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# Effects of prescribed fire for fuel reduction on *Solanum parishii* (Parish's horse-nettle)

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2009 Progress Report

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Institute for Applied Ecology*

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## PREFACE

This report is the result of a cooperative Challenge Cost Share project between the Institute for Applied Ecology (IAE) and the USDI Bureau of Land Management. IAE is a non-profit organization dedicated to natural resource conservation, research, and education. Our aim is to provide a service to public and private agencies and individuals by developing and communicating information on ecosystems, species, and effective management strategies and by conducting research, monitoring, and experiments. IAE offers educational opportunities through internships. Our current activities are concentrated on rare and endangered plants and invasive species.

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## ACKNOWLEDGEMENTS

The authors gratefully acknowledge the contributions and cooperation by the Medford District Bureau of Land Management, particularly Armand Rebischke and Mark Mousseaux. Support was also provided by IAE staff and interns: Matthew Barmann, John Grotefend, and Shell Whittington. **Cover photographs:** *Solanum parishii* habitat at Hukill Hollow and an *S. parishii* flower. Photos by T.N. Kaye and R.T. Massatti.

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## INTRODUCTION

### **Background**

*Solanum parishii* (cover photo & Figure 1), Parish's horse-nettle, is a rare plant of southern Oregon that occurs in Jackson, Josephine, and Curry counties (Figure 2). Most known occurrences are on lands managed by federal agencies, including the USDI Bureau of Land Management and the USDA Forest Service. Previous studies have shown that this species is among a group of plants that may benefit from wildfires (Copeland 2004), but a clear understanding of how fire affects survival and reproduction of the species after controlled burns is lacking. This project will clarify the roll of fire and fire intensity on this species and provide guidance for fuel reduction planning.



**Figure 1.** *Solanum parishii* individual.  
Photo by R.T. Massatti.

### **Description and ecology**

*Solanum parishii* is an herbaceous perennial that becomes more or less woody with age. Individuals are less than 100 cm tall, much-branched, and generally glabrous, though sparse, simple hairs may be present. Stems are clearly angled to ribbed. Leaves are lanceolate to elliptic with wavy to entire margins and 2 to 7 cm long. They are usually unlobed and sessile or gradually tapering to their bases. The blue-purple (to white) flowers are clustered in umbel-like inflorescences in which pedicels are longer than peduncles. Fruits are berries 7 to 10 mm in diameter that turn from green to purple with age. *Solanum parishii* occurs in dry chaparral and shrublands, oak and pine woodlands, and pine forests throughout its range from southern Oregon to Baja California at elevations less than 2,000 m. Individuals typically occur in small populations (less than 10 plants) scattered across the landscape.

