

Wheel Cactus

Opuntia robusta



Spray application of glyphosate trials Nuggetty Hills - Victoria

Jenny Baig & Brett Tyler
In partnership with
Nuggetty Land Protection Group
Parks Victoria - Mount Alexander Shire
BRIT 2004 - Diploma in Conservation and Land Management

SUMMARY

The objective of this project was to trial and document the efficacy of a new technique of surface spray application of glyphosate on Wheel Cactus *Opuntia robusta* in the Nuggetty hills of Victoria.

With often little resources available to land managers, the challenge is to find an effective control method that is accessible and cost effective.

A field trial was initiated in April 2004 and formally documented. Observations were made over a two year period and are recorded in this report.

Results have indicated that the application technique of glyphosate at the percentage used in this trial was effective in significantly reducing the potential for further spread of *O. robusta*. Results show consistent reduction of plant size and lack of fruit development. Smaller plant mass facilitates access to large stands for further control measures and prevents the development of viable seed.

It is hoped that the technique used to achieve the results of this trial may provide an additional and useful tool for the control of wheel cactus in the field and provide further data for continuing research.

CONTENTS

Aim	1
Background	1
Current control methods	1
Life cycle of <i>Opuntia robusta</i>	2
Vegetation and soil types in trial area	2
Permits and permission	3
Methodology	3
Results	4
Discussion	4
Conclusion	4
Acknowledgments	5
References	6

APPENDIX 1	Locality map and land use
APPENDIX 2	Trial site map
APPENDIX 3	Record sheet
APPENDIX 4	GPS Coordinates & Photography orientation & plot size
APPENDIX 5	Site photograph summary April 2004 - October 2006

Aim

To trial and document the efficacy of a new technique of surface spray application of Glyphosate on Wheel Cactus *Opuntia robusta* in the Nuggetty hills of Victoria.

Background

Wheel cactus *Opuntia robusta* originated in Mexico and was introduced as an ornamental plant to Australia (Parsons & Cuthbertson 2001).

Wheel Cactus is a Local Priority Weed infesting the Granite-Metamorphic soils of the Nuggetty-Maldon-Baringhup area of the Central Goldfields Bioregion. Plants are fleshy succulents forming dense stands. Each leaf segment or wheel is covered in numerous sharp spines capable of inflicting serious injury.

The Wheel Cactus infestation referred to in this report is located on the north facing slopes of the Nuggetty Hills to a height of 470 metres, in soils derived from Ordovician hornfels and granite.

The infestations cover an area that includes private land holdings and the Nuggetty Hills Park consisting of Box woodland. Land use on private holdings is mostly grazing (sheep) with some revegetation sites.

O. robusta is listed as Regionally Controlled Weed and Local Priority Weed and responsibility for control lies with the landowner or land manager. There is currently no herbicide registered for use on *O. robusta*.

Nuggetty Land Care Group has trialed the spray application of herbicide to *O. robusta* and have identified specific requirements and conditions for effective results.

Treatments with glyphosate under normal spraying conditions (fine, sunny weather) has proven ineffective. Application during overcast conditions in cool weather however, has produced effective results in previous trials. (pers. com. Teresa Cocoran, Nuggetty Landcare Group 15.10.04).

This trial aims to provide comprehensive data to assess the efficacy of this technique in a field situation.

Current control methods

A variety of control methods have been used by landowners and managers in the past with varying degrees of success. These include

- Mechanical removal - This requires cutting and destroying plant parts so they do not regrow. This is time consuming and dangerous in large stands and is difficult on steep terrain.
- Herbicide injection using Glyphosate - This method requires injecting each separate leaf segment to effectively kill the whole plant. The technique is time consuming, dangerous and impractical in large stands.
- Surface application of herbicide - A variety of agents, many off label, have been applied but have proved ineffective.

Life cycle of *Opuntia robusta*

Plants are long lived and form dense stands up to 4 m high but commonly 1 to 2 m. Plants do not flower and fruit until at least 3 years old. Reproduction is by seed or vegetative parts. Local dispersal around existing plants occurs from fallen fruit or segments (wheels). Detached wheels will readily take root from areoles in contact with the soil. New wheels are produced from areoles on the upper surface. Seeds are dispersed to wider areas in the droppings of birds, foxes and other animals that have learnt to eat the fruit (Parsons & Cuthbertson 2001).

