Santa Clara Valley Habitat Agency

Burrowing Owl Supplemental Feeding Study – Phase II

Progress Report No. 2
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Prepared by
Talon Ecological Research Group
Philip G. Higgins
Sandra Menzel

Prepared for
Santa Clara Valley Habitat Agency
Edmund Sullivan
535 Alkire Avenue, Suite 100
Morgan Hill, CA 95037

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Introduction

This report summarizes the methods and results for Phase II of the Burrowing Owl Supplemental Feeding Study that Talon Ecological Research Group conducted for the Santa Clara Valley Habitat Agency in Santa Clara County, California. We conducted this work during the peak of the 2021 breeding season for burrowing owls from February 21 to September 30. This Phase II of the Supplemental Feeding Study follows up on the success of Phase I of this project that we conducted during the 2017−2019 breeding seasons.

We fed burrowing owls at three historical breeding sites during the 2021 breeding season. All three sites are located within the Santa Clara Valley Habitat Plan area: Shoreline Regional Wildlife Area (Shoreline), NASA Ames Research Center at Moffett Field (Moffett), both located in the City of Mountain View, and the San Jose-Santa Clara Regional Wastewater Facility (RWF) in Alviso. This report includes supplemental feeding for both the Juvenile Burrowing Owl Overwintering Project and wild owls as both projects overlapped, occurring during the same time period and at the same sites.

We started supplemental feeding on February 26 at RWF when we soft-released three single males into hacking enclosures as part of the Juvenile Overwintering Project. We started feeding wild pairs on March 2 at Shoreline and April 12 at Moffett. No breeding burrowing owls were observed at the Don Edwards National Wildlife Refuge - Warm Springs Unit (Warm Springs) in Fremont, thus no supplemental feeding occurred at this site. We began feeding wild owls as soon as we observed them pairing up or we detected evidence of breeding activity (decoration and nesting material at the burrow entrance) at potential nest burrows. Supplemental feeding was discontinued when we confirmed that a nest burrow was no longer active or hatchling owls had fledged.

Methods

Early during the 2021 breeding season, we started to conduct walk-through transect surveys at all sites to locate burrowing owl pairs. We conducted the first survey during February at the RWF, March at Shoreline, and during April at Moffett. When we detected evidence of breeding activity at a potential nest burrow (presence of a pair, decoration, or nesting material), we commenced supplemental feeding at that location.

We assigned each burrow location (primary nest as well as satellite burrows) a unique identifying number (either a historical or new number) and recorded all activity at that location (number of individuals, behaviour, nesting material, decoration, prey remains etc.). We also recorded the banding status of each owl as either banded, unbanded, or unknown). If banded, we noted the band color and alphanumeric code of each Acraft band on a data sheet. We recorded GPS coordinates for each burrow and marked the location on a map.

Motion detection trail cameras were installed at each nest burrow to assist with band identification of adults, detection of nestlings, brood size, approximate age of young, and predator activity.

Adult frozen mice were purchased from Layne Labs, Inc. and stored in a freezer until the day of feeding. We thawed all mice in water prior to feeding to reduce the odor and prevent flies as well as potential scavengers/predators from being attracted to the carcasses.

Supplemental Feeding Study Protocols

Mice were defrosted in advance of feeding by taking them out of the freezer and placing them in the refrigerator in zip lock bags filled with water until thawed.

Before approaching each nest burrow, we first scanned the area and ensured that no predators of burrowing owl were nearby. Especially aerial predators are of concern because they could prey on burrowing owls if flushed from their burrow. If predators were present, we did not approach the burrow until the predators had moved out of sight. We placed all mice deep inside the burrow entrance so predators/scavengers could not see the mice near the burrow.

At each feeding location, we recorded the number of owls observed, both adults and young, and also noted the number of mice provided during each feeding.

Weekly Supplemental Feeding Schedule (wild owls)

We fed mice to each pair of owls according to the following schedule:

Week	Number of mice/week	Number of feedings/week
Week 1	2 mice	1 feeding
Week 2	4 mice	1 feeding
Week 3	8 mice	2 feedings
Week 4+	14 mice	2−3 feedings

During the first week, each pair received two mice to get the owls used to dead mice inside the burrow entrance. When feeding increased to four mice twice per week during Week 3, we waited at least three days between feedings. From the fourth week onward, each pair received 14 mice per week over 2−3 feedings.