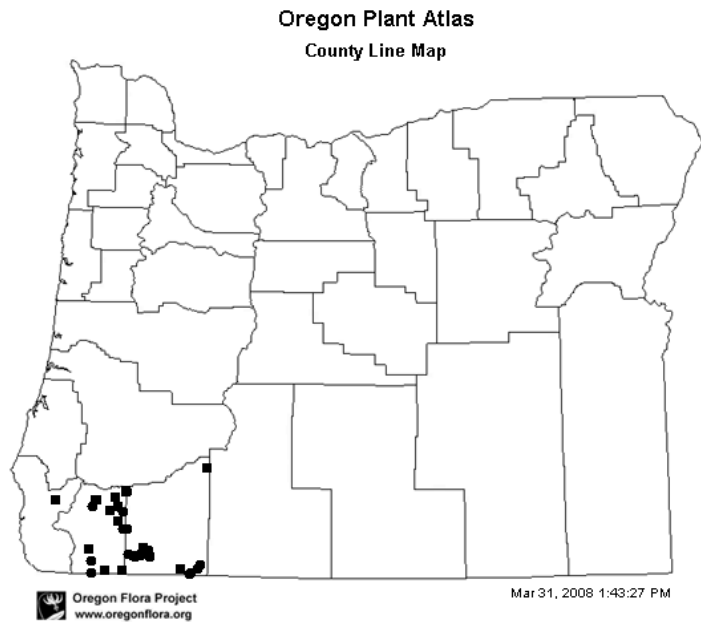
## METHODS

Field work was conducted from June 15<sup>th</sup> through June 17<sup>th</sup>, 2009 in the Squires Peak – Woodrat Mountain area of the Ashland Resource Area, Medford District BLM. Forty monitoring plots were established, 23 at Hukill Hollow and 17 at Woodrat Mountain (Appendix A). Plots measured 3 m by 6 m, with the long axis oriented parallel to the slope. Each corner was monumented with a 3 to 4 ft piece of rebar sunk 18 to 24 in into the ground. A numbered metal tag was wired around the upslope right rebar (as determined when standing at the bottom of the plot and facing upslope); this rebar also served as the origin (0, 0) when measuring plant distances within the plot (see below), with the 3 m side representing the x-axis and the 6 m side representing the y-axis. Plots were situated to include at least two *Solanum parishii* individuals in their upper halves. Half of the plots were randomly assigned to the burn treatment, while the

other half will serve as controls, being either excluded from burn areas or protected from burning. Green flagging was tied around each of the rebar corners of control plots while orange or pink flagging was tied around each of the rebar corners of burn plots. Controlled burns will be conducted by Medford BLM fire staff in the fall/winter of 2010/2011.

Various data were recorded with respect to the plants and plots. Within the plots, each plant was mapped onto a grid and its x-value and y-value were recorded. The maximum and perpendicular widths of each plant were recorded in addition to a count of the number of fruits and/or flowers per plant. Herbivory by mammals and insects were each recorded as yes/no values; mammal damage was defined as stems that were either clipped or stripped of leaves, while insect damage was defined as irregular damage to leaves and/or stems, including ragged leaf margins and leaf holes. The cover of shrubs, forbs and grasses was ocularly estimated both in the immediate vicinity of each plant and for the plot as a whole. Total vegetation was also estimated for the entire plot and a GPS point was recorded at the plot's origin. These measurements will be performed again in summer 2010 and for two subsequent years after the fires (2011 and 2012).

Data analysis will test the fire effects on plant survival, size, reproduction, and seedling occurrence. This method will indicate if fire affected burned plants as a group relative to controls. A logistic regression (effects on survival) and t-tests (effects on plant size) will be performed, with plant size before treatment included as a covariate.



**Figure 2.** Distribution of *Solanum parishii* in Oregon. The map was created by the Oregon Flora Project's Plant Atlas. (<http://oregonflora.org/atlas.php>)

## RESULTS

The forty plots established in 2009 contained 118 plants (mean 3.0 plants/plot); seventy plants were recorded within 23 plots at Hukill Hollow and 48 plants were recorded within 17 plots at Woodrat Mountain. The mean area of plants at both sites was  $697.3 \pm 59.7 \text{ cm}^2$ ; the mean area of plants between sites was only marginally different (Table 1). Eighty-five percent of plants were in flower and/or fruit at Woodrat Mountain and had on average  $17.8 \pm 3.6$  fruits and  $13.9 \pm 12.0$  flowers per reproductive plant. Only 53% of plants were in flower and/or fruit at Hukill Hollow and had on average  $9.8 \pm 2.4$  fruits and  $2.5 \pm 1.3$  flowers per reproductive plant. Insect and mammal herbivory impacted both populations of *S. parishii*. Insect damage was noted on 84% of plants while mammal damage was only recorded on 64% of the measured

plants. Both types of herbivory were more prominent at Woodrat Mountain compared to Hukill Hollow (Table 1).

Plant functional groups and their associated covers were similar at Woodrat Mountain and Hukill Hollow. Total vegetation cover averaged 42% between sites. Shrub cover at Hukill Hollow was greater than graminoid cover (19.1% vs. 11.4% respectively) while graminoids comprised more cover than shrubs at Woodrat Mountain (18.1% vs. 9.8% respectively). Litter dominated the non-vegetative ground cover, averaging 75.1% between sites. The remaining ground cover was dominated by bare ground with small amounts of gravel and rocks. Graminoid and litter cover in the immediate vicinity of *S. parishii* was similar to their respective overall cover values (13.4% and 70.9% respectively) while shrub cover was slightly lower (10.0%, Table 1).