Not usually eaten by stock and extremely drought tolerant, *O. robusta* prefers well drained north facing slopes.

Vegetation and soil types in trial area

The vegetation benchmark for Nuggetty Hills is EVC 70 - Hillcrest Herb-rich Woodland. This EVC is uncommon within the Goldfields Bioregion and is restricted to upper slopes and the tops of steep, broad topped ridges. It is usually, but not always, associated with ridges of contact metamorphics adjacent to granitic plutons.

The general description for this classification is as follows:

Overstorey normally dominated by Yellow Box *Eucalyptus melliodora*. Other common components are Bundy *E. goniocalyx*, Grey Box *E. microcarpa*, and White Box *E. albens*. The shrub layer is either very sparse or non-existent. The ground layer is rich in herbs and grasses and can be quite dense particularly when dominated by Kangaroo Grass *Themeda triandra*. (DNRE 2002).

Vegetation observed growing in the trial area during the month of April included an overstorey of White Box *E. albens*, Grey Box *E. microcarpa* and Bundy *E. goniocalyx* and understorey of Golden Wattle *Acacia pycnantha*, Cotton Fireweed *Senecio quadridentatus*. Green Rock Fern *Cheilanthes austrotenuifolia*, was noticed to dominate the ground cover.

Soil types in the three zones of the trial area were identified as:

ZONE	FIELD TEXTURE	pH	EC
1	sandy loam	4.6	20.0 ppm
2	loamy sand	5.8	11.0 ppm
3	sandy loam	5.5	33.3 ppm

Table 1. Soil Types

Permits and Permission

The trial was undertaken on 2 private properties and adjoining crown land of Nuggetty Hills Park managed by Parks Victoria. Permission for the trial has been granted by the landowners and Parks Victoria. Regional Chemical Standards Officer, Allan Roberts, Department of Primary Industries, has assisted in ensuring the trial conformed with all relevant legislation.

Methodology

To allow monitoring of the efficacy of Glyphosate on Wheel Cactus, trial sites were selected in the Nuggetty Hills area to represent different densities, soil types, vegetation and land use .

The trial area is divided into three zones determined by land use (Figure 2).

Zone 1	Private land. Primary production (sheep grazing)
Zone 2	Private land. Revegetation area (domestic grazing excluded)
Zone 3	Public conservation and resource. EVC 70 (see below)

Nine sites (A - I) measuring 10 m x 10 m were pegged in April 2004 to include representative plants from three class sizes*

(*NB: standard classification of class sizes for weeds refers to the level of infestation ie: 1 = light, 5 = heavy. For the purposes of this trial class sizes 1 - 3 are used to reflect the age and size of *O. robusta* plants within the individual sites).

CLASS SIZES

- 1 Plants to three years <1m (three or four wheels (leaf segments); no flowers or fruit).
- 2 Plants three to six years 1-2m (producing large wheels; branching but not dense; usually flowering and fruiting).
- 3 Plants six years and older > 2m (multiple large wheels; branching and dense; showing woody base segments; heavily flowering and fruiting).

The site positions were recorded using GPS and documented photographically prior to treatment using four points of reference (appendix 4).

The surface spray application of Glyphosate 2% and *Pulse* 0.2% was applied to the trial area between late May and late August 2004. A twenty litre pack-pack spray unit was used for the application to all sites. The entire plant was treated on all surfaces until run-off stage.

Particular consideration was given to weather conditions at the time of spraying. As previous trials have indicated, overcast to foggy still conditions early in the day favour the best results.

The sites were monitored and assessed in October 2004. Photographic records were taken for comparative analysis and the general effects of the treatment noted. Preliminary analysis of results are made below as the full effects of the treatment may not be seen for several months. Follow up monitoring should take place until late summer 2005. Final recording and evaluation of trial results can then be conducted.

Results

Refer to Appendix 3 & 5 for record sheet and site photographs.

A total of 9 sites have been established across the trial area including 3 control sites (Appendix 2). Controls sites have been included in the three zones determined by land use.

