

# Rare Butterfly Monitoring and Translocation

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## TASK 1.4:

*2017 HARBISON'S DUN SKIPPER FLIGHT SEASON SURVEYS*  
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## Table of Contents

Table of Contents .....	2
Figures .....	3
Tables .....	3
Executive Summary .....	4
Introduction .....	5
Methods .....	6
Adult Surveys .....	6
Genetic Samples .....	7
Results .....	7
Adult Surveys .....	7
Genetic Samples .....	8
Discussion .....	8
Conclusions .....	9
Acknowledgements .....	9
Literature Cited .....	10
Appendix A: 2017 adult Harbison's dun skipper observations .....	11

## Figures

Figure 1. Harbison's dun skipper distribution in 2015. ....	6
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## Tables

Table 1. Comparison of Harbison's dun skipper annual adult population sizes. ....	7
Table 2. Number of non-lethal genetic samples obtained from Harbison's dun skipper adults. ....	8

## Executive Summary

The Harbison's dun skipper (*Euphyes vestris harbisoni*) has a very restricted distribution in southern California and northern Mexico and entomologists have expressed concern that threats will lead to the extirpation of populations. The larvae of this skipper feed only on San Diego sedge (*Carex spissa*) and are generally associated with riparian oak woodlands.

Surveys for Harbison's dun skipper adults were conducted to assess year to year variation in population size and to collect non-lethal genetic samples. Field visits were also used to document plants used for nectar sources. The 2017 counts were generally low, and there was not a clear relationship between the 2016 and 2017 counts as some were higher and some lower. We were able to collect 16 genetic samples including the first from Santa Margarita Trail, a second from Fox Springs, and samples three and four from Pamo Valley. Efforts were focused on sites with small populations and few previous samples, likely the reason for the low number of 2017 samples.

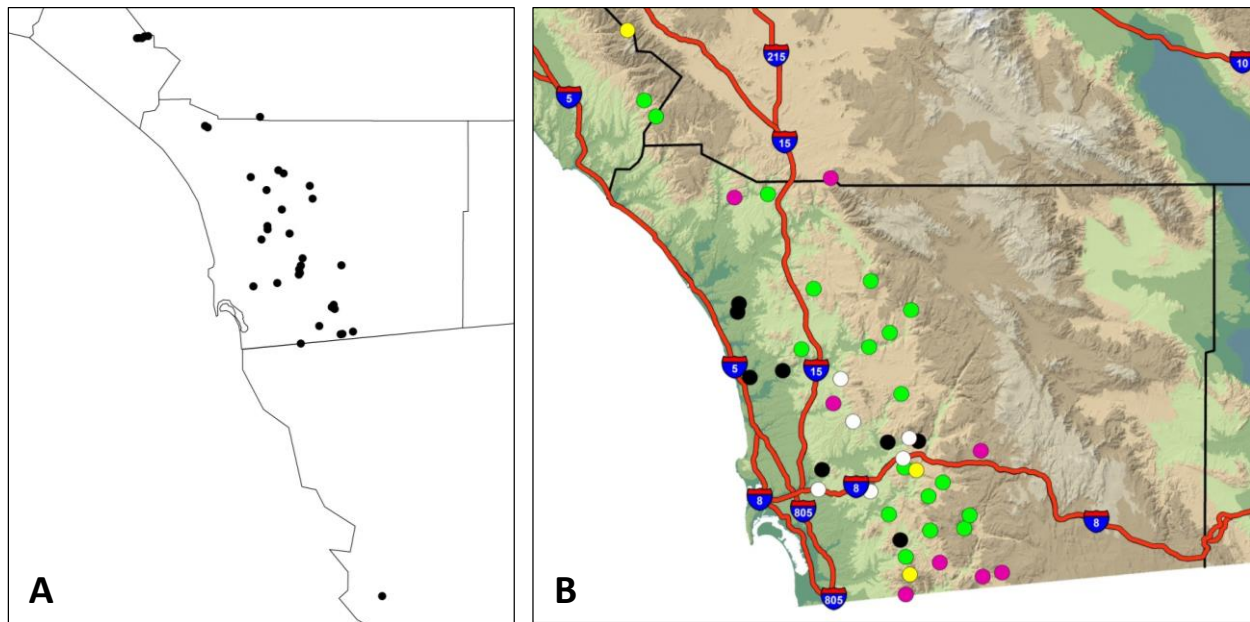
While past years have been dry, the 2016-2017 winter had several rainstorms, each with several inches of precipitation. Soil and vegetation, including San Diego sedge, were removed in locations, altering the skipper's habitat within the oak woodlands. It was also commonly observed that the sedge leaves were knocked down by water. Removal of sedge by high water flow is clearly a threat to the skipper, but it is unknown if short-term flooding of the sedge is a threat to the larvae. To provide a complete report, we included all 2017 Harbison's dun skipper survey data, including our surveys not funded by this project.