Data collected in 2010 will allow a short-term comparison of yearly fluctuations in plant and vegetative cover characteristics. Post-burn monitoring in 2011 and 2012 will help determine the effect of fire on *S. parishii* populations.

**Table 1.** *Solanum parishii* characteristics at Hukill Hollow and Woodrat Mountain. Area per plant was determined by calculating the area of the ellipse formed by a plant's maximum and perpendicular widths. Total cover was a separate ocular estimation, not the addition of the different vegetative categories. "Ann. gram." refers to annual graminoids and "Per. gram." refers to perennial graminoids.

Site	Mean area per plant (cm <sup>2</sup> ± 1 SE)	Mean # fruits per repro. plant ± 1 SE	Mean # flowers per repro. plant ± 1 SE	Herbivory (% of population)		% cover (near plant)			% cover (plot)				
				Insect	Mammal	Shrub	Gram.	Litter	Shrub	Ann. gram.	Per. gram.	Litter	Total
<b>Hukill Hollow</b>	693.9 ± 81.4	9.8 ± 2.4	2.5 ± 1.3	76	53	12.9	9.2	62.1	19.1	11.1	0.3	68.7	39.7
<b>Woodrat Mtn.</b>	702.3 ± 87.2	17.8 ± 3.6	13.9 ± 12.0	96	79	5.8	19.4	83.7	9.8	16.5	1.6	83.8	45.4
<b>Total</b>	697.3 ± 59.7	14.0 ± 2.2	8.5 ± 6.3	84	64	10.0	13.4	70.9	15.2	13.4	0.8	75.1	42.1

## LITERATURE CITED

Copeland, S. 2004. Fire effects on selected rare plants of southern Oregon. Masters thesis, University of Colorado, Boulder, CO.

## APPENDIX A. DIRECTIONS, MAPS, GEAR LIST, AND DATASHEETS

### **Directions to field sites:**

Note: Distances are estimates only, please check them and update as needed in 2010. There is an Ashland Resource Area transportation map with the driving routes and field sites marked in red. Other information on this map is for CYFA.