Glyphosate was applied on 4 different days over the 3 month period from May to August 2004. All treatments took place in the morning before 9am. The weather conditions were overcast. A slight breeze was recorded on most days with site F being the exception as the record describes the morning as being 'still'. The Glyphosate application at Site F was the second treatment to be applied in an 11 month period i.e. earlier treatment June 2003. The differences in the time taken and the volume of herbicide used, reflects the level of infestation and the maturity of some of the plants.

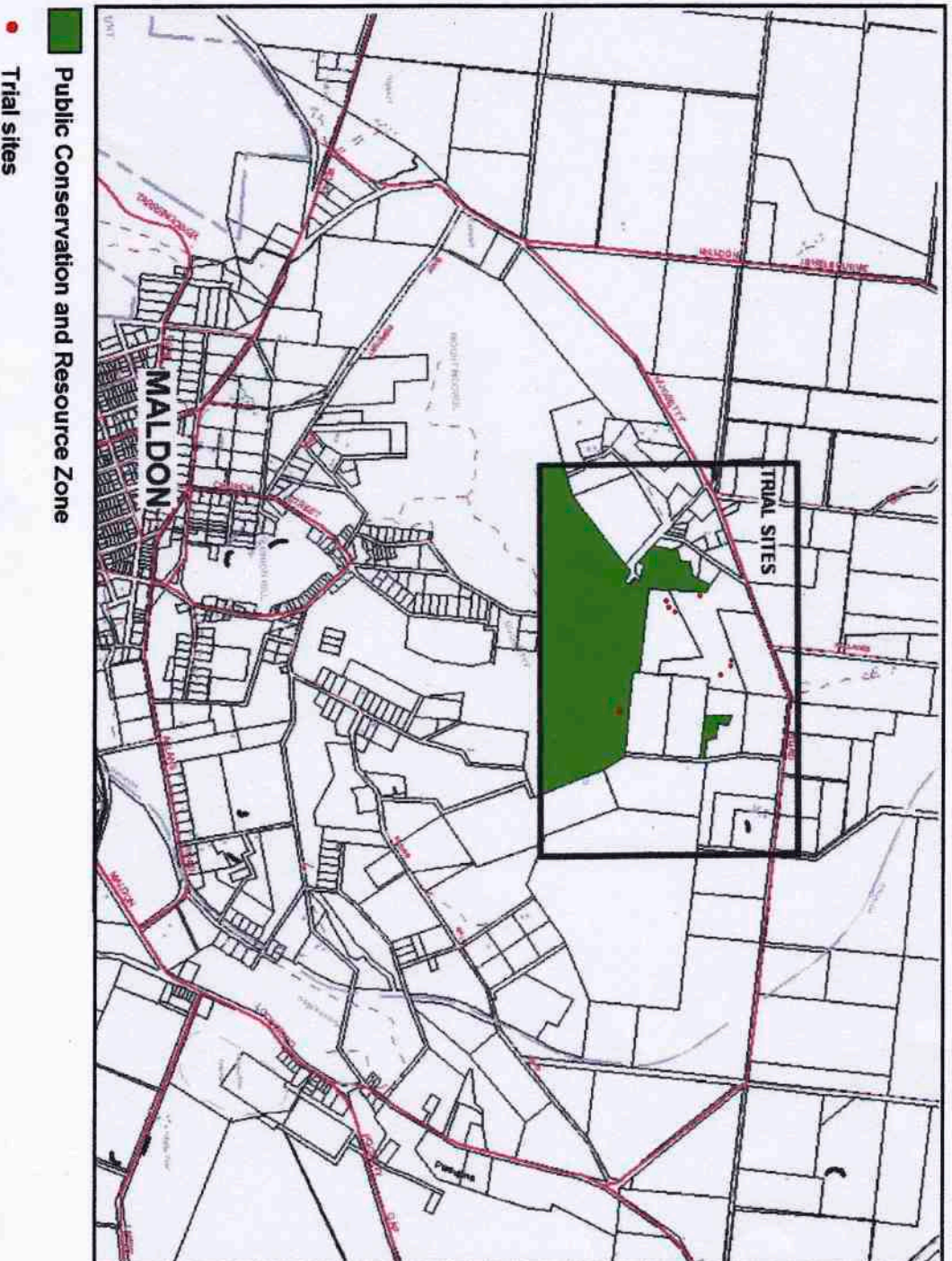
Site E & I have (as of November 2004) not been sprayed

Conclusion

The results of this trial consistently indicate that the spray application of glyphosate at 2% has a significant effect on the development and spread of *O. robusta*. Regrowth of plants however suggests that further treatment is required. The volume of chemical used and its application method has proven effective in reducing plant size and the production of viable seed. This is valuable in reducing seed bank and enabling easier access to dense stands for further control measures to take place.