Feeding at each nest burrow continued until the young were observed foraging for themselves, had moved a significant distance from the natal burrow (> 200 feet), or no young were observed near the burrow.

We trapped and banded adults and young at each nest burrow and collected the following data: weight, tarsus length, wing chord, and approximate age of young. Upon completion of trapping, we analyzed the data and calculated reproductive rates.

Results

Shoreline Summary

At Shoreline, we observed a total of five pairs of owls attempting to breed during 2021 (Table 1, Figure 1). Of these five pairs, only two successfully reproduced. One pair had four nestlings of which none survived to fledging. Images from trail cameras revealed activity of a great-horned owl and red fox at the burrow entrance on several occasions. After the predators were captured on camera, we no longer detected the nestling owls. The second pair of owls had two nestlings, of which one fledged.

Of the five pairs, three pairs and one single female were owls we released as part of the 2020 Juvenile Overwintering Project. The single female paired up with an unbanded male. The fifth pair were siblings hatched at Moffett during 2019. They successfully produced offspring at Shoreline during 2020 but were not successful during 2021. The female from this sibling pair actually abandoned her nest at one stage and moved to Moffett where she paired up with a different male, but did not produce any young. The female then returned to Shoreline to pair up with her sibling again, with no success.

Table 1. Adult band identification, nest status, and feeding timeline at Shoreline.

Burrow Number	Male Band Identification	Female Band Identification	Nest Status	Feeding Timeline
143	Red over black D6	Red over black E9	Failed	March 2 – August 31
227	Blue M15*	Blue M02*	Failed	March 2 – August 31
226	Blue M44*	Blue M63*	4 young	March 2 – August 31
86	Red/blue 5N	Blue M58*	Failed	March 2 – August 31
84	Blue M51*	Blue M28*	2 young	March 2 – August 31

*Adult released as part of the 2019 Juvenile Burrowing Owl Overwintering Project–Phase 1

Moffett Field Summary

We observed three breeding pairs at Moffett Field (Table 2, Figure 2). One pair on the airfield at nest burrow #282, and two pairs in the Eastside Airfield #7 owl preserve at nest burrows #20 and #279. Both pairs within the owl preserve were successful: the pair at nest burrow #280 produced four young, while the pair at nest #279 produced three young. The pair on the airfield was not successful. This pair was not supplementally fed as feeding was not permitted on the airfield.

Table 2. Adult band identification, nest status, and feeding timeline at Moffett Field.

Burrow Number	Male Band Identification	Female Band Identification	Nest Status	Feeding Timeline
280	Red over black A9	Red over black 4U	4 young	April 12 – August 6
279	Red over black 5P	Red over blue 2K	3 young	April 12 – August 6
282	Red over blue 2U	Red over black E9*	Failed	-

*moved from Shoreline after failed nesting attempt, then returned to Shoreline after nest failure at Moffett

San Jose-Santa Clara Regional Wastewater Facility Summary

At the RWF, we observed a total of six nesting pairs during 2021 (Table 3, Figure 3). On February 26, we soft-released three single males (band codes: blue M12, M48 & M73) from the Juvenile Burrowing Owl Overwintering Project into a single hacking enclosure. These males were kept in the enclosure until March 12 and were fed two mice each, daily. Upon removal of the enclosure, two males remained on site and paired up with females. One male (blue M12), successfully produced five young with a female that hatched at Moffett (black over green SP). The other released male did not reproduce.

On March 19, three pairs of burrowing owls from the Overwintering Project were released into enclosures 1, 2 & 3. Supplemental feeding occurred daily for the duration of the time the owls were kept in the enclosures: enclosures 1 and 2 were removed on April 16, after we observed six eggs in enclosure 1 and four eggs in enclosure 2. We did not observe eggs in enclosure 3, even after delaying removal of the enclosure until May 1. The female in this enclosure (blue M59) was a rehabilitated owl from the Silicon Valley Wildlife Rescue Center. Since she was a rescue, her age was unknown; possibly she was past reproductive age. Unfortunately, trail camera data showed that this female died/was killed and was carried away by an opossum. None of these three released pairs produced offspring, even though two of the females had laid eggs.

The only other pair that successfully reproduced at RWF during 2021, nested at burrow #50 and produced four young. This was the second year in a row that this pair successfully reproduced. The female (blue M70) was released as part of the Juvenile Overwintering Project in 2020, while the male hatched at RWF (black over green D8).

Table 3. Adult band identification, nest status, and feeding timeline at the RWF.