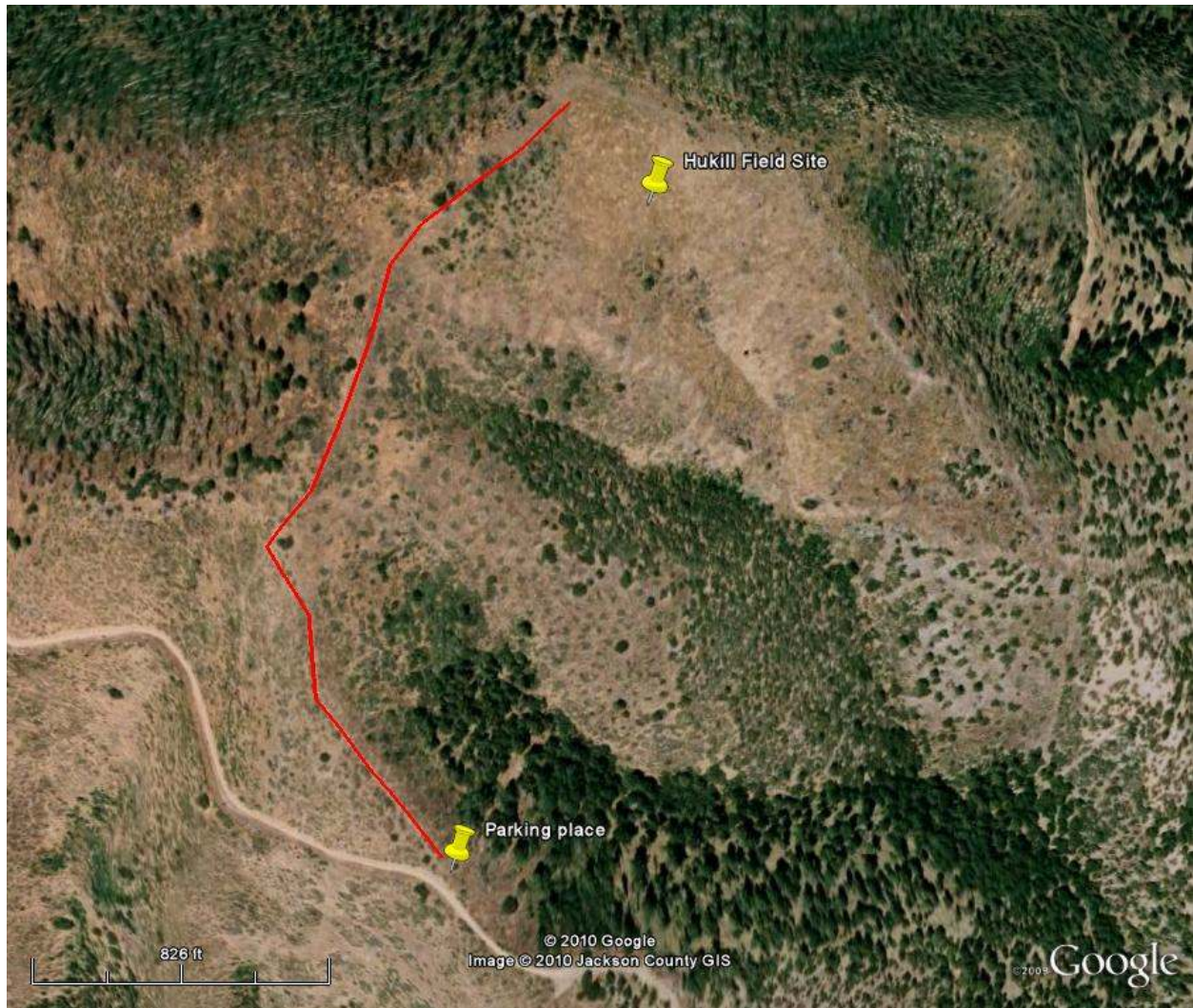
Woodrat Mountain: From downtown Jacksonville, take S. Oregon St. (aka County Road 584, Applegate St.) south. After 1.2 miles, road slights left and turns into Cady Road. After 1.8 (total), turn left onto Sterling Creek Road (County Road 787). From this junction, drive south ~4.6 miles and turn right onto BLM road 38-2-29 (Woodrat Mtn. Rd). After about 0.7 miles you will take the left fork and must go through a locked gate. After an additional 0.6 miles take the right fork. Drive an additional 0.6 miles, staying left at any junction. You should stay on top of the ridge until the road dead-ends. From the park place, the SOPA site is a short hike to the south, use GPS coordinates and aerial maps. There are several good camping spots on top of the ridge.

Hukill Hollow: Follow directions to Woodrat Mountain site, but instead of turning right onto BLM road 38-2-29, continue on Sterling Creek Road an additional 4.4 miles, where you take a right onto dirt road 39-2-7. After ~0.6 miles, turn left, where you should have to go through a locked gate. Drive ~1.8 miles and pull off and park on the right at what looks like an old overgrown road (see aerial photos). From parking place, walk to sites up old trail (should follow ridge up), use aerial photos and GPS coordinates.

