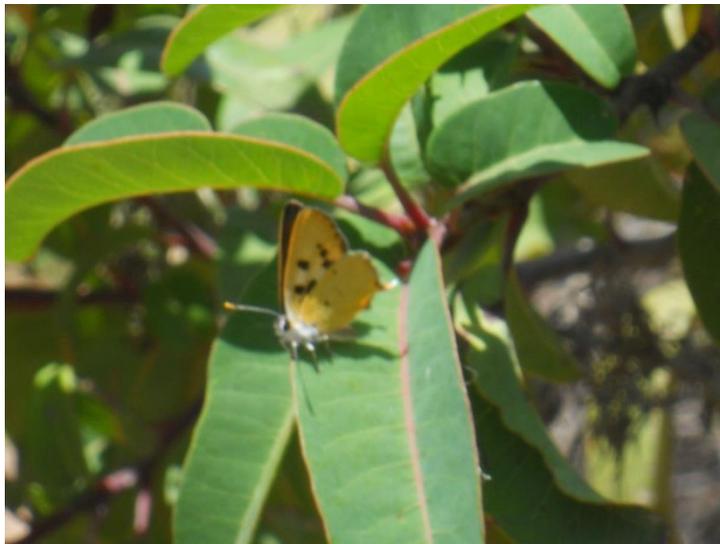


Rare Butterfly Management and Conservation Planning

TASK 2:

HERMES COPPER ADULT SURVEYS AT NORTH COUNTY SITES

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Table of Contents

- Table of Contents 2
- Figures 3
- Tables 3
- Executive Summary 4
- Introduction 5
- Methods 6
 - Hermes Copper Surveys 6
 - Habitat Assessment 7
- Results 8
 - Hermes Copper Surveys 8
 - Habitat Assessments 9
- Discussion 9
- Acknowledgements 10
- Literature Cited 10
- Appendix A: Vegetation data associated with spiny redberry (*Rhamnus crocea*) patches at northern Hermes copper populations. 11

Figures

Figure 1. Detections of Hermes copper butterflies on conserved lands, 2010-2013.	6
Figure 2. Map of 2016 northern Hermes copper population survey sites with an inset of San Diego County.....	7
Figure 3: Spiny redberry patch size distribution (left) and shrub cover (right)	9

Tables

Table 1. Habitat assessment variables.....	8
Table 2. Effort and results for 2016 Hermes copper surveys, and historical data for context.....	8

Executive Summary

The Hermes copper (*Lycaena hermes*) is a rare butterfly endemic to San Diego County and northern Baja California. This species is threatened by recent urbanization and wildfires throughout its range in the United States. Since most individuals and larger populations are found in the southern portion of San Diego County (Figure 1), one large fire could nearly extirpate the species. Assessment of the northern habitats will allow for prioritization of management actions and lead towards developing larger and more robust populations. The geographic separation reduces the extinction risk due to wildfires.

In 2016, we conducted butterfly surveys and habitat assessments at these small northern populations. We did not detect Hermes copper adults at any of the eight sites, although this was consistent with other (larger) sites in the county due to continuing drought conditions. Habitat assessments resulted in the mapping of 65 spiny redberry patches and 11 single redberry shrubs across the 8 sites. Up to 90 redberry shrubs were recorded in a single patch, but more patches were represented by a relatively low number of shrubs, and most of the redberry patches had at least 60% shrub cover. Additional insight may be gained from a more formal comparison to the habitat measured at Hermes copper sites in southern San Diego County.

Introduction

The Hermes copper (*Lycaena hermes*) is a rare butterfly endemic to San Diego County and northern Baja California. This species is threatened by recent urbanization and wildfires throughout its range in the United States. In April of 2011 the United States Fish and Wildlife Service (USFWS) issued a 12-month finding which concluded that listing the Hermes copper butterfly as threatened or endangered was warranted, and is currently on the USFWS list of candidate species (USFWS 2011). A proposed rule, including designated critical habitat, will be developed.

