

Surveys and Observations of Braunton's milkvetch (*Astragalus brauntonii*)  
2006 and 2007

Prepared by:

Betsey Landis  
California Native Plant Society

310-472-0624  
betseylandis@sprintmail.com

Prepared for:

Christine Hamilton  
U.S. Fish & Wildlife Service  
Ventura Fish and Wildlife Office  
2493 Portola Road, Suite B  
Ventura, CA 93003

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## I. EXECUTIVE SUMMARY

Braunton's milkvetch (*Astragalus brauntonii*) is listed as endangered under the federal Endangered Species Act. The world-wide range of *A. brauntonii* is limited to populations in southern California: Simi Hills (SH) Ventura County, Santa Monica Mountains (SMM) and one location in San Gabriel Mountains (SGM) Los Angeles County, and northern Santa Ana Mountains (SAM) Orange County. Due to confusion over differing names used by various researchers for *A. brauntonii* sites, a synonym chart is provided in Table 1. All known *A. brauntonii* sites were surveyed, their numbers counted and habitat conditions assessed.

The recent Topanga wildfire, which burned from September 29 to October 3, 2005, charred much of recently acquired parcels of parkland in the Simi Hills. Occasional small occurrences of *A. brauntonii* in the burn area hinted at larger populations nearby. Surveys focused on *A. brauntonii* were scheduled for 2006, then continued through 2007 when extremely hot, dry weather in late summer and fall of 2006 resulted in closure of park access, not only in the Simi Hills, but in other *A. brauntonii* locations. The danger of wildfires remained high into 2007.

The extreme weather continued through the fall of 2006, with unusual cold periods in winter and record low rainfall into spring, 2007. The weather effects on *A. brauntonii* populations varied from very little change at a site near the coast in the Santa Monica Mountains to total loss of plants at inland sites in the northern Santa Ana Mountains. The effects of fire and weather were studied in a comparison of two sites: Cheeseboro Ridge Road bowl and Temescal Ridge Road populations. Counts of age classes -- young plants not in bloom or fruit, adults in bloom or fruit, and recently dead plants (still firmly rooted in the ground, usually still upright, gray in color, skeletonized leaves, fuzzy shoots and often full stalks of dry seedpods) -- offer a good comparison of the history and health of different *A. brauntonii* populations. Estimates were made of the acreage occupied by *A. brauntonii* populations throughout its range.

Fire management practices and fuel modification requirements or practices adversely impact most *A. brauntonii* populations as do proximity to residential development. Management of this species requires communication, education and respect for its value as a species with numerous strategies for survival.

## II. INTRODUCTION

*Astragalus brauntonii* Parish is a short-lived perennial in the family Fabaceae. The species lives only in southern California in isolated populations ranging from the Simi Hills (SH) in Ventura County, to the Santa Monica Mountains (SMM) and one location in the San Gabriel Mountains (SGM) in Los Angeles County, and in the northern Santa Ana Mountains (SAM) in Orange County. *Astragalus brauntonii* is federally listed as endangered. Due to the addition of acres of new parkland in the Simi Hills with possible new population sites showing up after the 2005 Topanga fire, U.S. Fish and Wildlife Service Ventura office contracted for up-to-date surveys on all existing *A. brauntonii* populations. The surveys covered most known *A. brauntonii* sites, adding four new sites, all in the Simi Hills. The following report covers various aspects of each population, comparisons of characteristics of different populations and factors impacting each population.

**Table 1: *Astragalus brauntonii* location synonyms & CNDDDB information**  
 northern Santa Ana Mountains (SAM), San Gabriel Mountains (SGM),  
 Santa Monica Mountains (SMM), Simi Hills (SH)

Occurrence #	EO index #	Map index #	Location synonyms for <i>Astragalus brauntonii</i> populations
1	41758	41758	above Sherman, West Hollywood, SMM
2	41759	41759	Topanga, perhaps Fernwood area, SMM
3	19368	00743	Malibu Beach, SMM
4	52	02886	Coal Canyon, SAM
5	41760	26518	Cienega (erroneous report)
6	19385	02382	Monrovia (Myrtle Ave. & Hillcrest Ave.), SGM
7	19386	00719	Silvernale Ranch, Dayton Canyon, Burro Flats, SH
8	12658	01038	Santa Ynez Canyon, Trailer Canyon, Traylor Canyon, SMM
10	8526	02882	E. of Claymont Clay Mine, E. of Rocket Fuel site, W. Coal Cyn Ridge Road, CDFG preserve, E. Coal Cyn, W. Coal Cyn, Coal Cyn wash, Coal Cyn detention basin, Caltrans debris basin, pipeline site, Boundary Ridge A,B, C, & D, Roadcut, Mothers A, B, & C, SAM
11	5261	00528	Medea Creek N. & in Oak Park Community Park, Oak Park Comm. Prk, SH
14	13904	01045	Trailer Cyn Rd, Traylor Cyn Rd, Santa Ynez Cyn, SMM (see Occurrence 8)
15	19301	01075	Temescal Ridge Trail, Temescal Ridge, Temescal powerline easement, Temescal Trail, SMM (not part of Temescal Canyon, these are close to Trailer Canyon, Mr. Bell's quarry and Santa Ynez Canyon) (see Occurrence 8 & 14)
16	984	02374	above Monrovia, below Clamshell Canyon, Clamshell Motorway
17	12657	01127	Temescal Trail, Temescal Fire Road (see Occurrence 15)
18	19380	01163	1/2 way between ocean and Temescal Canyon above Sunset Blvd. on a firebreak, SMM ( see Occurrence 8 & 14)
19	19378	00591	Jordan Ranch, Palo Comado, Palo Comado Canyon Trail, Santa Monica Mountains National Recreation Area Cheeseboro/Palo Comado Canyons, SH
20	10019	17846	Oak Park III sites, West Hill Preserve, Debris Basin, Deerhill and Doubletree, Oak Park III water tank site, Doubletree and Mormon Church site, Rare Plant Conservation Plan, Ventura County, SH
22	11928	17845	Ridgeline SE. of Lang Ranch Parkway, Oakbrook Regional Park, COS, SH
23	10017	17795	Dayton Canyon, SH
24	5212	26106	above Monrovia, below Clamshell Canyon, Clamshell Motorway or Truckway or Fire Road, SGM (see Occurrence 16)
25	35537	40530	SE of Lang Parkway (see Occurrence 22)
27	49018	49018	Zuma Ridge, Zuma Ridge Motorway, upper Zuma Canyon, SMM
28	49021	49021	Bus Canyon, Bridal Path Homeowners Association, SH
29	49829	49829	Ahmanson Ranch, Cheeseboro Ridge Trail, Cheeseboro Ridge, Cheeseboro saddle, slope or bowl, Baleen Wall 1, 2, and 3
30	49832	49832	Edison easement by Pathfinder Avenue, Thousand Oaks; Pathfinder
31	54499	54499	Trough Canyon ridge, between Bus and Runkel Canyons, Bridal Path HOA
32	54816	54816	Upper Zuma Canyon, SMM (see Occurrence 27)
33	57119	57103	Cheeseboro saddle, Cheeseboro ridge, SMM (see Occurrence 29)
34	69243	59493	Brentwood, SMM, LAX
35	69244	68759	Sherman, West Hollywood, SMM (see Occurrence 1)
36	69245	68760	Kanan Rd., W. of intersection with Rayburn St., Thousand Oaks, SH, (part of Occurrences 22 & 25 which new data show as one large population)

### **III. RESEARCH OBJECTIVES**

#### **1. Assessment of population sites**

Previous observations of small numbers of *A. brauntonii* in the area of Jordan Ranch and Ahmanson Ranch along roads and trails indicated that larger populations might reside as seedbanks under the chaparral and sage scrub canopy. After the 2005 Topanga Fire burned much of the newly acquired parkland, Santa Monica Mountains National Recreation Area (SMMNRA) sent teams into the burn area to do rapid assessments of the habitat. However staff and time were insufficient to do detailed surveys of all the rare species. U.S. Fish and Wildlife is preparing a report on the status of *A. brauntonii* so they requested these surveys to update information on all new and old population sites.

#### **2. Population counts**

The number of living *A. brauntonii* plants were counted at all sites surveyed. Populations were estimated at some sites where numbers were greater than one thousand.

#### **3. Assessment of factors affecting viability of each population**

To assess factors affecting the viability of each population other measurements were made, such as age classes and heights of plants. Predation, such as herbivory, and competition from other plant species were noted.

### **IV. RESEARCH METHODS**

#### **1. Basic description of population sites**

Global positioning system (GPS) was used to approximate the location of each population site. In SMMNRA sites, polygons were run. Descriptions of each site included topography, dominant plant species, position relative to any adjacent *A. brauntonii* populations, evidence of herbivory, other damage, evidence of fauna on site, and competition from other plant species.

#### **2. Population counts**

At all sites a basic count of living *A. brauntonii* was made within observed population boundaries. Where population counts exceeded one thousand plants the number of plants occasionally had to be estimated due to time constraints.

#### **3. Height and age classes for certain sites**

At certain sites, for the purpose of quantifying differences between populations, *A. brauntonii* heights were measured and the plants were counted by age class: young *A. brauntonii* not yet in flower or fruit, adult *A. brauntonii* in flower or fruit, and dead *A. brauntonii*.