Burrow Number	Male Band Identification	Female Band Identification	Nest Success	Feeding Timeline
50	Black over green D8	Blue M70	4 young	May 3 – July 9
E1	Blue M05	Blue M67	Failed	March 19 – August 13
E2	Blue M46	Blue M20	Failed	March 19 – August 30
E3	Blue M37	Blue M59	Failed	March 19 – June 17
90	Blue M48	Red over black DE	Failed	May 3 – July 15
91	Blue M12	Black over green SP	5 young	May 3 – July 9

*Adult released during 2019 Juvenile Burrowing Owl Overwintering Project–Phase 1

Warm Springs Summary

No burrowing owl pairs were observed at Warm Springs during the 2021 breeding season.

Table 4. Number of breeding pairs, number of successful pairs, and percent nest success at four sites where burrowing owls were supplementally fed during the breeding season, 2015−2021.

Site	Year	Number of Pairs (Females)	Number of Successful Pairs (Females)	Percent Nest Success
Shoreline	2015	3	1	33
	2016	2	1	50
	2017	2	0	0
	2018	2	2	100
	2019	1	1	100
	2020	8*	8*	100*
	2021	**5**	**2**	**40**
Moffett Field	2015	8	3	38
	2016	6	3	50
	2017	5	4	80
	2018	6	6	100
	2019	5	1	20
	2020	2	1	50
	2021	**3**	**2**	**67**
Alviso (RWF)	2015	10	9	90
	2016	13	12	92
	2017	17	9	53
	2018	9	7	78
	2019	5	4	80
	2020	3	2	67
	2021	**6**	**2**	**33**
Warm Springs	2015	3	3	100
	2016	4	2	50
	2017	4	2	50
	2018	3	1-2	33-67**
	2019	1	0	0
	2020	0	0	0
	2021	**0**	**0**	**0**

*One double-brood , same female and male (9 successful nesting attempts by 8 females)
**Insufficient field data to determine accurate breeding outcome

Conclusion

In 2021, we observed a total of 14 breeding pairs at three sites included in the Supplemental Feeding Study, whereas during the 2020 breeding season we observed 12 pairs (Table 4). Releases from the Juvenile Burrowing Owl Overwintering Project contributed a total of eight females and eight males, resulting in a total of six pairs in 2021.

During 2021, six pairs reproduced successfully, compared to 11 successful nesting attempts in 2020. Reproductive success was not as high in 2021 (n=14) compared to 2020 (n=13). Percent nest success at each site was as follows during 2021 and (2020): Shoreline 40% (100%), Moffett 67% (50%), and RWF 33% (67%). Overall, the number of breeding adults is experiencing a steady decline (Figure 1).

Biologists in British Columbia, Canada, and in San Diego reported that reproductive success of burrowing owls in these regions was also below average during 2021. One contributing factor could be impacts from the severe drought. For example, grass growth was greatly reduced during 2021, whereas non-native invasive weeds such as mustard, stinkwort, and pepperweed were dominant. These patterns may have impacted the food availability for prime burrowing owl prey including harvest mice and grasshoppers. During transect surveys in past summers, grasshoppers were usually very abundant; however, during 2021 we observed very few or no grasshoppers at all sites.

Overall, the Supplemental Feeding Study was crucial to the survival of breeding burrowing owls and their offspring and we recommend continuation of this work during the 2022 breeding season.

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Santa Clara Valley Habitat Agency

City of Mountain View, Shoreline Staff

NASA Ames Research Center at Moffett Field

City of San Jose

United States Fish and Wildlife Service

California Department of Fish and Wildlife

Shoreline Regional Wildlife Area

Nest #	84	226	227	86	143
Female	Blue M28	Blue M63	Blue M02	Blue M58	Red/black E9
Male	Blue M51	Blue M44	Blue M15	Banded 8/2 R/blue 5N	Red/black D6
Nest Status	**2 chicks**	**4 chicks**	Failed	Failed	Failed

Successful Pair Failed Pair

Figure 1. Burrowing owl nest locations at Shoreline during the 2021 breeding season.

NASA Ames Research Center at Moffett Field

Nest #	279	280	282
Female	Red/blue 2K	Red/black 4U	Red/black E9
Male	Red/black 5P	Red/black A9	Red/blue 2U
Nest Status	3 chicks	4 chicks	Failed

Successful Pair Failed Pair

Figure 2. Burrowing owl nest locations and single owl at Moffett Field during the 2021 breeding season.