This report describes the field work conducted during the 2016 Hermes copper flight season. Monitoring populations provides an opportunity to understand how climatic conditions influence variation in adult densities and flight season phenology. Adult surveys are generally the most accurate and cost-effective way to monitor butterflies, using adapted Pollard walks through suitable habitat. Previous monitoring at multiple sites revealed that population changes tended to covary across sites (i.e. high degree of concordance). As a result, we have monitored only a handful of sites during 2012-2015. In 2016, we also conducted surveys for Hermes copper adults at northern populations that tend to be small (fewer than 10 individuals observed at peak numbers) and not detectible every year (Deutschman et al. 2011, Marschalek et al. 2016).

Assessment of habitats that support these small northern Hermes copper populations is important to update our understanding of the species. Since most individuals are found in the larger populations in the southern portion of San Diego County (Figure 1), one large fire could devastate the species. Protecting the northern populations will reduce extinction risk because of the geographic separation. Assessment of the northern habitats will allow for conservation management focused on developing larger and more robust northern populations.

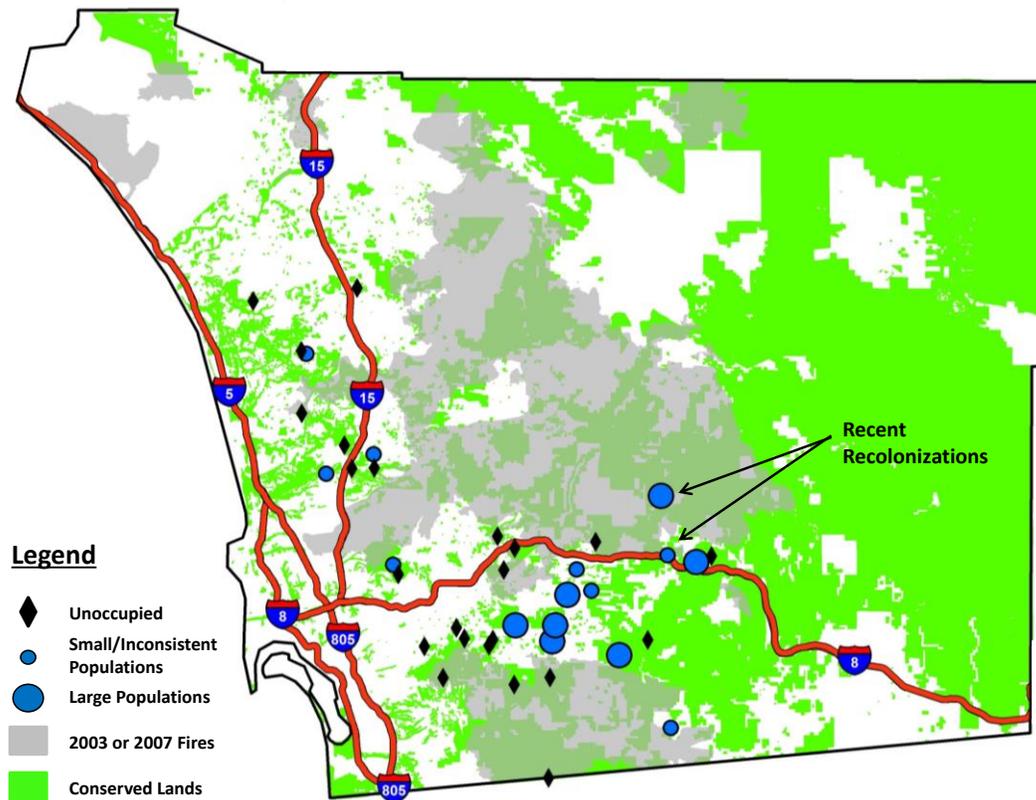


Figure 1. Detections of Hermes copper butterflies on conserved lands, 2010-2013. Sampling locations where Hermes copper was not detected are represented by black diamonds. The relative size of Hermes copper populations is indicated by the size of the blue circles.