## V. SURVEYS OF *ASTRAGALUS BRAUNTONII*

### 1. Background

#### A. Species description

Seedlings observed in the wild are very small, about four millimeters high by six millimeters in diameter. Growth to flowering and fruiting status may take more than two years, depending on the availability of nutrients, plant competition and the effects of browsing. Plants unable to complete a fruiting cycle may go dormant until the next heavy rain. The leaves may turn white but the plants do not die back to the roots. Normally *A. brauntonii* will begin new growth with the first rains, and bloom sometime between January and August, depending on weather and herbivory. Loss of meristems causes the plants to grow more meristems, with smaller numbers of buds and fewer seedpods. Fruit will develop and mature anytime between May and September, though late July through August are the best months to determine the peak seed set. In good growing conditions adult *A. brauntonii* may reach heights of two meters (field observations), each adult waving many long silvery-leaved branches bearing stalks of violet blossoms. These blossoms develop into small hairy pods 6.5 to 9 mm long (Jepson). Each pod may contain six seeds, with a half chamber in the back of the pod containing one seed. The seeds are long-lived and essential to the survival of the species.

From personal experience as well as field observations, I have recorded these pods sticking to my equipment, and young plants sprouting in new locations within water erosion channels, in tire tracks, and in road-scraper debris. Their travels also may be wind-aided as the senescent brittle pod-stalks are blown apart. Most of these traveling *A. brauntonii* do not establish permanent populations, probably due to inappropriate soil conditions, human activities, predation and competition from other plants. They are seen frequently along trails and roads in the vicinity of their home populations or residual seed banks.

#### B. Geographical range

*A. brauntonii* populations are found in ancient marine sediments in the drainages of Simi Peak in the Simi Hills, broken blocks of ancient marine sediments associated with the Topanga Formation in the Santa Monica Mountains, in mounded ancient marine sediments in a bay-shaped formation at the base of the San Gabriel Mountains above Monrovia, and in the northern Santa Ana Mountains in marine sediments of Coal and Gypsum Canyons associated with the Silverado Formation.

#### C. Ecological requirements

Large populations of *A. brauntonii* are found on dry windy hilltops, saddles or bowls between hills, and shoulders or slopes of larger hills at elevations ranging from 277 m to 646 m. Slope aspects vary from site to site. A few populations persist in open rocky areas. Dominant plant species in these open areas include *Hesperoyucca whipplei* or

*Nolina cismontana*, *Malosma laurina*, and *Hazardia squarrosa*, but most large populations remain as seedbanks under the canopies of sage scrub or chaparral in the same topographic locations<sup>1</sup>. These seedbanks germinate when competing plant species are removed by disturbance, e.g. fire, brush clearance or large scale grading. *A. brauntonii* will persist as long as seed production can be maintained. When predation, competition, nutrient levels, and soil structure changes prevent further seed production, *A. brauntonii* disappears aboveground, depending on its seedbank to survive until future disturbance creates more favorable conditions. The seedbank has to be large enough to survive seed predation and loss of viability over time to be successful.

*A. brauntonii* blooms are pollinated by megachilid bees, bumblebees, honey bees and wasps<sup>2</sup>. Butterflies such as the Southern blue are occasional visitors. At the Temescal powerline site (15) in the Santa Monica Mountains a duskywing butterfly (*Erynnis* spp.) was observed in late July persistently returning to one *A. brauntonii* plant even after being repeatedly disturbed by survey activities.

The plant grows in ancient marine sediments rich in calcium, low in nitrogen, low in potassium, somewhat saline and generally without phosphorus. Often the magnesium levels are high. These sediments were deposited around rocky ridges and outcrops. Over time the basal rock has eroded material into and onto these sediment layers. This information is based on analyses of 51 samples of soil removed from known *A. brauntonii* sites. Sites were sampled from 2004 through 2007 by the author. Sixteen additional analyses were done on samples taken from sites having marine sediments of similar geologic history but no *A. brauntonii*. Though adjacent geologic strata often contain water-rounded cobbles, no cobbles have been observed in the soil at main populations of *A. brauntonii*.

The soil structure preferred by *A. brauntonii* is shallow with some sort of barrier such as a thick layer of chalk, thin or fissured layers of sandstone, limestone or granite about 10 cm below ground level, which seems to protect the plant from pocket gophers, a major lethal predator that only attacks *A. brauntonii* roots. Other predators are rodents, deer and insects such as grasshoppers, borers and parasitic beetles. Evidence of these plant predators have been found at every site. Raptors frequently are observed perching on power towers or hunting in the open hilltop areas preferred by persistent populations of *A. brauntonii*.

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<sup>1</sup> California Natural Diversity Database erroneously lists “closed-cone coniferous forests” as one of the habitats for *Astragalus brauntonii*. This habitat designation refers to Tecate cypress habitat which occurs on gabbro in the Coal Canyon (SAM) area. *A. brauntonii* occurs on marine sediments only. Tecate cypress has never been observed during surveys of *A. brauntonii* sites.

<sup>2</sup> Rancho Santa Ana Botanic Garden found parasitic wasps and seeds with exit holes in a package of frozen *A. brauntonii* seeds. The presumption is that the chalcid wasps were exiting seeds as the seeds were in the freezing process. The seeds came from Dayton Canyon (23) (SH). J. Keeley and C.J.Fotheringham [Ecology and Distribution of Braunton’s milkvetch (*Astragalus brauntonii*) and Lyon’s pentachaeta (*Pentachaeta lyonii*), 1 April 1998] noted chalcid wasps on *A. brauntonii* at Temescal (15) (SMM).

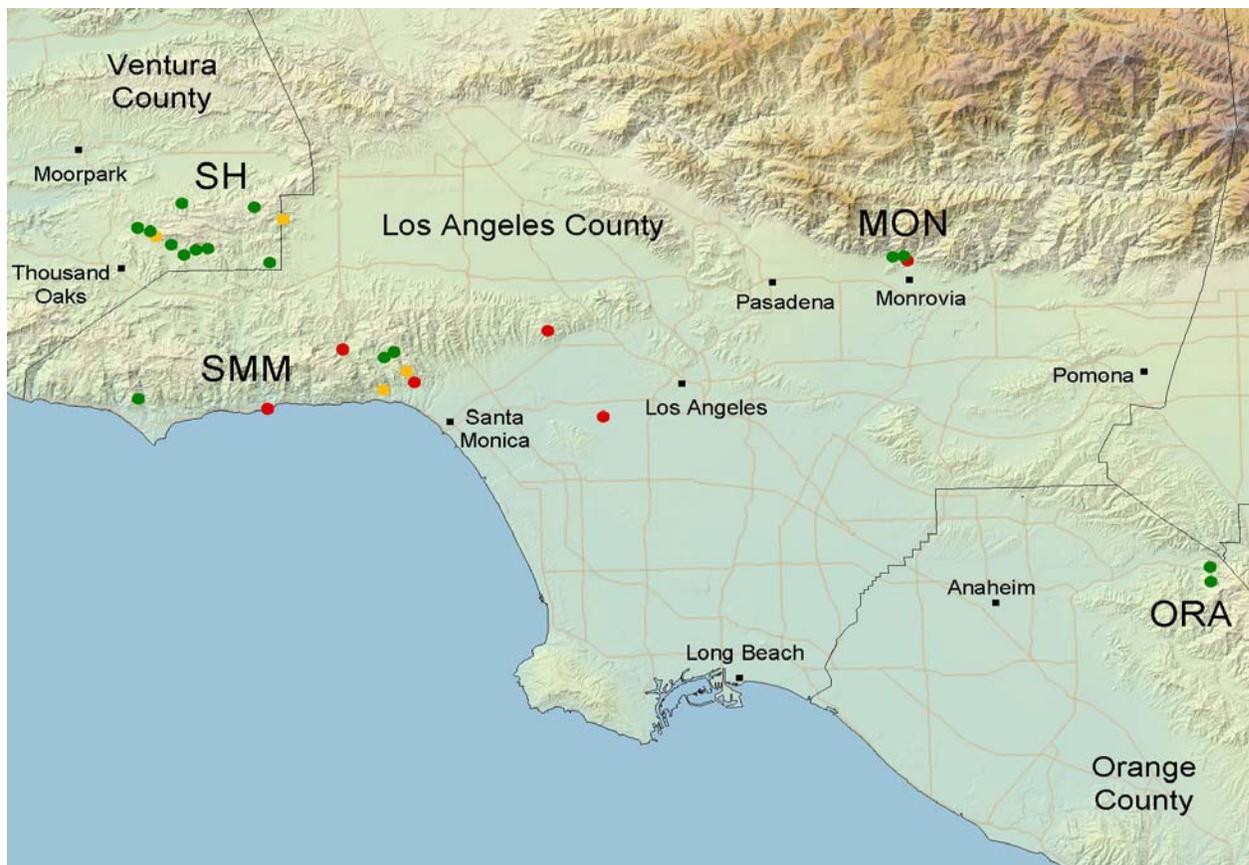
**Map 1:**

**WORLDWIDE RANGE OF *ASTRAGALUS BRAUNTONII***

Distance from Thousand Oaks, Ventura County  
to “ORA”(Coal Canyon), Orange County is approx. 75 miles.