APPENDIX 1

LOCALITY AND LAND USE



References

Perkins, E. Is it a Native?. A Weed Identification Guide for Central Victoria.

Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. 2nd Edition.
CSIRO Publishing. Australia.

Weeds and Streamsides - Strategies and Actions - October 2002.
© Mount Alexander Shire 1999. Revised September 2002.

Geomap Database.

Mount Alexander Shire Planning Scheme

Acknowledgements

The glyphosate trial on Wheel Cactus in Nuggetty Hills project was undertaken in partnership with Bendigo Regional Institute of TAFE and the following people:

David Averay	Parks Victoria, Northern Goldfields
Dean Bridgfoot	Mount Alexander Shire Council
Ian Grenda	Nuggetty Land Protection Group
Teresa Corcoran	Nuggetty Land Protection Group
Alan Roberts	Department of Primary Industries, Bendigo

We are grateful to the following people who provided their time and helpful information:

John Townsend	Community Member
Vince Lakey	Soil Scientist. Bendigo Regional Institute of TAFE

APPENDIX 4

TRIAL SITE PHOTO SUMMARY

APPENDIX 3

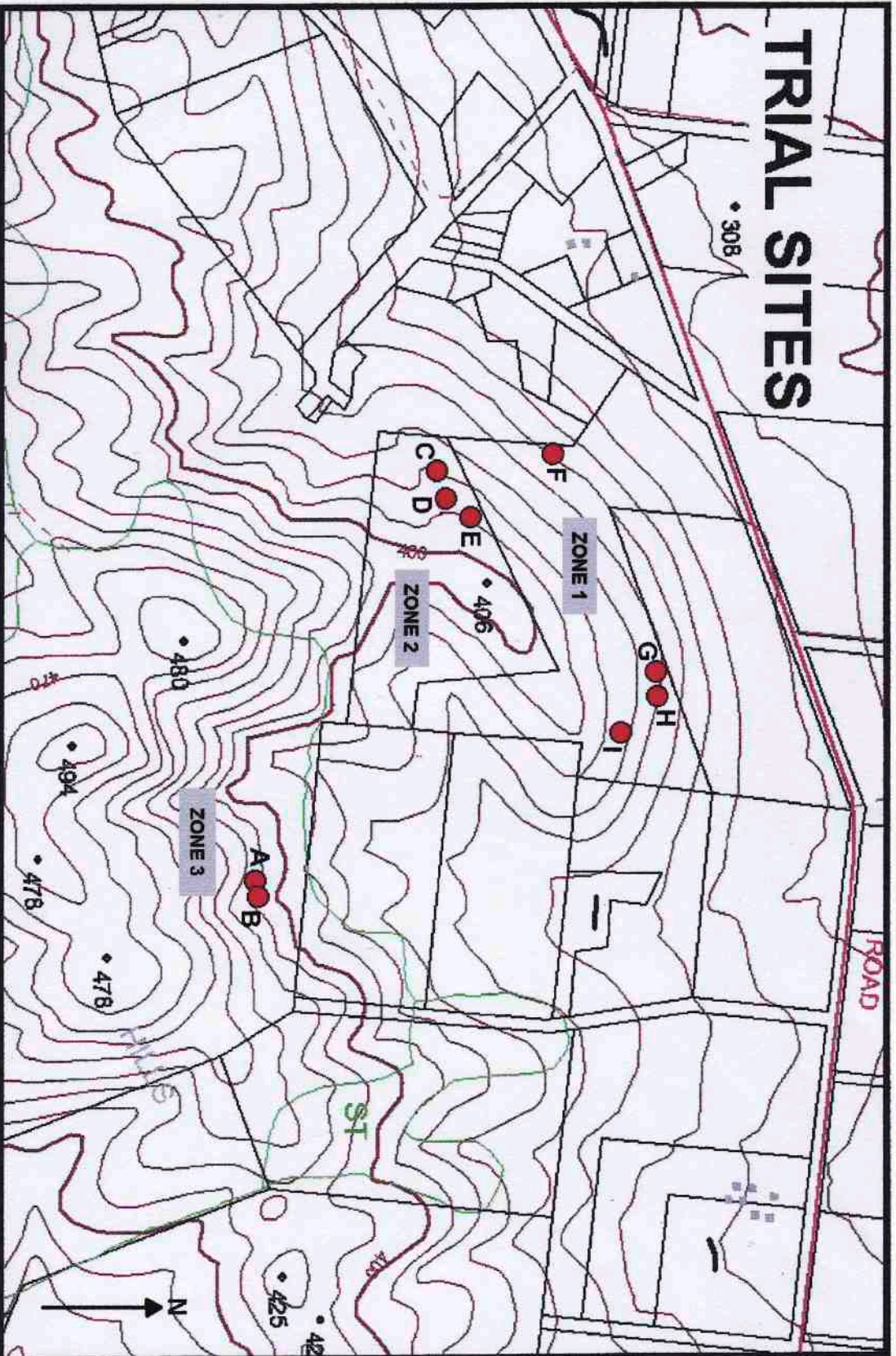
RECORD SHEET

PROJECT: Spray application of Glyphosate on Wheel Cactus – Nuggetty 2004 - 2005