Methods

Hermes Copper Surveys

In 2016, we conducted surveys for Hermes copper adults at historically occupied populations in the northern portion of the species' range. Survey sites included Bette Bendixen, Black Mountain, Elfin Forest, Lopez Canyon, Meadowbrook Ecological Reserve, Mendocino, Mission Trails Regional Park, and Sabre Springs (Figure 2). Our goal was to record the maximum number of Hermes copper adults present on a single day at each site (*maximum count*). All surveys were conducted during periods of appropriate weather (sunny or partly sunny, 20 to 35 degrees C, and modest wind speeds) unless stated otherwise. Initial surveys occurred about one time per week and started on 16 April at Sycuan Peak. This site was chosen because past survey efforts have shown this area to regularly produce the first adults of the season. This initial survey is earlier than historical records of Hermes copper adults including the observation of adults on May 1 in 2015. Like 2015, the spring of 2016 was similarly warm and we expected that adults would emerge fairly early again. Once Hermes copper adults were found, we started surveys across all of the northern sites. Sampling occurred two times per week (weather dependent) throughout the Hermes copper flight season.

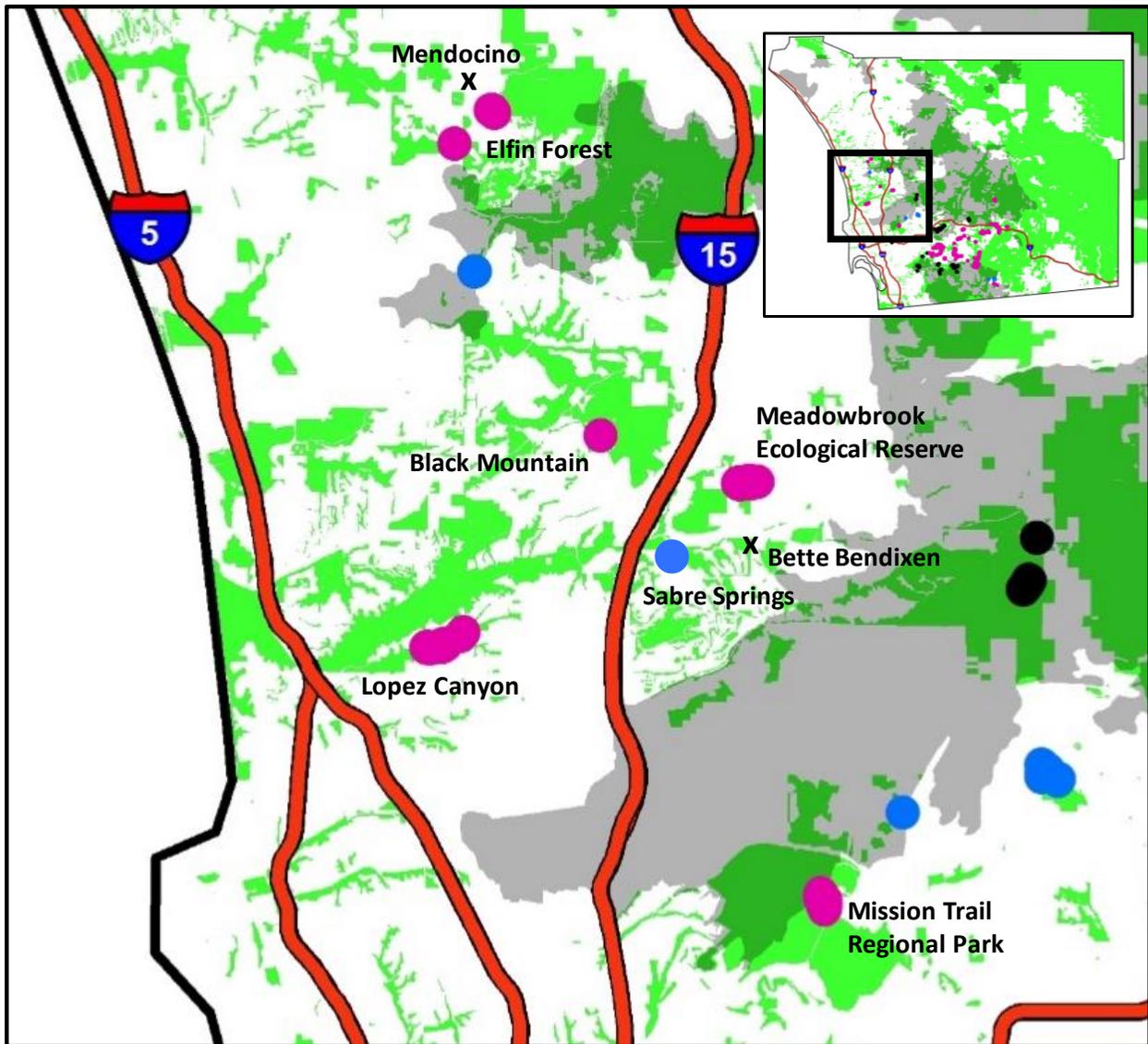


Figure 2. Map of 2016 northern Hermes copper population survey sites with an inset of San Diego County. Purple and black circles represent extant populations and extirpated populations, respectively. Blue circles denote sites of unknown status and black x's mark sites that have suitable habitat but have never been known to have Hermes copper populations. Green shading are conserved lands (SANDAG) and dark gray shading maps the footprints of the 2003 and 2007 wildfires.

Habitat Assessment

At each site, redberry patches were mapped and in the same areas where we conducted surveys for adult Hermes copper. The abundance and cover of spiny redberry and California buckwheat was recorded, as well as general vegetation composition (Table 1). The site assessments were designed to be rapid and detect large differences in habitat. Individual redberry shrubs were also recorded but associated habitat data were not collected for single, isolated shrubs.