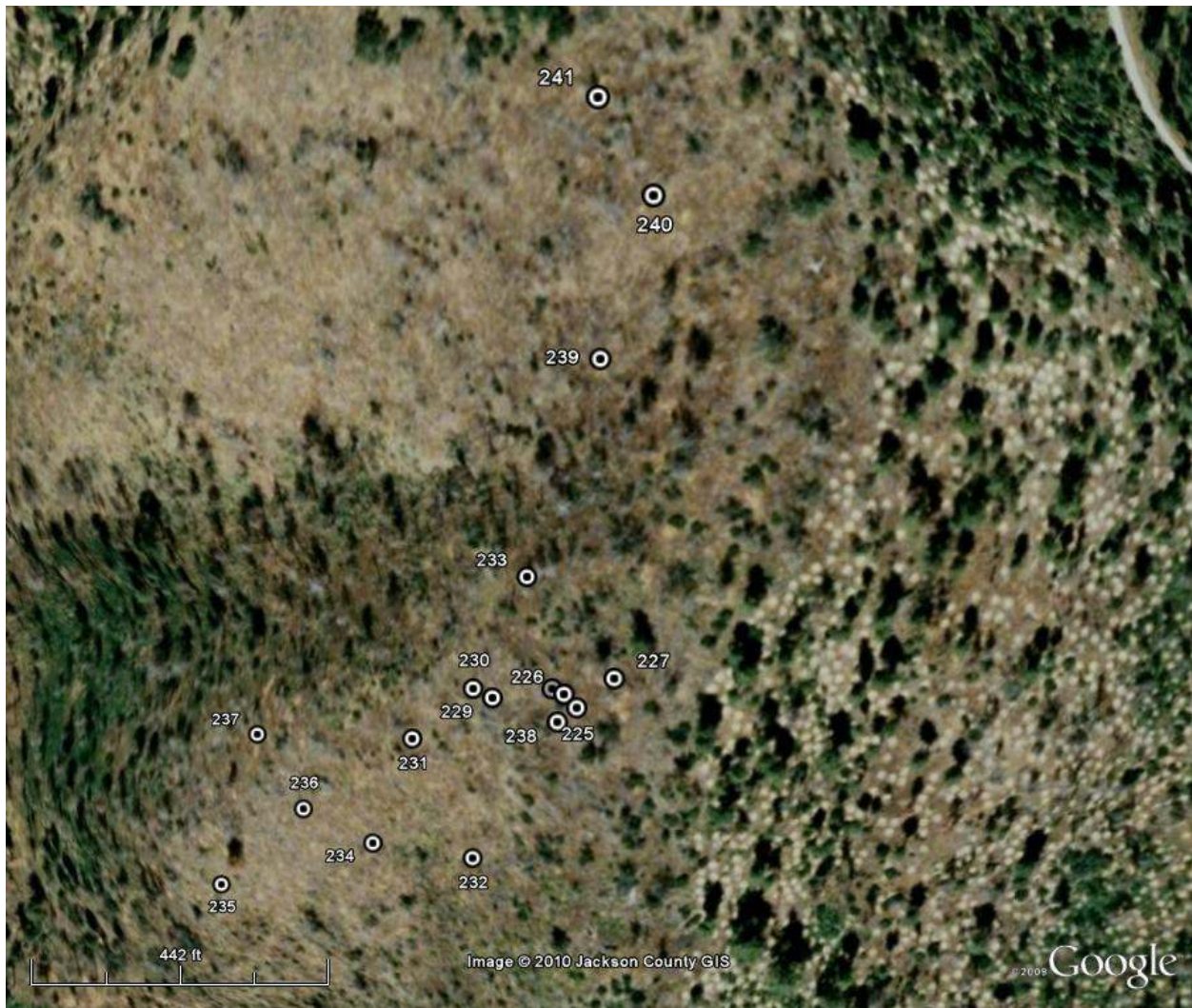
Hukill Hollow plot layout. Points are estimations, actual plots are within 25 feet. Parking place and route to walk to plots is marked in next photo.