MON: San Gabriel Mountains (SGM in text)  
ORA: northern Santa Ana Mountains (SAM in text)  
SH: Simi Hills  
SMM: Santa Monica Mountains

Colored dots indicate historical records of *A. brauntonii* sites:  
Red is presumed extinct. Yellow may exist. Green means plants are present.  
(Map courtesy of Dr. Robert Taylor, Santa Monica Mts. National Recreation Area)



#### D. Effects of Extreme Weather

In 2006 *A. brauntonii* sites in Simi Hills: Oakbrook Regional Park (22, 25 & 26), Thousand Oaks Open Space east of Oakbrook Regional Park (new location), Cheeseboro Ridge Road (AKA Baleen Wall, Ahmanson Ranch, Cheeseboro saddle, slope and bowl)(29 & 33) were surveyed, as well as Dayton Canyon (23). Mary Ann Campbell supplied counts for Bridal Path Homeowners Association sites (28 & 31). Unfortunately temperatures in the Simi Hills and elsewhere rose to extreme levels and stayed there for most of July and August. Due to the high hazard of wildfire, access to *A. brauntonii* populations was either closed or too dangerous to attempt.

The weather continued to be extreme. No significant rainstorms occurred during fall and winter. Rainfall reached record lows for many areas. In the second week of January, 2007 about five days of chilly, frosty weather hit that freeze-burned *Malosma laurina* canopy, the growing tips of many shrubs and, apparently, the first growth of *A. brauntonii* plants. Almost uniformly, throughout the sites, *A. brauntonii* plants that grew in 2007 were topped by a long thin dead main stalk (or stalks) with no side branches. This year's growth began below the dead stalks. At some sites where dense banks of late spring and summer fog supplemented the sparse winter rains (some Simi Hills sites and the Santa Monica Mountains sites) flowering and fruiting was fairly normal. At the Cheeseboro Ridge Road sites, in July, there were more young plants than mature plants, the leaves were drying out and growth was stunted. Many mature plants had no, or only a few, side branches and very few seed pods. In the northern Santa Ana Mountains, which apparently is too far inland or blocked by coastal mountains from coastal fog, all the *A. brauntonii* (except for one plant) at all the sites were dead by July, with very few mature seedpods<sup>3</sup>.

Available data on cumulative rainfall totals for July 1, 2006 through June 30, 2007 are presented in Table 2. The rainfall gage stations noted are within two to nine miles of the indicated *A. brauntonii* populations. No publicly available data could be found for official rainfall gages in the San Gabriel Mountains near Clamshell Motorway for the last rainfall season. This data gives an idea of cumulative rainfall throughout the range of *A. brauntonii*, but does not describe conditions at specific *A. brauntonii* sites, which may be in a rain shadow, may have received no rain at all, or may have been lower down on slopes or drainages where more rain run-off was available. Winter rain in 2006 to 2007 came in local showers, all less than one inch of rainfall, emphasizing the importance of local conditions. No measure of fog was available.

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<sup>3</sup> Galvin, Paul 2007 *Astragalus brauntonii* surveys in Coal and Gypsum Canyons

**Table 2:** Comparative rainfall data for rain gage sites near some *A. brauntonii* populations.

ASBR sites (Occurrence #s)	Rain gage sites	2006 - 2007 rainfall (in.)	Source of data
11, 20, 25, 30	Thousand Oaks, SH	4.40	Watershed Protection District, Ventura County
19, 28, 31	Simi Valley, SH	4.04	same as above
29, 33	Cheeseboro	4.38	State Water Resources
4,10	Villa Park Dam, Anaheim SAM	3.78	Orange County Coop. Observer Rainfall Data
8, 14, 15, 17	Topanga Patrol FC-6, SMM	5.18	NOAA website

## 2. Survey Results by County and Mountain Range

Occurrence numbers from the California Natural Diversity Database (CNDDDB) are added in parentheses after *A. brauntonii* site names to minimize confusion over local names. If a site name has “new” in parentheses, it is a new location and has no CNDDDB Occurrence number.

### A. Ventura County, Simi Hills

#### Geographical description of sites

The Simi Hills *A. brauntonii* populations surveyed after the 2005 Topanga wildfire show a clear pattern of clustering around the drainages of Simi Peak. Simi Peak at 738 m is the highest point in the area of the Simi Hills where most of these populations are found. The patterns of deposition around the older geologic bones of Simi Peak and some ridges to the east that curve around Dayton Canyon clearly show that the marine sediments flowed, or drifted, into these older solid geologic structures, forming rounded knolls, long drifts on slopes, mounded shoulders, or were caught in the back eddies and created crescent-shaped deposits. One population is on the slopes and knolls of Dayton Canyon (23). Established populations of *A. brauntonii* lie in the major drainages of Simi Peak: Medea Creek (11), Palo Comado Canyon (19) and Cheeseboro Canyon (29 & 33) to the south and southeast; to the north in Bus Canyon and on top of Trough Canyon (28 & 31); on the eastern flank of Simi Peak in Oakbrook Regional Park, City of Thousand Oaks and Thousand Oaks Open Space; on the western flank of Simi Peak in Santa Monica Mountains National Recreation Area land. A large crescent-shaped deposit of marine sediments full of *A. brauntonii* seeds filled a ridge above the City of Oak Park (20).

#### Dayton Canyon

Dayton Canyon is in private ownership. One owner has spent years trying to develop his acreage, fencing and gating the entry road with a security guard to prevent unwanted

visitors. Bulldozers were used to cut a moat across the hill between his property and an equestrian/hiker path leading from the public road to the ridge fire road at the southern edge of his property. Core-drilling roads were cut are on the south side of the project area. June 20, 2006 my son and I were escorted in by the project's consulting biologist, David Hughes. He showed us a new population of *A. brauntonii* in a disturbed field to the north of the main access road.

The area burned in the 2005 Topanga Fire. The project area is very weedy, but *Ceanothus megacarpus*, *Encelia californica*, *Lotus scoparius*, *Pellaea* spp., *Artemisia californica*, *Adenostoma fasciculatum*, *Malosma laurina*, *Hazardia squarrosa*, *Eriodictyon crassifolium*, grow on the south ridge with the core-drilling roads.

In 2005 we found one *A. brauntonii* on the equestrian path near the moat, about fifty seedlings and one young plant on core-drilling roadcuts on the southern ridge of the project site. In 2006 we counted 39 living plants in the weedy field mentioned earlier. On the south ridge we found *A. brauntonii* between the two core-drilling roads and on the slope above the highest core-drilling road. The population appeared to continue on to the top of the ridge. We counted 542 living plants and estimated the total population to be at least 1000 plants. Most of the *A. brauntonii* were young.

The core drilling sites suggest this slope will be developed if the project is approved. However there is local opposition to the project on many issues, including the presence of rare plants.

There is a record of a few *A. brauntonii* on the former Rocketdyne property, currently part of Boeing, and an earlier record of *A. brauntonii* on Silvernale Ranch which was purchased in part by Rocketdyne. At the date of the earlier collection the plants could have been in the vicinity of Dayton Canyon since that part of Silvernale Ranch was still in private hands. There is confusion about the locations of both observations. Boeing intends to develop the property but has not completed hazardous material clean-up required in settlement of a lawsuit.

### **Oak Park III and Oak Park Community Park**

As the last phase of a long-term development plan, Oak Park III developers graded the *A. brauntonii* seedbank in the crescent-shaped mound south of Simi Peak. Almost ten years later the seeds continue to germinate. Indeed, *A. brauntonii* solitary plants appear by drainage ditches, concrete curbs and sidewalks. The developer agreed to a "Rare Plant Conservation Plan", which was later modified (after a lawsuit with California Native Plant Society), approved and funded by the Ventura County Board of Supervisors. Mismanagement of the conservation plan and destruction of *A. brauntonii* have continued unabated. Rancho Simi Recreation and Parks District owns the open space in Oak Park III. On July 27, 2007 in two *A. brauntonii* preserves, one demonstration garden, one small group in Oak Park Open Space and Oak Park Community Park I found:

1) The debris basin preserve off Deerbrook has bare ground where the *A. brauntonii* used to grow. On the other side of the fence I saw one small live *A. brauntonii* in the chaparral that burned in the 2005 fire. *Nolina* in the chaparral was dominant. There may be more *A. brauntonii* in the burned area, but none in the debris basin. Weeds covered the opposite side of the debris basin.

2) At the West Hill Preserve, bounded on one side by a heavily overgrown fuel modification zone and irrigation lines that are overwatering the Preserve as well as the fuel mod zone, there is a heavy post and cable fence “protecting the preserve” and a metal sign proclaiming this a rare plant preserve. One lone, small, live adult *A. brauntonii* stood outside the area. In 2004 we counted 45 living *A. brauntonii*. Inside the Preserve were piles of dead, broken, mature *A. brauntonii* mixed with bleached garden snail shells. No naturally semi-arid *A. brauntonii* population has snails. Only wet, thick vegetation attracts snails. Snails only die in large numbers when they are sprayed. The conservation plan required that no pesticides or herbicides be used around or on *A. brauntonii*. There were no live *A. brauntonii* in the West Hill Preserve. I walked over to the fuel mod. zone across Deerhill Road, finding more drifts of dead snails and one tall dead *A. brauntonii*.