Table 1. Habitat assessment variables.

Variables	Categories
Spiny Redberry	Number of shrubs, mapped extent
California Buckwheat	Distribution (evenly distributed, most along road, and/or few patches)
Vegetation Composition (% cover)	Spiny redberry, buckwheat, shrubs (includes redberry and buckwheat), non-native grasses, non-native forbs, bare soil
Trees	Distance to redberry patch, tree species

Results

Hermes Copper Surveys

In 2016, we did not detect Hermes copper adults at any of the northern populations (Table 2). Surveys were planned to occur two times per week at each site and this was the case when the weather was appropriate. However, there were several periods of cool and cloudy weather during the flight season. This prohibited surveys (due to unsuitable conditions) or restricted them to an hour or two during the middle of the day (when the marine layer had receded).

Table 2. Effort and results for 2016 Hermes copper surveys, and historical data for context.

Site	Number of 2016 Surveys	2016 Count	Previous High Count (Year of count)
Bette Bendixen	4	0	0 (no historic observations but did not burn in 2003 or 2007 wildfires)
Black Mountain	5	0	1 (2004)
Elfin Forest	5	0	1 (2011)
Lopez Canyon	5	0	5 (2011)
Meadowbrook Ecological Reserve	5	0	14 (2003)
Mendocino	5	0	0 (no historic observations but close to occupied habitat)
Mission Trails Regional Park	5	0	7 (2008)
Sabre Springs	5	0	Unknown (2002 or earlier, Hermes copper was consistently observed)

Habitat Assessments

We mapped 65 spiny redberry patches and recorded 11 single redberry shrubs across the 8 sites. Up to 90 redberry shrubs were recorded in a single patch, but more patches were represented by a relatively low number of shrubs (Figure 3a). Most of the redberry patches had shrub cover that was at least 60% (Figure 3b). A more in depth analysis will be presented when the habitat is compared to the Hermes copper sites in southern San Diego County (Marschalek and Deutschman *in preparation*).