APPLICATION: Backpack spray unit. 2 % Glyphosate, 0.2 % Pulse

DATE	TIME	TOTAL (mins)	SITE No	CONDITIONS	CLASS SIZE	ZONE	VOLUME OF SPRAY USED (L/Ha)	COMMENTS / OBSERVATIONS	
								OCT 2004	APRIL 2006
21.08.04	START	0.33333	20	A	1, 2 & 3	3	9000	Extensive tissue damage to all plants and all plant parts. Collapse of main structure.	Original plants completely collapsed. Regrowth from class sizes 2 and 3. No fruit develop
	FINISH	0.34722							
	START			B	1, 2 & 3	3		Healthy plants.	Plant size increase of 1 segment (wheel). Heavy fruiting
	FINISH								
	START			C	1, 2 & 3	2		NOT SPRAYED	
	FINISH								
	START			D	1, 2 & 3	2		CONTROL	Healthy plants.
	FINISH								
15.08.04	START	0.28125	15	E	1, 2 & 3	1	4000	Slight breeze Overcast	Partial decay of 1 - 2 yr segments. Main stem solid.
	FINISH	0.29167							
30.5.04	START	0.35417	15	F	3	1	6000	Still Overcast Sprayed June 2003 (2% G + 0.2% P)	Further damage to plant size and vigor. No growth.
	FINISH	0.36458							
	START			G	1, 2 & 3	1		CONTROL	Healthy plants.
	FINISH								
08.08.04	START	0.33333	45	H	2 & 3	1	15000	Slight breeze Fog	Decay in all segments.
	FINISH	0.36458							
	START			I	1, 2 & 3	1		NOT SPRAYED	Regrowth from main stem segments. No fruit development
	FINISH								