3) The demonstration native plant garden at the corner of Deerhill and Doubletree, separated from the soccer field by a tall berm, contained live *A. brauntonii*. Two large sprinkler heads were in the center of the native plant garden. The native shrubs were healthy, but the *A. brauntonii* near the sprinkler heads were either dead or dying. A small group of healthy *A. brauntonii* were living in the dry top corner of the berm between the soccer field and the garden. Someone had cleaned out the weeds and trimmed the rosemary groundcover invading the garden from both sides. An attractive fake split-rail fence restrains the *A. brauntonii* while another metal sign explains this is a rare plant demonstration garden. This year I counted 51 living plants. In 2004 we counted 67 living plants. No *A. brauntonii* lives outside the fence.

4) In 2004 there were five young *A. brauntonii* in Oak Park III Open Space across Doubletree Road from the Mormon Church. July 23, 2007 no more plants were found. Small *Quercus agrifolia* trees have been planted.

5) Oak Park Community Park has removed all leaves, seeds and other organic litter from the small chaparral area on a knoll beside the main park road, effectively preventing the formation of a seedbank. Several *A. brauntonii* were living there several years ago. This year I found two dead adult plants in the chaparral and one small live adult plant by a garbage can at the bottom of the knoll. The one *A. brauntonii* living at the corner of the driveway to the caretaker’s house was gone. The soil was bare of any organic matter.

### **Pathfinder Avenue, Thousand Oaks**

There is a small population of *A. brauntonii* on an Edison powerline easement which crosses Pathfinder Avenue in the City of Thousand Oaks. Its continued existence is in doubt because current fuel modification goals seem to require that all organic material,

whether alive or dead or seeds, be removed from all open space areas. May 3, 2006 I counted 27 living plants. July 23, 2007 I counted 15 living plants along a permanent fence that marked the edge of a hiking and maintenance access road. The rest of the easement was bare. One *A. brauntonii* crossed the road and grew up in the shade of an oleander bush, part of a hedge around the yard of a residence. Residences line both sides of the easement where it crosses Pathfinder Avenue.

### **Bus Canyon and Trough Canyon**

Bus Canyon (28) and Trough Canyon ridge(31) in Bridal Path Homeowners Association north of Simi Peak *A. brauntonii* populations were discovered by Mary Ann Campbell, who continues to monitor them. August 14, 2007 she reported the population numbers in 2007 to be about the same as in 2006: 16 *A. brauntonii* in the Bus Canyon location and 130 *A. brauntonii* in the Trough Canyon ridge location. She also reported finding more *A. brauntonii* in the vicinity of Bridal Path Homeowners Association, but did not specify their locations.

### **Oakbrook Regional Park and Adjacent Open Space**

For years small occurrences of *A. brauntonii* had been noted around many acres of open space between Kanan Dume Road and Lang Ranch Parkway (22, 25, 26) either on jeep roads through the acreage or when powerline easements were cleared or land was graded at the edges for new residential development. Today 486 acres are dedicated as Oakbrook Regional Park. The western half of the park is oak forest, the eastern half is chaparral, often chamise-covered ridges. At the northeastern boundary the land becomes filled with rock ridges and tumbled boulders. The park adjoins the North Ranch Open Space, part of Thousand Oaks. This area lies on the western skirts of Simi Peak. When the 2005 wildfire raced westward, firebreaks were bulldozed in broad swaths through the middle of the park and toward the northeastern edge. The firebreak builders stopped before they intruded into the open space section. The fire may have burned that section before they reached it.

In 2006 *A. brauntonii* was discovered on all the firebreaks made in the chaparral section of Oakbrook Regional Park, growing in berms and ruts, mixed with broken shrubs and weeds. On one slope Frank Landis and I counted 384 living *A. brauntonii*, then we found five more by a power pole as well as two others near another section of the powerline easement. Jay Sullivan told us we had missed the main population. May 12, 2006 Jay led us east toward Simi Peak up a succession of firebreaks on which we found 66 *A. brauntonii*. The firebreaks stopped, as did any trail. We rounded a stony outcrop and looked into a large bowl with a high stony ridge on the south and a series of low hills on the north. The hilltops were formed by sediment filling low parallel ridges of rock. The area had burned, but not completely. After climbing down, crossing a small creek and pushing through the burnt shrubbery we saw more and more *A. brauntonii*. Frank hiked up to the parallel-ridged hilltop and found he could not move without stepping on *A. brauntonii*. Jay and I searched for the population boundaries while Frank kept counting. Time ran out before he finished. The count for that one area was 1894 living plants,

estimating at least 2000 more. This year, 2007, Jay returned to the area then reported that we missed a lot of *A. brauntonii*, that the population boundaries were much larger than we had thought. I have asked that National Park Service staff experienced in the use of polygon-measuring devices help in defining this very large population of *A. brauntonii*. We hope to schedule a trip in cooler weather this year. Rick Burgess confirmed that the firebreak population surveyed as 384 in 2006 remains about the same number of *A. brauntonii* in 2007.

### **Santa Monica Mountains National Recreation Area (SMMNRA), Simi Hills**

Summer 2007, Santa Monica Mountains National Recreation Area biologist Jennifer Carlson and I searched for and surveyed all *A. brauntonii* locations identified by post-burn assessment teams in parkland from Simi Peak Trail east to Cheeseboro Ridge Trail. All the following areas burned in the 2005 wildfire.

#### **Simi Peak, SMMNRA (new)**

On the eastern flank of Simi Peak, adjacent to the Simi Peak Trail we surveyed a previously unknown population of *A. brauntonii*, on a long rolling low hill with *Malosma laurina* on the sides and *Eriodictyon crassifolium* shrubs filling the dished-in top of the hill. A trail cut across the eastern edge of the hill. On the other side of the trail a gentle slope with more *A. brauntonii* led down to a shadier, moister area. *Hazardia squarrosa*, *Salvia mellifera*, *Lotus scoparium*, *Adenostoma fasciculatum*, *Artemisia californica*, *Baccharis pilularis*, *Hesperoyucca whipplei*, *Calystegia macrostegia* are other species found there. May 21, 2007 we counted 447 living *A. brauntonii* growing over the low hill.

#### **Palo Comado Canyon, SMMNRA**

1) We located a side canyon east of Palo Comado Trail with *Quercus agrifolia* and *Toxicodendron diversilobum* at the mouth, a dry rock waterfall at the back with *A. brauntonii* on the north-facing flank of the side canyon, a few on the south-facing flank and on top of the south ridge running up above the rock waterfall (19). *Calystegia macrostegia*, *Hesperoyucca whipplei*, *Adenostoma fasciculatum*, *Eriogonum fasciculatum*, *Cuscuta* spp., *Salvia mellifera*, *Argemone munita*, and non-native *Centaurea melitensis* covered the drier slopes. Several *Calochortus plummeri* were growing above the rock waterfall. Over two days, May 21, 2007 and June 11, 2007, Jennifer and I counted 324 living *A. brauntonii*. June 13, 2006 Frank Landis and I counted 627 plants in the same area.

2) Farther south on Palo Comado Canyon Trail, Jennifer Carlson and I observed a new population of *A. brauntonii* on the north-facing side of a long shoulder running far uphill (new). The habitat was similar to the previous site, except there was a meandering dry creek bed at the bottom of this drainage. *A. brauntonii* found along the creek bed had grown normally: tall with multiple long branches and stalks of twenty or more seedpods. The *A. brauntonii* uphill from the creek bed were much smaller, either immature or, if

flowering or fruiting, with very few side branches, flowers or seedpods. Over two visits (June 11, 2007 and June 25, 2007) I counted 821 living plants, but that is an undercount. We are not sure we found the uphill boundary of this population as the plants were scattered in groups of 9 to 11 plants all over the slope.

### **Cheeseboro Ridge Trail, SMMNRA**

The Cheeseboro Ridge Trail population consists of three sections: a slope south of Cheeseboro Ridge Road where the road curves behind a rock wall named “Baleen Wall”, a saddle area on the west as the road bends again, and a bowl on the east side of the road, below the slope south of the road.

1) *A. brauntonii* plants were noted on a slope above Cheeseboro Ridge Road east of the saddle when we finished surveying the saddle in 2006. The vegetation is mixed chaparral on the slope and denser mixed chaparral in the bowl, so finding the mostly young, small *A. brauntonii* was difficult. *Ceanothus* spp., *Rhus ovata*, *Malosma laurina*, *Adenostoma fasciculatum*, *Salvia mellifera*, *Rhamnus ilicifolia*, *Hesperoyucca whipplei*, *Mimulus aurantiacus*, *Calochortus plummeri* are some of the species encountered. June 13, 2006 Frank Landis and I counted 501 living plants on the slope above the road. On the slope on June 25, 2007 I counted 71 living plants and observed severe herbivory. Surviving plants were often found in the shelter of stunted *Adenostoma fasciculatum* shrubs. One brush rabbit bounced out of my way and deep deer trails wound around the slope. Deer and rabbit scat were so frequent they were often mixed.