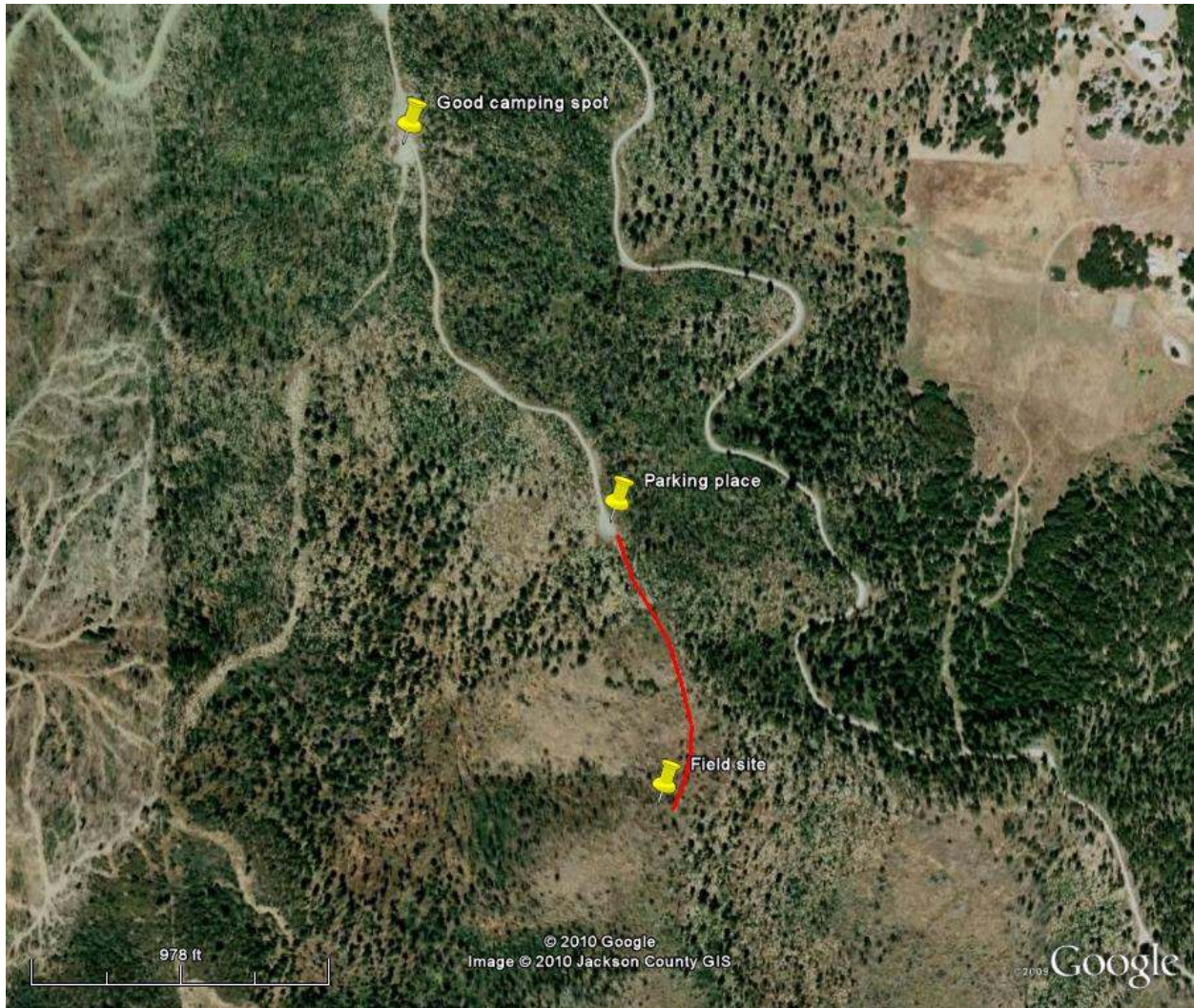
Parking place and route to walk (red line) to field site at Hukill Hollow. North is towards the top of the photo.



Woodrat Mountain plot layout. Points are estimations, actual plots are within 25 feet. The label “228” is hidden behind the label “226,” but the point is shown. Parking place and route to walk to plots is marked in next photo.



Parking place and route to walk (red line) to field site at Woodrat Mountain. North is towards the top of the photo.