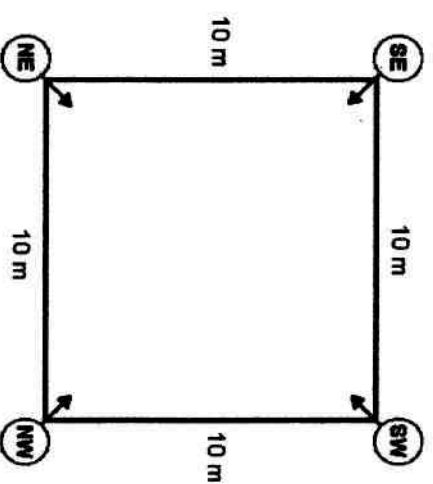
APPENDIX 2



APPENDIX 5

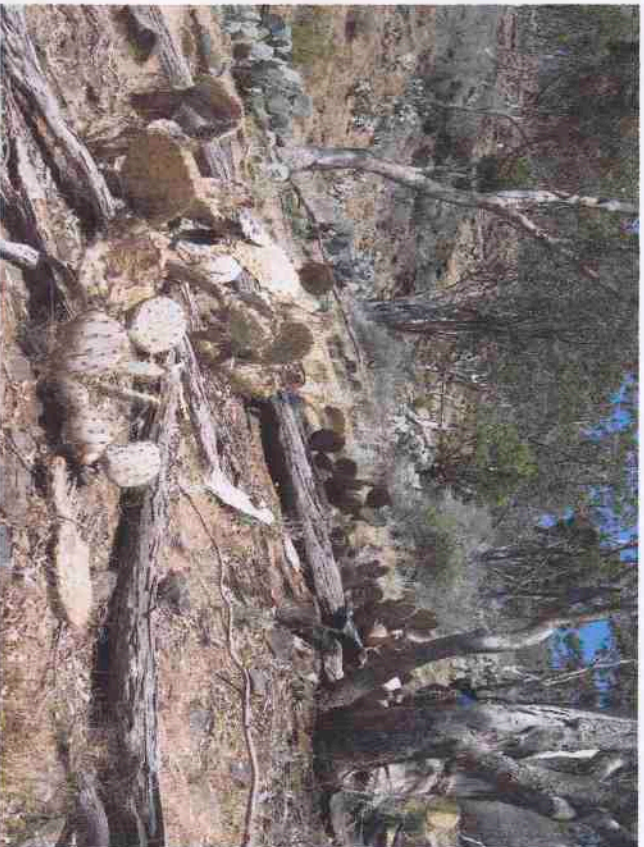
WHEEL CACTUS TRIAL SITES – GPS COORDINATES & PHOTOGRAPHY ORIENTATION & PLOT SIZE

SITE	EASTINGS	NORTHINGS
A	240084	5904585
B	240109	5904588
C	239482	5904852
D	239523	5904864
E	239550	5904900
F	239457	5905024
G	239778	5905175
H	239816	5905176
I	239868	5905123

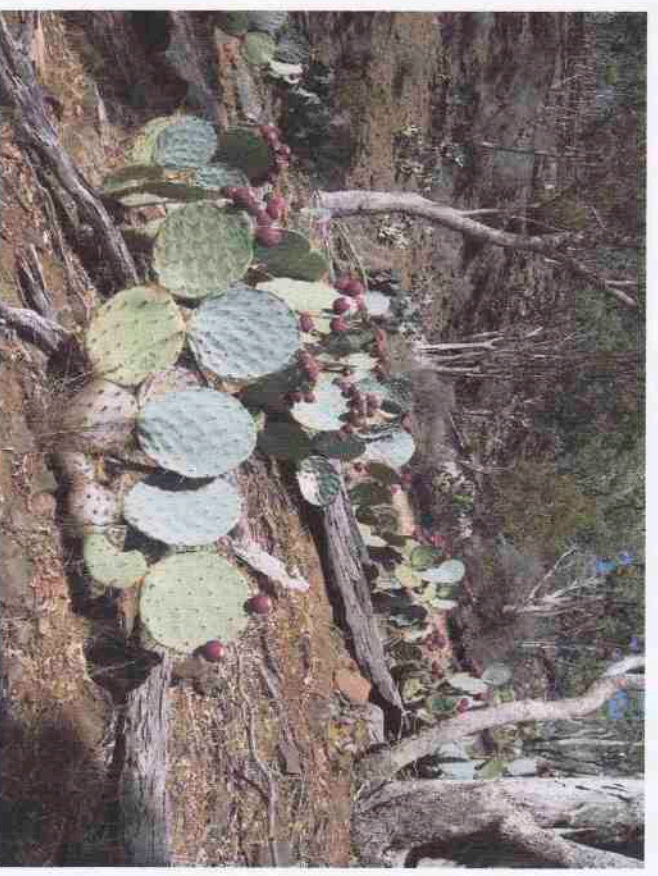


SITE A

ZONE	3
SPRAYED	21 AUGUST 2004 - 8:00 AM
L/Ha	9000
CONDITIONS	Patchy cloud, Slight breeze