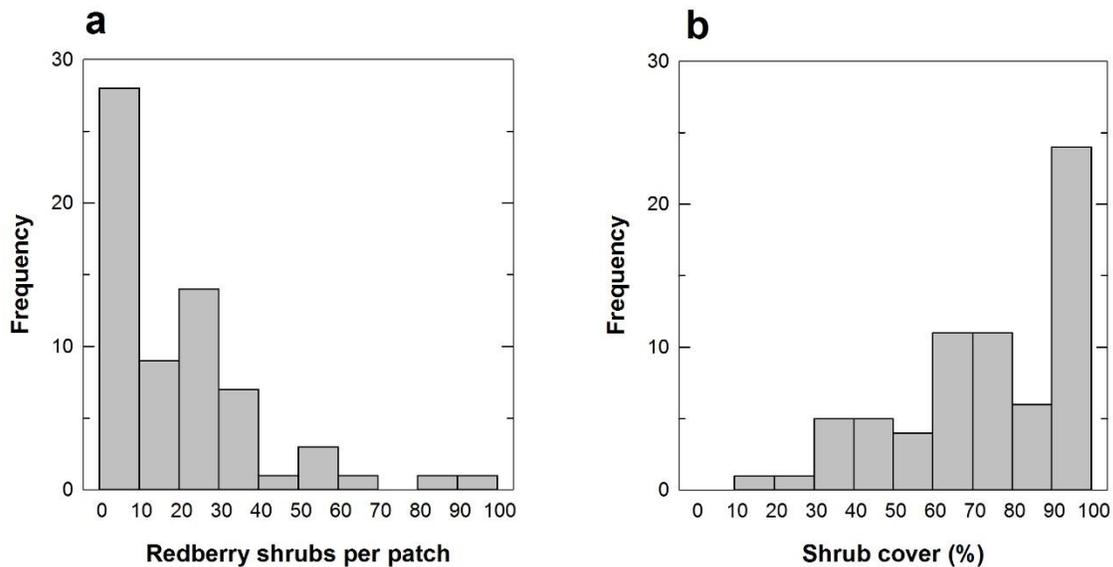


Figure 3: Spiny redberry patch size distribution (left) and shrub cover (right)

Discussion

Few Hermes copper adults have been observed during the last two years due to the drought, particularly west of Cleveland National Forest (Marschalek and Deutschman *in preparation*). We have documented adult numbers rebounding following a one-year drought (Marschalek and Deutschman 2015) but it is unclear how multiple years of extremely dry conditions will impact the species. Surveys during years of closer to average, or above average precipitation, will be required to adequately assess occupancy of habitat patches and relative population sizes of these northern sites.

The habitat assessment data, including redberry mapping, should be included in site-specific vegetation maps to determine opportunities for restoration to enhance these northern

populations. Areas of degraded habitat adjacent to redberry patches present opportunities to increase the resources available to Hermes copper. Other degraded habitats should be explored for restoration, and could include spiny redberry and California buckwheat if the local conditions are determined appropriate to support these plants. Based on the patchiness of spiny redberry distribution, it should not be assumed that all locations can support the species. A more in depth analysis will be included in the south county report (Marschalek and Deutschman *in preparation*).

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Appendix A: Vegetation data associated with spiny redberry (*Rhamnus crocea*) patches at northern Hermes copper populations.

Site	# Redberry	Percent Cover						Distribution of				
		Redberry	Buckwheat	Shurbs	NN Grass	NN Forbs	Soil	Buckwheat	Trees	Tree 1	Tree 2	Tree Distance
Bette Bendixen	5	3	10	74	3	3	20					
Bette Bendixen	11	5	3	76	1	3	20	most along road	No			0.5
Bette Bendixen	21	10	3	30	64	5	1	few patches	No			0.5
Bette Bendixen	29	10	3	90	5	3	2					
Bette Bendixen	29	8	5	95	1	2	2	few patches	Yes			
Bette Bendixen	62	10	1	75	2	2	20	few patches				
Black Mountain 1	2	5	5	55	2	5	38	few patches				150 ft
Black Mountain 1	3	40	20	90	0	2	8	few patches				100 ft
Black Mountain 1	3	10	7	100	0	0	0	few patches				100 ft
Black Mountain 1	3	7	12	93	0	0	7	few patches				250 ft
Black Mountain 1	5	5	25	95	0	0	5	evenly distributed				100 ft
Black Mountain 1	6	20	5	90	2	1	7	few patches				75 ft
Black Mountain 1	7	10	2	97	0	0	3	few patches				75 ft
Black Mountain 1	8	2	1	97	0	0	3	few patches				200 ft
Black Mountain 1	15	9	65	96	0.5	0.5	3	evenly distributed				150 ft
Black Mountain 1	15	5	15	100	0	0	0	evenly distributed				100 ft
Black Mountain 1	80	2	7	95	0	0	5		Yes	Quercus agrifolia		
Black Mountain 2	2	12	11	33	60	0	7	few patches				100 ft
Black Mountain 2	2	3	0	60	40	0	0	evenly distributed, few patches				375 ft
Black Mountain 2	2	10	0	90	10	0	0	evenly distributed, along road				300 ft
Black Mountain 2	3	45	0	60	30	10	0	evenly distributed, few patches				500 ft
Black Mountain 2	4	5	0	80	7	3	10	evenly distributed, few patches				400 ft
Black Mountain 2	5	10	70	90	5	0	5	evenly distributed				300 ft
Black Mountain 2	5	1	1	98	0.5	0.5	1	evenly distributed, few patches				300 ft
Black Mountain 2	8	4	0	45	40	15	0	evenly distributed, few patches				400 ft
Black Mountain 2	15	5	2	85	8	7	0	evenly distributed, few patches				500 ft
Black Mountain 3	3	10	3	90	4	0	6	few patches				500 ft
Black Mountain 3	3	7	5	90	3	0	7	few patches				500 ft
Black Mountain 3	5	7	5	95	2	0	3	few patches				400 ft
Black Mountain 3	7	7	9	98	1	0	1	few patches				450 ft