**Gear list:**

(NOTE: this list may not encompass everything you need, update as needed)

Gazetteer

Ashland Resource Area transportation map (the one with the SOPA sites marked)

Aerial maps showing plot locations

Plot GPS coordinates (in data Xcel spreadsheet)

Jepson/Kozloff

GPS

Camera

Extra Batteries

Previous year's report

Previous year's datasheets

Blank datasheets (Rite-in-Rain if necessary)

Pencils

Clipboard/Tatum (2)

Rulers (4)

Meter tapes (small okay, at least 2)

Extra 2-3' rebar for replacement

Flagging (pink/orange, green)

Small sledge

Camping gear box

Water jugs

Health and safety box

Tables

Chairs

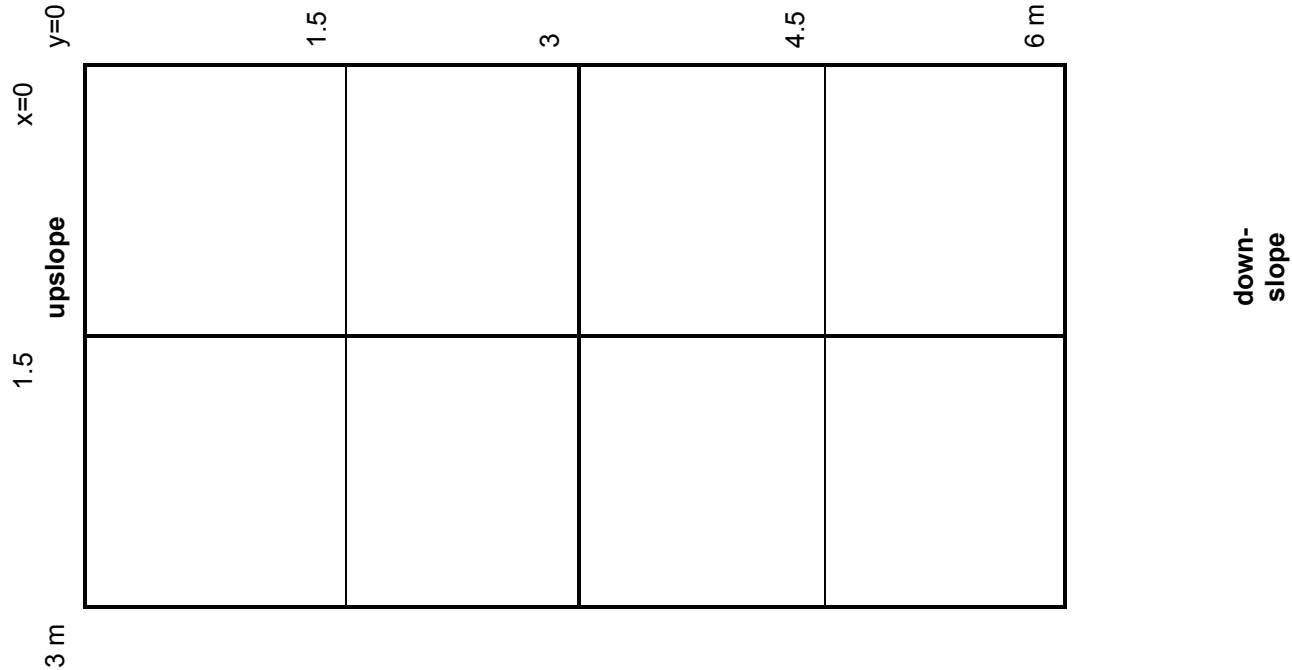
Food box

Cooler

***Solanum parishii* burn study**

Site: \_\_\_\_\_  
 Names: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Plot #: \_\_\_\_\_  
 GPS coord: \_\_\_\_\_  
 BURN or NO BURN (circle one)

**Total % cover (plot)**  
 shrubs: \_\_\_\_\_  
 annual grams: \_\_\_\_\_  
 litter: \_\_\_\_\_  
 total vegetation: \_\_\_\_\_  
 per. grams: \_\_\_\_\_



Plant #	x coord.	y coord.	max width (cm)	perp. width (cm)	frts	flws	herbivory		% cover (around plant)			notes
							insect	mam mal	shrub	grass	litter	