2) The saddle area is the one known site (29 & 33). The dominant shrub in the saddle area is *Adenostoma fasciculatum*. About 130 *A. brauntonii* were noted in the saddle after a prescribed burn in 1999. I counted 15 *A. brauntonii* in the saddle March 8, 2004. June 13, 2006 Frank Landis and I counted 827 living plants in the saddle and down slope from the saddle. June 25, 2007 I found 76 living plants.

3) In 2006 Frank observed *A. brauntonii* in a bowl below Cheeseboro Road across from the saddle site. He climbed down and counted 265 living plants in the bowl below the road. After the very dry winter of 2006-2007 the vegetation was extremely dry. Little shrub growth was evident, though *Rhus ovata*, and *Malosma laurina* were green and growing. Some *Rhamnus ilicifolia* had fruit.

July 2, 2007 Frank joined Jennifer and me to survey the bowl below Cheeseboro Ridge Road. Jennifer recorded the polygon boundaries. We counted 1163 living plants in the bowl. Frank and I measured the heights of *A. brauntonii* as we counted them. The population dynamics compared to the well-established *A. brauntonii* populations at Temescal Ridge Trail (15) are very interesting (see Graphs 1 & 2).

The combined 2007 population total for the three sections of the Cheeseboro Ridge Road is 1310 living *A. brauntonii*.

## **Sulphur Springs Trail**

May 21, 2007 ten *A. brauntonii* were found on a slope above Sulphur Springs Trail. This small group, a previously unrecorded occurrence, may have originated as downslope travelers from the Cheeseboro Ridge Road population.

## **Los Angeles County, Santa Monica Mountains<sup>4</sup>**

### **Zuma Ridge**

Zuma Ridge (AKA upper Zuma Canyon) populations (27, 32) were surveyed May 12, 2007. The known populations lie east of Zuma Ridge Motorway above Zuma Canyon on a shoulder sloping toward a saddle, and also above the shoulder on a rounded ridge, and near the end of an abandoned roadcut running to the next shoulder to the east. New *A. brauntonii* were discovered on a slope above the intersection of the abandoned roadcut and Zuma Ridge Motorway. Since the plants are obviously above the known site on the shoulder they are combined with the survey on the old prescribed burn site farther down the slope. The five plants were in excellent condition. Dense chaparral canopy and continued depredation by pocket gophers, deer and rabbits left only eighteen *A. brauntonii* living on the old prescribed burn site down the slope, mostly in the few rocky areas with shallow soils that remain open. To the east, eighteen *A. brauntonii* were doing well in the small location near the eastern end of the abandoned roadcut though some seedpods showed insect damage.

### **Trailer Canyon**

Trailer Canyon (AKA Traylor Canyon) population (8, 14) was surveyed April 22, 2007. The main population is on a high cut bank on the State Park side of a gate controlling traffic on a well-maintained fire road. The bank is studded with yucca. Above the bank the ridge is covered with *Ceanothus* chaparral. Every year the wide fire road is graded at least once, scraping up young plants and seeds at the bottom of the cut bank and depositing them elsewhere, e.g. far outside the State Park gate in a truck turnaround not far inside the Michael Lane trailhead for hikers in Palisades highlands. The truck turnaround population varies year to year from 0 to 1 to 21 this year. The heavy rains in 2004-2005 caused sheet erosion under the State Park gate and down the fire road. This year we counted forty-two young plants and seven adults growing in the erosion channel. Unfortunately many of these plants will be damaged or destroyed by road maintenance activities, but their numbers seem to be on the increase outside the State Park gate. Inside the gate we counted fourteen adults and five young plants. Old yucca stalks and other debris had been thrown on top of the young plants growing at the base of the cut bank, probably by hikers and mountain bikers. This population is located above the old limestone quarry once owned by Alphonso Bell. We checked for any other *A. brauntonii*

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<sup>4</sup> Mary Ann Campbell mentioned seeing a small group of *A. brauntonii* on private property while on a group hike to Nicolas Flats in the Santa Monica Mountains. I have not had a chance to verify that observation.

along the fire road toward the Temescal Ridge populations, but found none. This fire road links to the Temescal Fire Road (AKA Temescal Ridge Trail) (15, 17) which also is accessed from a trailhead in Palisades Highlands (Via las Palmas).

### Temescal Ridge Trail

Temescal Ridge Trail (Temescal Fire Road) runs through a very well-established population of *A. brauntonii* on a ridge that is part of a maze of small canyons, including Trailer Canyon. The Temescal Fire Road does run down one side of Temescal Canyon eventually, but Temescal Canyon is connected with these populations in name only. The large *A. brauntonii* population has three sections:

1) A natural population I have monitored for almost ten years. My field label for this population is 15b, in reference to the main population's CNDDDB Occurrence number 15. 15b lies on a knoll and rocky slope above the intersection of the Temescal Ridge Trailhead access from Palisades Highlands and the main Temescal Ridge Trail. It has large family groupings of all age groups, grows with *Malosma laurina*, *Hesperoyucca whipplei*, *Hazardia squarrosa*, *Rhus ovata* x *R. integrifolia*, and some weeds. There were 526 living plants on July 16, 2006. July 23, 2004 there were 181 live plants. One cluster of plants near a biking jump was smashed by some large person or animal falling on them. A mountain biking trail through the population is becoming wider and more eroded.

2) The knoll (15b) links to Temescal Ridge Trail on two slopes with traveling *A. brauntonii* providing a sparse line of plants to the second section of the Temescal population. This section grows along Temescal Ridge Trail and adjacent to it. State Park staff have managed the trail population well. When clearing is necessary along the trail it is done when seedpods are mature and the cut plants are placed in clear areas a short distance from the trail edge. The trail population spreads from the knoll through a saddle area and around the base of the hilltop with the largest population (15). July 23, 2004 we counted 226 living *A. brauntonii* along the trail. March 22, 2005 there were about 250 living plants counted here. July 17, 2007, there were 337 living *A. brauntonii* in this population section, 78% of which were adults with mature seedpods.

3) The main section of the Temescal population (15) lives upslope from Temescal Ridge Trail on a ridge shared with a powerline easement. The plants are clustered around and in a line of *Malosma laurina*. *Hazardia squarrosa* is common. *Rhus ovata* x *R. integrifolia* and *Rhamnus crocea* are also present as are non-native grass species. The slope down to Temescal Ridge Trail is dominated by *Hesperoyucca whipplei*. The top of the ridge seems to be cleared intermittantly, probably as a fuelbreak for the powerlines, but the *A. brauntonii* are, for the most part, left alone. Deer and rodent scat and browsing are common as is insect damage on stems, leaves, flowers and pods. Keeley and Fotheringham estimated a population of *A. brauntonii* greater than one thousand in their 1998 report<sup>5</sup>. July 23, 2004 we counted 552 living plants. Due to the very wet winter 2004 – 2005, proximity to the coast, a southwest-facing slope open to the coast, more

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<sup>5</sup> see footnote 2, page 5.

rainfall than the other populations last winter and heavy fogs all summer, this population is very healthy. On July 27, 2007 I counted 1258 living plants: 1033 adults and 225 young plants. A threat to their numbers are weeds, especially smilo grass (*Piptatherum miliaceum*) which started invading the site two years ago. That year the *P. miliaceum* was cleared, but it has returned. Another threat is fire management activities as more houses are built closer to their ridgetop location. About 500 feet downhill to the southwest are new upscale residences of Palisades Highlands and the building continues.

### **Los Angeles County, San Gabriel Mountains**

Known populations in the San Gabriel Mountains are located on and in the vicinity of Clamshell Motorway (16, 24), which seems to have been graded as a fire road in the early 1950s. *A. brauntonii* has been known from the area above Monrovia since 1923<sup>6</sup>. Surrounding habitat is mixed chaparral: *Ceanothus* spp., *Heteromeles arbutifolia*, *Rhamnus ilicifolia*, *Rhus ovata* x *R. integrifolia*, *Malosma laurina*, a *Quercus* hybrid, *Brickellia californica*, *Cuscuta* spp., *Salvia mellifera*, *Nassella* spp., non-native species e.g. grasses, including smilo grass, *Salsola tragus*, *Erodium cicutarium*, and mustards. Though the area is a City of Monrovia Preserve, there are private landholdings beside Clamshell Motorway. One landholder has gated and locked off one section of Clamshell Motorway and insisted the road be cleared for use as an emergency access. The City of Monrovia contracted with Los Angeles County Fire Department to maintain the road with the proviso that the LACFD work with the City to protect *A. brauntonii* populations on the road during maintenance activities. July 30, 2007, when I surveyed the population about two-thirds of the plants had been bulldozed by the LACFD<sup>7</sup>. Many of the plants were cut off, bent to the ground or buried in new dirt berms created as the road was widened. Plants found in the dirt berm had been buried with immature seedpods, so their seed production was lost. Battered but still living plants were putting out new leaves and stems, but they were not flowering or producing seedpods. Most of the remaining uninjured plants had seedpods. February 9, 2004 we counted 1465 *A. brauntonii* in the main population on Clamshell Motorway. July 30, 2007 we counted 285 living plants in the same area.