Site	# Redberry	Percent Cover						Distribution of				
		Redberry	Buckwheat	Shurbs	NN Grass	NN Forbs	Soil	Buckwheat	Trees	Tree 1	Tree 2	Tree Distance
Elfin Forest	3	1	3	60	25	1	10	mostly along road	No			20 m
Elfin Forest	4	5	5	30	54	1	5	evenly distributed	Yes	Oak		adjacent
Elfin Forest	5	1	10	35	15	1	5	evenly distributed	Yes	Oak	Sycamore	
Elfin Forest	20	2	2	42	42	2	10	mostly along road	Yes	Oak		
Elfin Forest	20	2	2	60	19	2	15	mostly along road	Yes	Scrub oak		
Elfin Forest	25	3	5	50	40	1	1	mostly along road	Yes	Oak		adjacent
Elfin Forest	27	5	2	60	33	2	5		Yes	Coast Live Oak		
Elfin Forest	33	5	2	50	46	2	2	few patches	Yes	Coast Live Oak		
Elfin Forest	34	3	3	25	30	15	30	mostly along road	Yes	Coast Live Oak		
Elfin Forest	38	5	3	40	49	5	6	few patches	Yes	Coast Live Oak		
Lopez Canyon	14	10	5	90	1.5	0		few patches	Yes	Willow		
Lopez Canyon	16	5	10	60	20	10	10	few patches	No			50 ft
Lopez Canyon	22	5	15	40	25	25	10	evenly distributed				50 ft
Lopez Canyon	22	3	7	85	5	10	0					
Lopez Canyon	25	5	5	90	3	3	4	most along road	Yes	Oak		
Meadowbrook	9	3	3	60	10	25	5	few patches	No			0.5
Meadowbrook	37	4	2	70	5	20	5		No			0.5
Meadowbrook	50	10	5	90	4	4	2	few patches	Yes	Oak		
Meadowbrook	90	15	10	70	20	10	0	few patches	Yes	Oak		
Mendocino	4	2	10	64	30	5	1	evenly distributed	Yes	Eucalyptus		
Mendocino	4	3	1	80	15	5	0		Yes	Eucalyptus	Pepper Tree	
Mendocino	5	2	4	30	35	34	1	few patches	No			20 ft
Mission Trails	10	1	10	40	30	20	10	few patches	No			
Mission Trails	20	1	2	10	75	5	7	mostly along road	Yes	Oak		
Mission Trails	25	1	5	75	9	3	7	mostly along road	No			.35 mi
Mission Trails	25	3	10	75	2	5	5	evenly distributed	No			.7 mi
Mission Trails	40	5	5	75	2	8	5	evenly distributed	No			.5 mi
Mission Trails	50	5	15	70	10	5	5	evenly distributed	No			.34 mi
Sabre Springs	8	2	1	60	0	0	5		Yes			
Sabre Springs	10	3	1	70	10	10	x					
Sabre Springs	14	3	4	80	7	6	7	most along road	Yes	Oak		
Sabre Springs	23	5	5	60	20	10	10	most along road	Yes	Oak		
Sabre Springs	31	10	15	85	5	5	5	most along road	Yes	Oak		
Sabre Springs	32	10	3	70	10	17	3	few patches	Yes	Oak		
Sabre Springs	50	10	5	60	15	20	5	few patches	Yes	Oak		