San Jose-Santa Clara Regional Wastewater Facility

Nest #	50	E1	E2	E3	90	91
Female	Blue M70	Blue M67	Blue M20	Blue M59	Red/black DE	Black/green SP
Male	Black/green D8	Blue M05	Blue M46	Blue M37	Blue M48	Blue M12
Nest Status	4 chicks	Failed	Failed	Failed	Failed	5 chicks

Successful Pair Failed Pair

Figure 3. Burrowing owl nest locations at San Jose-Santa Clara Regional Wastewater Facility during the 2021 breeding season.

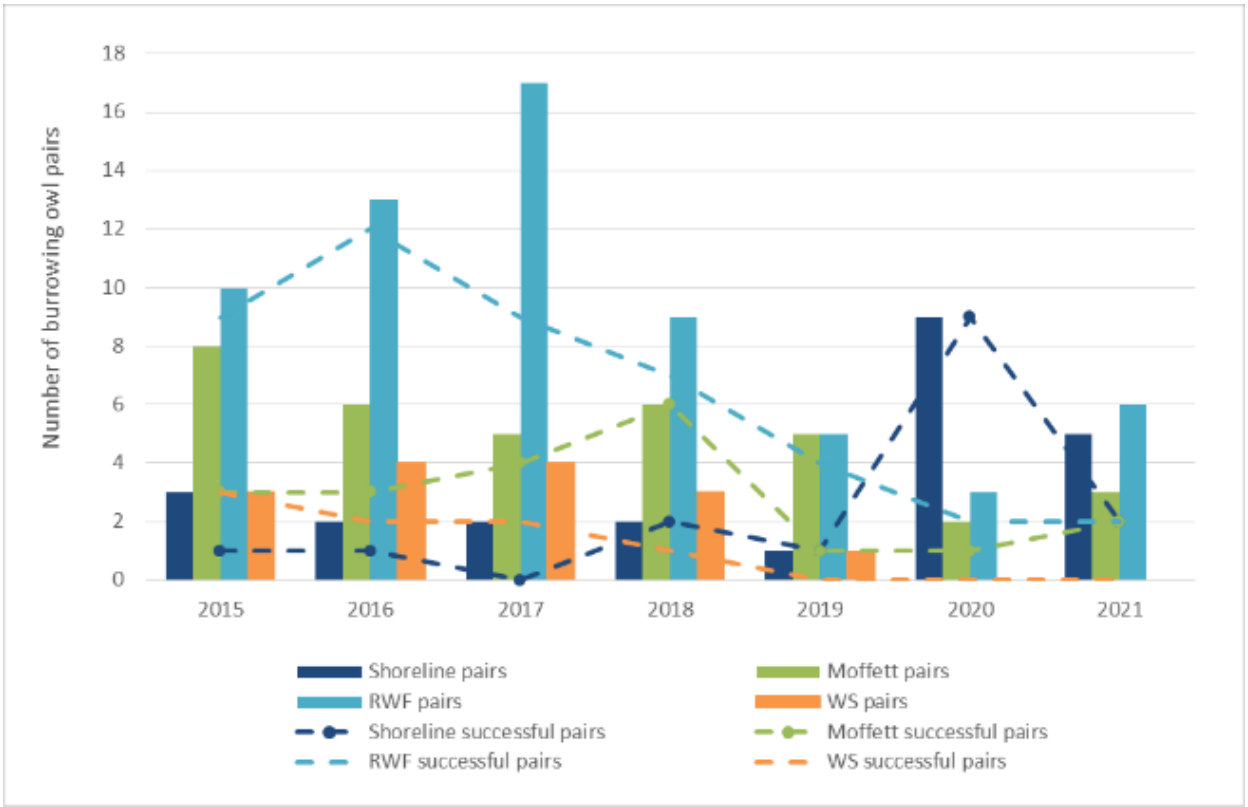

Figure 4. Number of all pairs and number of successful pairs at four sites where burrowing owls were supplementally fed during the breeding season, 2015−2021.

Appendix 1. Trail camera photos taken during the Supplemental Feeding Study in 2021.

Photo 1. Pair of burrowing owls with a mouse at RWF #91.

Photo 2. Two juveniles at natal burrow RWF#50.

Photo 3. Female burrowing owl with four young at natal burrow #226 at Shoreline.

Photo 4. Burrowing owl capturing a live mouse at Enclosure #1, RWF.