OCTOBER 2004 N-E



APRIL 2004 N-E



APRIL 2006 N-E

SITE D

**ZONE
CONTROL**

2



OCTOBER 2004 N-W



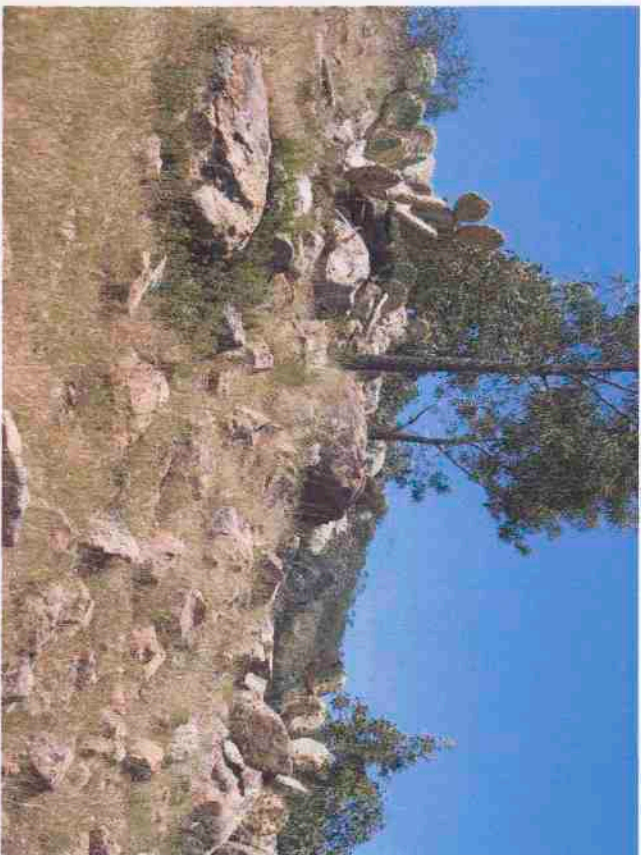
APRIL 2004 N-W



APRIL 2006 N-W

SITE E

ZONE	2
SPRAYED	15 AUGUST 2004 - 6:45 AM
L/Ha	4000
CONDITIONS	Overcast, Slight breeze



OCTOBER 2004 N-E



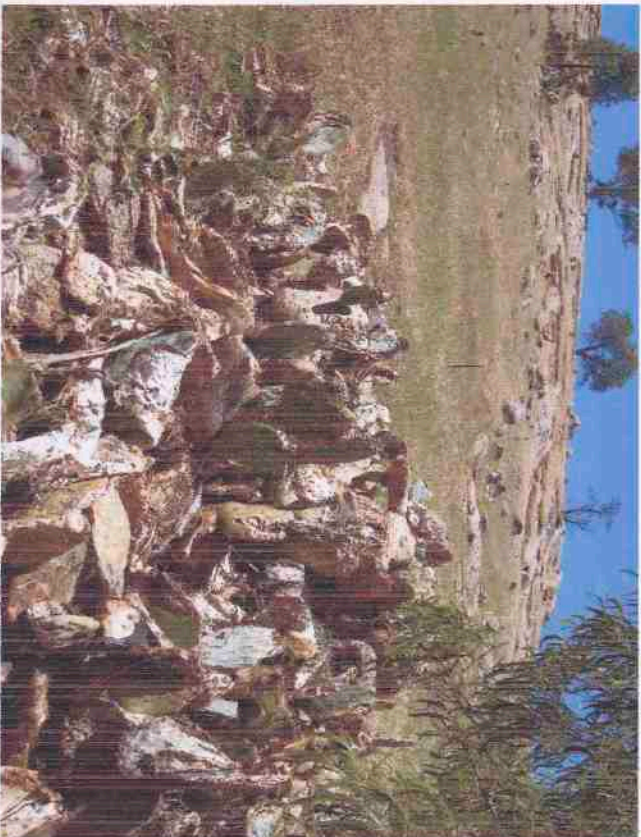
APRIL 2004 N-E



APRIL 2006 N-E

SITE F

ZONE	1
SPRAYED	30 MAY 2004 - 8:30 AM
L/Ha	6000
CONDITIONS	Overcast, Still



OCTOBER 2004 N-W



APRIL 2004 N-W



APRIL 2006 N-W

SITE H

ZONE	1
SPRAYED	08 AUGUST 2004 - 8:00 AM
L/Ha	15000
CONDITIONS	Fog, Slight breeze



OCTOBER 2004 N-E



APRIL 2004 N-E



APRIL 2006 N-E