## Introduction

The Harbison's dun skipper (*Euphyes vestris harbisoni*) is restricted to southern Orange County, extreme western Riverside County, and San Diego County (Brown and McGuire 1983, Marschalek and Deutschman 2015a), with one record from Mexico (Marschalek and Deutschman 2015a). Entomologists have expressed concern that the skipper is rare and may be negatively impacted by habitat loss and degradation (Brown 1991, Glassberg 2001). In 1989, the United States Fish and Wildlife Service (USFWS) issued a notice of review, on which Harbison's dun skipper was listed as a Category 2 species (USFWS 1989).

Prior to our initial efforts in 2013, nearly all of the known information about this skipper was restricted to descriptions in two published papers (Brown 1982, Brown and McGuire 1983). These papers identified this subspecies as morphologically different from the other subspecies and describe its biology (life history and nectaring sources) and distribution. The larvae of this skipper feed only on San Diego sedge (*Carex spissa*) and are generally associated with oak woodlands. The distribution of the skipper includes southern Orange County and San Diego County, with the skipper present in nearly all areas containing considerable numbers of the sedge. Brown and McGuire (1983) also mentioned that the skipper appears to be facing several threats related to urbanization and development. They recorded a local extirpation at Adobe Falls in San Diego due to development, pollution, and subsequent invasion of the riparian area by non-native plants.

We updated and expanded on what was known about the skipper by conducting surveys as part of a project funded by a CDFW Local Assistance Grant (Marschalek and Deutschman 2015a) and a previous SANDAG contract (Marschalek and Deutschman 2016, 2017). Based on these surveys for larvae and adults in 2013-2016, the current Harbison's dun skipper distribution includes the foothills in the northern and southern parts of San Diego County, extreme western Riverside County, and southern Orange County (Figure 1). In San Diego County, there appears to be a significant gap around the Poway area due to local extirpations likely resulting from wildfires. It is unclear whether the skipper currently occupies Silverado Canyon, its northernmost location, following the 1987 Silverado Fire. Extirpation from Silverado Canyon would represent a substantial range contraction. To the south, the Harbison's dun skipper has been documented in northern Baja California, Mexico. Skipper observations from Riverside County and Mexico are not represented in the published literature. There are a number of threats to the Harbison's dun skipper, including recent extirpations further reducing its distribution, habitat alteration/loss, wildfires, drought, grazing, and habitat degradation associated with the spread of the goldspotted oak borer (*Agrilus auroguttatus*).



**Figure 1.** Harbison's dun skipper distribution in 2015. A: Map shows all known locations regardless of current status. B: Map of all known locations in the United States with current status (green = extant, yellow = probably extant but uncertainty exists, white = extirpated, purple = not surveyed). From Marschalek and Deutschman (2015a).

Additional surveys are warranted to assess annual variation in population size, quantify habitat use, further investigate threats, and collect genetic samples to describe gene-flow from which we can infer dispersal.

