. L. Atwood. 1997. Least tern (*Sterna antillarum*). In *The birds of North America*, No. 290 (A. Poole and F. Gill, eds.). Academy of Natural Sciences, Philadelphia, PA, and American Ornithologists' Union, Washington, D.C.