The small population (21 plants in 2005) discovered above Clamshell Motorway in a patch of *Salvia mellifera* were all dead and broken on the ground, except for one live adult plant. There is one other population in the vicinity of Clamshell Motorway that I have not yet accessed. I have been informed it is not as large as the main Clamshell Motorway population.

### **Orange County, Northern Santa Ana Mountains**

In the Santa Ana Mountains, Santiago Peak, located about halfway between the coast to the south and the Coal Canyon/Gypsum Canyon populations to the north, recorded 7.80

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<sup>6</sup> Information is based on conversations with Braunton's daughter, Ernestine B. Peterson, and a photo of her as a very young child, standing under an *A. brauntonii*. The photo is dated in Ernest Braunton's handwriting as 1923, Dr. Lux's ranch, Monrovia.

<sup>7</sup> Information from a Monrovia City Councilperson is the City is considering canceling its contract with LACFD because LACFD did not notify them of its clearance activities.

inches of rain (similar to my rainfall records), more than twice the amount that fell at Villa Park Dam. Villa Park Dam, in Anaheim Hills about nine miles to the southeast of the *A. brauntonii* occurrences in Coal Canyon/Gypsum Canyon, recorded the lowest cumulative rainfall of 3.78 inches. The wettest storm of the season delivered 0.65 inches there in April, 2007.

Vegetation in the survey areas in the northern Santa Ana Mountains was very desiccated – young *Adenostoma fasciculatum* were dead, older shrubs had no fresh growth, except for *Malosma laurina* which was stunted but had fresh leaf canopy. *Eriodictyon crassifolium* leaves were curled and easily broken. *Salvia* spp. were dead. Thin 1.5 m tall saplings of *Malacothamnus fasciculatus* with miniature leaves were everywhere, crowding not only *A. brauntonii* plants but also the post-fire seed sprouters, e.g. *Ceanothus* spp.

The whole area burned in 2002. The Sierra Peak fire in early 2005 burned one site again. Due to the proximity of Anaheim Hills residential development (1 to 1 1/2 miles to the east), Orange County Fire Department has an aggressive fire management policy of grading broad fire roads and firebreaks and doing backfires far from any active wildfire front in Chino Hills State Park, the California Fish and Game Preserve and on Irvine Ranch Land Reserve Trust. This was especially true during the Sierra Peak fire. The high frequency of wildfires in this area, all caused by human activities, have resulted in serious damage to the habitat in Coal Canyon and Gypsum Canyon either from the actual wildfires or from fire management activities. A new development is being graded at the north end of Gypsum Canyon - south of the 91 freeway, west of Anaheim Hills - which will further impact these *A. brauntonii* populations.

August 3, 2007 I counted twelve recently dead individuals in Chino Hills State Park sites and 365 dead in the Fish and Game sites adjacent to West Coal Canyon Ridge Road, including both young and adult plants. Paul Galvin, the biologist doing surveys for Harmsworth Associates, and I checked Mother A and Mother B populations on Irvine Ranch Land Reserve Trust property August 17, 2007. We found only one small *A. brauntonii* with a few live leaves. All the other plant shoots were dead. Galvin said he found the plants dead when he surveyed all the Coal Canyon and Gypsum Canyon populations in July, 2007. Galvin's 2003, 2004, and 2005 survey numbers for *A. brauntonii* in Coal and Gypsum Canyons sites are shown in Table 2 below. Numbers from our August 17, 2007 counts have been added.

**Table 2:** Number of *Astragalus brauntonii* individuals at each location in 2003, 2005 and 2006 in Coal and Gypsum Canyons sites: Irvine Ranch Land Reserve Trust (IRLRT), California Dept. of Fish and Game Preserve (CDFG), Chino Hills State Park (CHSP) and Coal Canyon detention/Caltrans debris basin (Caltrans).

Survey data courtesy of Paul Galvin (Harmsworth Associates Report #462) with August, 2007 data added.

Location (AB # on Galvin's map)	# in July 2003	# in Aug. 2003	# in July 2005	# in June 2006	# in Aug. 2007
IRLRT, Mother A (AB7)	2152	3062	1126	208	0
IRLRT, Mother B (AB8)	169	282	35	0	1
IRLRT, Mother C (AB9)	12	12	0	0	0
IRLRT, Roadcut (AB1)	49	64	3	0	0
CDFG, Boundary Ridge A (AB3)	311	600	272	26	0
CDFG, Boundary Ridge B (AB5)	125	126	53	23	0
CDFG, Boundary Ridge C (AB4)	558	944	409	7	0
IRLRT, Boundary Ridge D (AB2)	2	2	2	0	0
CHSP, Coal-Gypsum Ridge (AB6)	200+	235	117	14	0
Coal Canyon detention basin (AB10)	-	10	0	0	0
<b>Total # of individuals</b>	<b>3578</b>	<b>5337</b>	<b>2017</b>	<b>278</b>	<b>1</b>

### 3. Analysis of data and comparison of data from some populations

Table 3 allows comparison of the most recent data available (2004, 2006-07) on known *Astragalus brauntonii* populations. Note the worldwide distribution of this species is 11599 plants living in small discrete units on 21.4 hilly acres in three counties in southern California. Due to the locations of *A. brauntonii* on easements, near new hillside development, where firebreaks and fuel modifications abound, few of these populations can be assured of protection.

Column 8 of Table 3 lists ASBR counts from 2004 surveys. Comparing population numbers taken in 2006-2007 with the 2004 data indicates that fire is not needed to have healthy populations of *A. brauntonii*. While the 2005 wildfire greatly increased the population at Cheeseboro Ridge Road, the Temescal Ridge Trail population increased without any disturbance such as fire. Nor is fire needed to cause damage.

Mismanagement in preserve areas has damaged Clamshell Motorway and Oak Park *A. brauntonii* populations. Weather conditions seemed to have adversely affected all the populations in the northern Santa Ana Mountains. Those populations will have to be surveyed next year to see if the plants recover.

**Table 3:** Recent data on known *A. brauntonii* populations. \* = partial count + estimate of remainder of observed population.

ASBR Locations with Occurrence Nos.	2006,2007 Surveys	Adult ASBR	Young ASBR	Dead ASBR	Total ASBR (2006, 2007)	Approx. Acres / Pop.	2004 ASBR Counts
Dayton Cyn, (23), SH	6/20/2006	—	—	—	1581*	0.14	3
Oak Park (20) & Pathfinder Ave (30), SH	7/23/2007	51	19	23+	70	0.16	175
Bus Cyn (28), SH	7/10/2006	—	—	—	16	0.002	—
Trough Cyn (31),SH	7/10/2006 8/14/2007	—	—	—	130	0.04	30
Oakbrook Reg. Prk (26, 22), SH	5/3/2006	—	—	—	391	0.6	6
(22 + new site), SH	5/12/2006	—	—	—	3960*	9	—
Simi Peak Trail (new), SH	5/21/2007 6/11/2007	357	90	0	447	0.41	—
Side canyon E. of Palo Comado Trail (19), SH	5/21/2007 6/11/2007	117	207	18	324	0.38	—
Palo Comado Trail-ridge S. of (19) (new), SH	6/11/2007 6/25/2007	360	461	9	821	2.73	—
Cheeseboro Ridge Rd (29, 33 + new), SH	6/25/2007 7/2/2007	353	957	17	1310	1.31	15
Sulphur Springs Trail (new), SH	5/21/2007	1	9	0	10	0.002	—
Zuma Cyn (27, 32), SMM	5/12/2007	19	17	32	36	1	163
Trailer Cyn (8,14), SMM	4/22/2007	25	64	6	95	1.8	95
Temescal Ridge Trail (15,17), SMM	7/16, 7/20, 7/27/2007	1668	453	240	2121	0.88	959
Clamshell Mtrwy (16, 24), SGM	7/30/2007	155	131	34	286	1.1	1465
Coal Cyn (4,10), SAM	8/3/2007	0	0	377	0	0.86	0
Irvine Ranch Land Res. Trust (10), SAM	8/17/2007	1	0	150+	1	1	1
<b>Total ASBR &amp; Acreage</b>		<b>3107</b>	<b>2408</b>	<b>906</b>	<b>11599 ASBR</b>	<b>21.4 ac</b>	<b>2912 ASBR</b>