## Methods

### Adult Surveys

We conducted surveys for Harbison's dun skipper adults at sites where we had previously detected adults. Surveys consisted of systematic searches around San Diego sedge patches conducted during periods of appropriate weather (sunny or partly sunny, 24 to 35 degrees C, and modest wind speeds). These surveys will provide an index of population size, help evaluate skipper detectability, and describe the adult flight season phenology, behavior, and nectaring sources. We focused our efforts on sites in northern San Diego County to better describe those populations and obtain genetic samples, as well as a few sites in southern San Diego County to assess annual variation. The southern sites included Barrett Lake, Hollenbeck Canyon Wildlife Area, and Loveland Reservoir.

### Genetic Samples

Non-lethal genetic samples were collected from adults in preparation for a landscape genetics project planned for the near future. This involved capturing adults, removing a middle (mesothoracic) leg and placing the leg in ethanol, and marking the skipper prior to release. Marked individuals were not recaptured to avoid duplicate sampling and reduce further damage. Previous sampling had yielded greater sample sizes in the southern portion of San Diego County so the 2017 efforts focused on northern populations as well as those fewer samples already collected.

## **Results**

### Adult Surveys

We were able to detect Harbison's dun skipper adults at all three of our 2017 reference sites (Barrett Lake, Hollenbeck Canyon Wildlife Area, and Loveland Reservoir) (Table 1). Counts were similar at Hollenbeck Canyon Wildlife Area and Loveland Reservoir for 2016 and 2017, one to two higher and one lower, respectively. The number of skippers observed at Barrett Lake was much lower in 2017. The riparian vegetation, including the San Diego sedge, was greener and lusher compared to the previous years. However, at several sites, the riparian topography and vegetation was different in years past due to erosion from high water flow. This included moving San Diego sedge plants.

**Table 1. Comparison of Harbison's dun skipper annual adult population sizes.**

<b>Location</b>	<b>2013 Highest Count*</b>	<b>2014 Maximum Count</b>	<b>2016 Maximum Count</b>	<b>2017 Maximum Count</b>
Barrett Lake	6-8	4	11	1
Hollenbeck Canyon Wildlife Area	6-10	5-6	2	3-4
Loveland Reservoir	8	4-5 or 3-6	3	2

\*2013 numbers do not necessarily represent an index of maximum adult numbers due to limited surveys. For this reason, the 2013 counts are not directly comparable to the other years.

In 2017, we observed adults nectaring on California buckwheat (*Eriogonum fasciculatum*), coastal bushmallow (*Malacothamnus fasciculatus*), and narrow-leaf milkweed (*Asclepias fascicularis*). These plant species have been previously recorded as nectar sources for the Harbison's dun skipper (Marschalek and Deutschman 2016).

## Genetic Samples

During surveys for Harbison's dun skipper adults, non-lethal genetic samples were obtained from as many individuals as possible. We focused most of our efforts at sites with previously small sample sizes (often small local populations) and newly discovered populations. Were able to collect a single leg from 16 individuals in 2017 (Table 3). As would be expected, the number of samples obtained appears to be proportional to the population sizes observed. This means that we have fewer than 10 samples for most of the sites.

**Table 2. Number of non-lethal genetic samples obtained from Harbison's dun skipper adults, 2013-2017.**

<b>Location</b>	<b>2013</b>	<b>2014</b>	<b>2016</b>	<b>2017</b>	<b>Total</b>
Barrett Lake	4	4	18	1	27
Boden Canyon Ecological Reserve	3	0	1	1	5
Crestridge Ecological Reserve	1	0	0	0	1
Daley Ranch	1	1	5	0	7
Elfin Forest	-	-	2	0	2
Fox Springs (Riverside County)	0	1	0	1	2
Hellhole County Park	5	0	1	0	6
Hollenbeck Canyon Wildlife Area	8	2	5	4	19
Hot Springs (Orange County)	-	1	-	0	1
Lake Hodges	9	0	24	-	33
Loveland Reservoir	7	11	2	6	26
Pamo Valley	0	2	0	2	4
San Diego National Wildlife Refuge	2	0	0	-	2
Santa Margarita Trail	0	0	0	1	1
Sky Valley Road	1	1	25	-	27
Sycuan Peak Ecological Reserve	5	4	10	-	19
	<b>46</b>	<b>26</b>	<b>93</b>	<b>16</b>	<b>181</b>