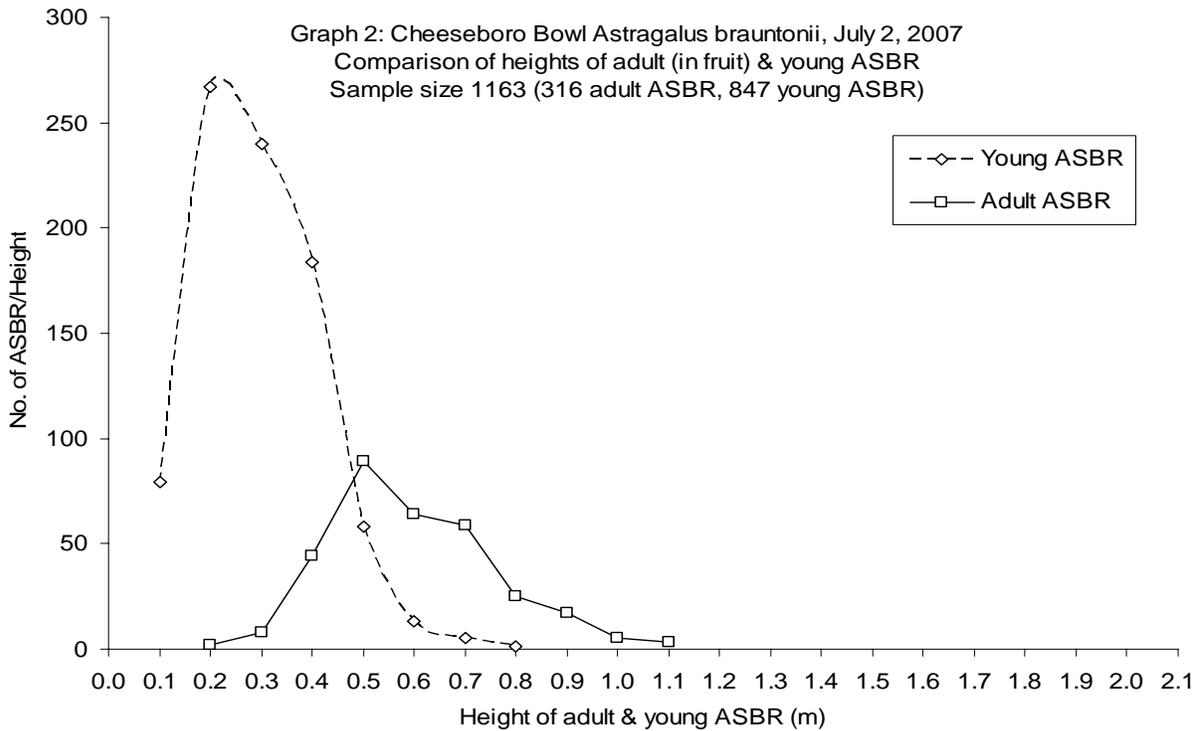
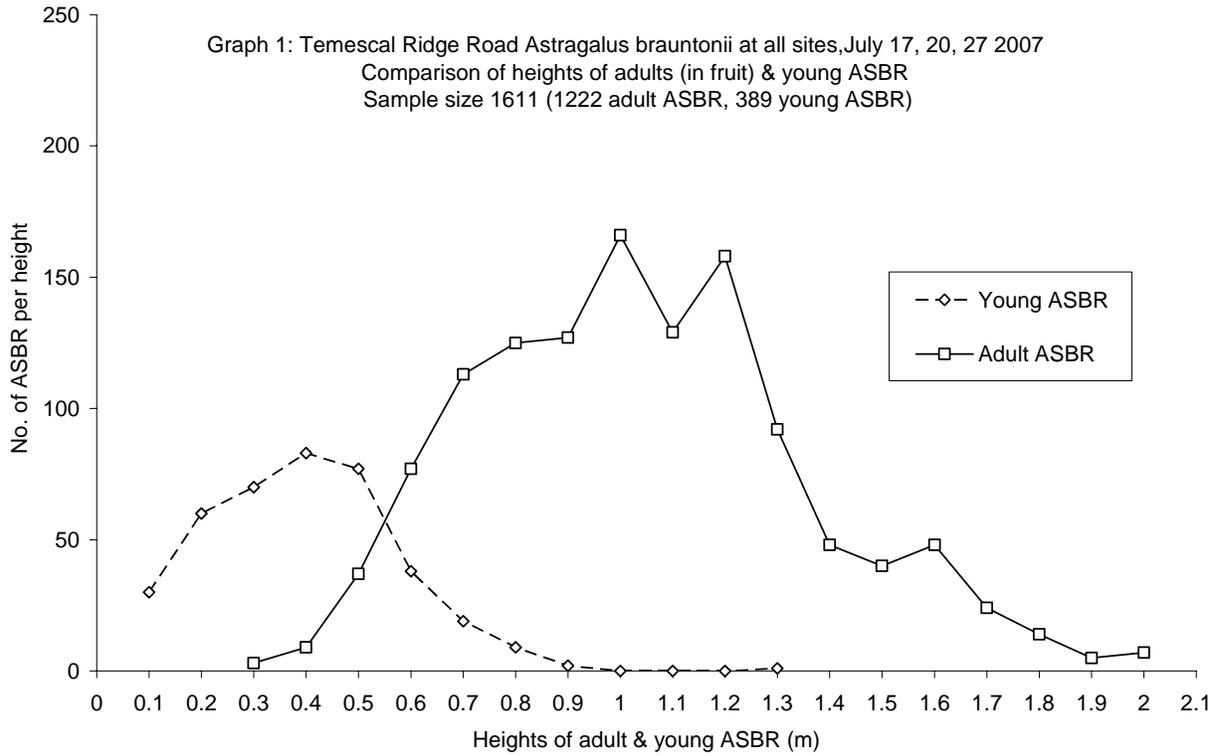
Graphs 1 and 2 on the next page illustrate the different growth strategies between the well-established, less-stressed population of *A. brauntonii* at Temescal Ridge Road and the drier, post-fire stressed *A. brauntonii* in the bowl area of the Cheeseboro Ridge Road populations.

Note the height measurements were taken in the same month. Temescal Ridge Road adult *A. brauntonii* outnumbered young *A. brauntonii* by a ratio of about 3 to 1. At Cheeseboro bowl the reverse is true: young *A. brauntonii* outnumbered the adult *A. brauntonii* by more than 2 to 1. Furthermore most adult (in fruit) *A. brauntonii* in the Cheeseboro bowl were about half the size of the adult *A. brauntonii* in Temescal Ridge Road populations. Many Cheeseboro bowl adults did not have side branches, developing a few flowers and pods at the top of the main stem. The seeds in those pods may not be viable. Photographs on page 22 show the difference in adult appearances at the two sites.

In June 13, 2006 Frank Landis found 265 *A. brauntonii* in the western portion of the Cheeseboro bowl population. Twenty-five, about 10%, of those 265 plants were flowering. That was before the very dry winter of 2006-2007. These ratios of young plants to adult plants and the stunted growth of adults have been observed in the Palo Comado populations as well, where the plants are on exposed slopes and shoulders or hilltops. At all sites we found pocket gopher holes, young *A. brauntonii* cut off at the roots, browsed stems and meristems and some plants surviving by growing under *Malosma laurina* or *Adenostoma fasciculatum* burnt branches and resprouting roots.

Table 4 compares the available numbers of young and adult *A. brauntonii* for all major populations. The data hints that established populations may have larger ratios of adult to young *A. brauntonii* than newer or more stressed *A. brauntonii* populations, which seem to mature more slowly and/or be unable to produce abundant flowers and seedpods. If that is the case, then the Simi Peak Trail population may have been growing there for years, not residing underground as a seedbank.

Comparison of Temescal Ridge Road (15) & Cheeseboro Bowl Heights of Adult & Young *Astragalus brauntonii* (ASBR)



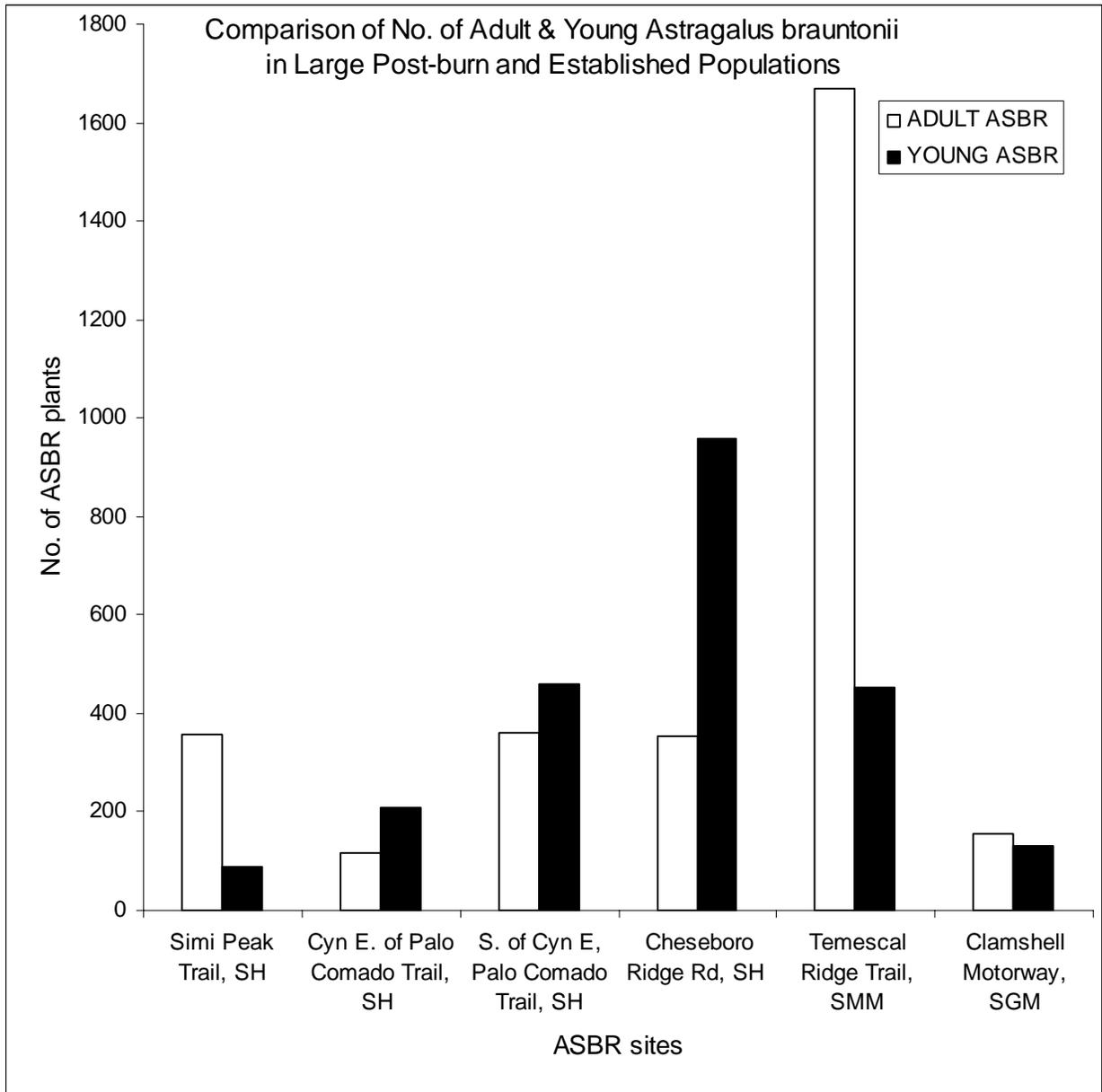


Adult *A. brauntonii* at Temescal Ridge Road population. Note the many branches and large seedpods. The measuring stick propped on the main stem is 1.2 meters long.

Adult *A. brauntonii* at Cheeseboro bowl population. Note the lack of branches, the short height, and the few seedpods at the top of the plant.



**Table 4:** 2007 data on numbers of adult and young *A. brauntonii* for major populations



#### 4. Conclusions and management implications

If more than three years after a fire are needed to establish a viable population of *A. brauntonii* capable of producing seeds enough to stock a seed bank, management plans for this species will have to include long-term monitoring and exclude prescribed burns. Judging from observations at Oak Park, use of pesticides must be forbidden.

If weather extremes are indeed as important as 2007 observations of northern Santa Ana *A. brauntonii* populations seem to indicate, then management plans would do well to establish weather monitoring stations in different topographical locations throughout the areas being managed.

The problems with fire management and fuel modification requirements must be solved to protect parkland in general, and *A. brauntonii* in particular because of its preferred habitat locations. Education and communication help, but various management levels in fire protection agencies must revise their methods and protocols with the goal of preserving and conserving parklands, landforms, and natural resources. This goal is imminently practical for disaster management in urban interface areas. For instance, *A. brauntonii* live on highly erodable soils. Scraping or blowing all organic matter off the soil as part of fuel modification requirements, prescribing burns or starting backfires when the area has been burned in the last few years and no wildfire is within a mile of any structures, or bulldozing broad firebreaks on tops of hills and down slopes in parkland far from fire fronts and any structures is a recipe for disastrous erosion and displacement of native habitat by non-native invasive weeds.

#### VI. ACKNOWLEDGMENTS

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## V11. LITERATURE CITED

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Wallace Laboratories, 51 soil analyses from all Simi Hills *A. brauntonii* major population sites, all currently identified Santa Monica Mountains *A. brauntonii* sites, known *A. brauntonii* sites in the San Gabriel Mountains, Coal Canyon *A. brauntonii* sites and one *A. brauntonii* site in Irvine Ranch Land Reserve Trust in the northern Santa Ana Mountains from samples provided by Betsey Landis.

Cumulative rainfall data provided by websites for these agencies:

Watershed Protection District, Ventura County (for Thousand Oaks and Simi Valley, SH)

State Water Resources (for Cheeseboro Canyon, SH)

Orange County Cooperative Observer Rainfall Data (Villa Park Dam, SAM)

NOAA website (Topanga Patrol FC-6, SMM)



Looking from the powerline *A. brauntonii* population southwest along Temescal Ridge Trail toward the smaller Temescal Ridge Trail population on the distant knoll, Santa Monica Mountains. The City of Santa Monica and Santa Monica Bay are in the distance. Houses in Palisades Highlands can be seen on the right edge of the picture. (B. Landis, July 27, 2007)

ASBR LOCATION	GPS (NAD27), UTM 11S Longitude, Latitude	GPS (NAD27), UTM 11S Longitude, Latitude
Dayton Cyn, 2 sites, SH (23)	1) 347347, 3787546 field	2) 347415, 3787333N core rd on hillside to 347380, 3787317W
Oak Park (West Hill Preserve, W. of Deerhill Rd), SH (20)	0337812, 3784369 (NAD83)	0337880, 3783991 (NAD83)
Pathfinder Ave powerline easement, SH (29)	0335559, 3785043 (NAD83)	
Trough Cyn, SH (31)	338863, 3788897 to 338872, 3788916	
Oakbrook Reg. Park, 3 sites, SH (26 & 22)	1) 333926, 3786047 2) 333785, 3786459S to 333762, 3786480N to 333663, 3786462W	3) 333761, 376177
(22) + new site, SH	1) 333884, 3786565 firebreak to 333811, 3786566	2) 333811, 3786566 main site W to 334762, 3786606S
Simi Peak Trail, SH (new)	0336660, 3786314 East boundary (lone ASBR)	0336375, 3786310 West boundary (main pop.)
Palo Comado Trail (above side cyn east of PC) SH, (19)	0339187, 3785044 SW	0339256, 3785020 NE & 0339247, 3785021 SE corners of pop.
Palo Comado Trail (ridge S. of side cyn) SH, (new)	0339316, 3784915 top edge of pop.	0339208, 3784898 NW, 0339406, 3784985 NE corners of pop.
Cheseboro Ridge Rd, saddle SH, (29 & 33)	0341047, 3785271 N. & 0341037, 3785262 S. edges of pop by rd	0341048, 3785260 E. edge of pop by rd
Slope S. of Cheseboro Ridge Rd SH, (29 & 33)	0341110, 3785115 SW upper corner of pop	0341104, 3785202 W. edge of pop above rd
Bowl N. of Cheseboro Ridge Rd SH, (29 & 33)	0341210, 3705215 N. lower edge of pop.	0341198, 3785190 S. edge of pop, close to rd
Sulphur Springs Trail, SH (new)	0340661, 3784720	
Zuma Cyn, SMM, N. of known site + known site, (27 & 32)	0331626, 3768468 North boundary	0331660, 3768446 South boundary
Zuma Cyn, SMM, abandoned roadcut east of known site (27 & 32)	0331635, 378630 Center of ASBR group	
Trailer Cyn turnaround, SMM, (14)	0356220, 3771977	
Trailer Cyn, washdown pop. outside State Park gate, SMM, (14)	0356236, 3772460 just outside SP gate	0356159, 3772368 farthest from SP gate
Trailer Cyn pop just inside State Park gate, (14)	0356290, 3772487 E. end of pop	0356265, 3772470 W. end of pop. (by SP gate)

ASBR LOCATION	GPS (NAD27), UTM 11S Longitude, Latitude	GPS (NAD27), UTM 11S Longitude, Latitude
Temescal Ridge Trail SMM, along trail, (15)	0357499, 3771845 S. edge of ridge trail pop	0357484, 3772035 N. limit of pop beside ridge trail
Temescal Ridge Trail SMM, knoll E. of Trail (15)	0357549, 3771482 bottom of knoll, by access to ridge trail	0357553, 3771576 N. edge of pop on knoll
Temescal Ridge Trail SMM, powerline pop (15)	0357506, 3772012 N. edge of pop, by first power pole on ridge	0357503, 3772041 W. edge of pop on ridge
Clamshell Mtrwy, Monrovia (ridgetop pop), SGM (16 & 24)	0407423, 3781476 on ridge above Clamshell Motorway	
Clamshell Mtrwy, SGM (16 & 24)	0407428, 3781556 (NAD83)	0407359, 3781657 (NAD83)
Coal Cyn wash, Chino Hills State Park, SAM, (9)	0436659, 3746881 (NAD83)	0436639, 3746892 (NAD83)
Coal Cyn west ridge, pipeline, CHSP, SAM, (4)	0436176, 3747016 (NAD83)	043168, 3746992 (NAD83)
Coal Cyn west ridge chaparral grove across rd from pipeline, E. side, (4)	0436115, 3747031 (NAD83)	0436163, 3747020 (NAD83)
pop below Coal Cyn west ridge rd, DFG preserve, (10)	0436361, 3745963 (NAD83)	0436373, 3745958 (NAD83)
pop above Coal Cyn west ridge rd, DFG preserve, (10)	0436509, 3745724 S. edge of pop.	0436501, 3745750 N. edge of pop.
Irvine Ranch Land Res. Trust (10)	0435454, 3745385 "Mother B" pop.	0435510, 3745360 west edge "Mother A" pop.