## **Discussion**

The condition of Harbison's dun skipper habitat, in terms of vegetation quality, was improved in 2017. However, the heavy winter rains resulted in some scouring of the creeks and move San Diego sedge plants. As was the case in 2016, counts were variable in regards to the previous year's counts. Some sites had more skippers in 2017 compared to 2016, and some with fewer. It is possible that the lower skipper numbers at Barrett Lake, and maybe other locations, is a result of high water flow altering the riparian habitat. We also noted that the patterns of sun and shade were different compared to 2016. For example, sunny locations where skippers

were commonly observed at Barrett Lake and Skye Valley were mostly shaded this year with the trees having fuller canopies. Both of these factors may have resulted in Harbison's dun skipper adults utilizing and preferring different portions of the riparian woodlands.

The changing of San Diego sedge and flowering plant locations and sun-shade patterns suggests that riparian woodlands need to be managed as a whole. Resiliency of the dun skipper-oak woodland community requires spatial heterogeneity and extent so that all required skipper resources are able to fluctuate between dry and wet years. Surveys following a couple winter months of high rainfall was informative to developing a better understanding of the factors that determine annual population sizes and habitat condition.

### Conclusions

While time consuming, it would be informative to completely and thoroughly survey entire riparian oak woodlands to determine all areas where the adult skippers are using. These woodlands can be 100 meters to several kilometers in length. Most of our past work has focused on surveying specific locations where skippers have been observed in the past. Multiple years of these surveys, including dry and wet years, will elucidate how the Harbison's dun skipper habitat and habitat use change year to year.

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## Appendix A: 2017 adult Harbison's dun skipper observations

Date	Site	Latitude	Longitude
5-Jun-17	Hollenbeck Canyon Wildlife Area	32.6945272	116.7937398
8-Jun-17	Barrett Lake	32.70355568	116.719074
9-Jun-17	Loveland Reservoir	32.7965353	116.7609101
9-Jun-17	Loveland Reservoir	32.79653672	116.7609117
12-Jun-17	Hollenbeck Canyon Wildlife Area	32.69453282	116.7937612
12-Jun-17	Hollenbeck Canyon Wildlife Area	32.69456718	116.7931772
12-Jun-17	Hollenbeck Canyon Wildlife Area	32.69457716	116.7937755
13-Jun-17	Pamo Valley	33.15769373	116.8405262
13-Jun-17	Pamo Valley	33.15774051	116.8406531
15-Jun-17	Loveland Reservoir	32.79650864	116.7608568
15-Jun-17	Loveland Reservoir	32.79661752	116.760778
16-Jun-17	Santa Margarita Trail	33.40902795	117.213764
19-Jun-17	Hollenbeck Canyon Wildlife Area	32.69452837	116.7937943
19-Jun-17	Hollenbeck Canyon Wildlife Area	32.69452988	116.7937353
19-Jun-17	Hollenbeck Canyon Wildlife Area	32.6945329	116.7937931
19-Jun-17	Hollenbeck Canyon Wildlife Area	32.69453432	116.7937467
26-Jun-17	Hollenbeck Canyon Wildlife Area	32.69454882	116.7937177
27-Jun-17	Boden Canyon	33.106991	116.894097
27-Jun-17	Loveland Reservoir	32.79656782	116.7607515
27-Jun-17	Loveland Reservoir	32.7965741	116.7607662
29-Jun-17	Fox Springs	33.5665254	117.4704859
29-Jun-17	Hot Springs	33.610717	117.511275