

# FACTORS INFLUENCING WOODY WEED DISTRIBUTION IN THE PROPOSED CRESWICK REGIONAL PARK, VICTORIA

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**Summary** A methodology for mapping site characteristics and the distribution of individual weed species was developed and applied to the distribution of woody weeds in the proposed Creswick Regional Park, Victoria. Site characteristics including disturbance, landform, dominant tree species and adjacent land use were recorded. Associations between weed distribution and site characteristics were analysed using the MapInfo® geographic information system.

High weed cover was found adjacent to pasture and residences, and along drainage lines dominated by swamp gum (*Eucalyptus ovata* Labill.), manna gum (*Eucalyptus viminalis* Labill.) and candlebark (*Eucalyptus rubida* Deane and Maiden).

## INTRODUCTION

The invasion of native vegetation by environmental weeds is seen as one of the most serious conservation problems in Victoria (Carr 1988).

The priorities for the control of environmental weed infestations must be based on an understanding of weed ecology. To evaluate the risk of invasion or incursion by a weed species, environmental factors and weed biology must be considered (Robinson 1994). Public land managers must prioritize their weed control efforts on the basis of the conservation status of the land, with consideration given to threat to amenity that is posed by weed infestation (Fox 1991). By examination of environmental factors and the biology of weed species, the potential threat can be assessed and a realistic control strategy can be developed (Fox 1991, Robinson 1994).

Frequently, weed control on public land is conducted on an *ad hoc* basis, with little consideration of ecological processes and with insufficient knowledge of the nature and extent of weed infestations. Locally based personal computer (PC) geographic information systems (GIS) can be used effectively to analyse weed distribution and environmental data, and thereby contribute to more effective weed management.

## SITE DESCRIPTION

The proposed Creswick Regional Park (henceforth referred to as the Park) is located 1 km east of Creswick, and 10 km north of Ballarat in Victoria, Australia.

The Park comprises some 1400 ha of mostly mixed messmate (*Eucalyptus obliqua* L'Herit.) open forest

which has been extensively disturbed by gold mining and timber extraction since the 1850s.

## MATERIALS AND METHODS

Weeds were defined for the purpose of this study as non-indigenous woody plants.

**Data collection** The Park was surveyed in 640 × 1 ha quadrats. Sites were initially surveyed on the basis of known weed infestations and expected high susceptibility to weed invasion. Areas of the park not covered by these categories were then surveyed, resulting in coverage of the Park with quadrats less than 400 m apart.

The canopy cover and height of each weed species were recorded.

A range of site characteristics were selected for survey on the basis of their perceived importance in influencing weed distribution, and as giving an indication of environmental processes operating on site. The landform was recorded as either slope, gully or ridge. Aspect, land use adjacent to the quadrat, and evidence of weed control were also recorded.

Evidence of mining, or the presence of a road or drainage line were recorded as types of disturbance occurring in each quadrat.

Observable human disturbance was recorded on a three level scale as follows: no disturbance observed; some evidence of disturbance; highly disturbed.

The dominant native tree species and top height were recorded for each quadrat. The dominant tree species was intended as an indicator of site quality, encompassing a range of environmental variables operating on the site to favour the dominance of that particular tree species.

**Data analysis** Data were input to the MapInfo® GIS and distribution maps showing height and canopy cover were produced for each of the major weed species.

An index of weed cover was derived from the canopy cover value of the dominant weed species in each quadrat. This index was used to create a series of maps showing levels of weed cover and site characteristics on a quadrat by quadrat basis, and to analyse relationships between site characteristics and weed coverage.

Chi squared analysis was used to test the relationships between weed coverage and site characteristics.

**Table 1.** Major weed species.

Common name	Scientific name
Blackberry	<i>Rubus fruticosus</i> L.
Cape broom	<i>Genista monspessulana</i> L.
English broom	<i>Cytisus scoparius</i> L.
Furze	<i>Ulex europaeus</i> L.
Common sallow	<i>Salix cinerea</i> L.
Spanish heath	<i>Erica luisitanica</i> Rudolf

Data were standardized to remove sampling weighting, and graphs of associations between weed cover and site characteristics were produced.

**RESULTS**

Thirty five species of woody weeds were recorded (major species are shown in Table 1). Weeds were found to be widespread throughout the Park. Some species were almost ubiquitous, whereas others exhibited clear habitat preferences and clumped distribution. See Figure 1 for furze (*Ulex europaeus* L.) distribution.

The areas of highest weed cover were concentrated in the north west of the Park and along the major creeks (Figure 2).

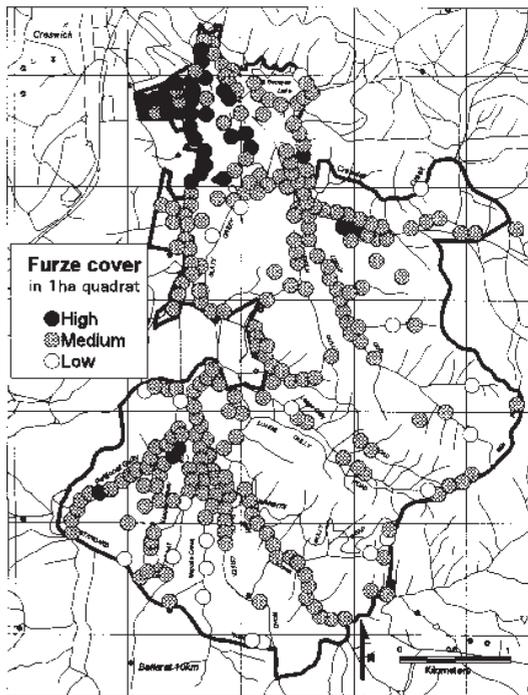
The analyses of site characteristics against weed coverage revealed that weed distribution in the Park is associated with landform (Figure 3), the level and type of disturbance (Figure 4), and site characteristics as reflected by the dominant tree species.

The highest weed cover levels in the Park were found to be along drainage lines, where the dominant tree species were swamp gum, manna gum, or candlebark. Sites adjacent to pasture or residences were also associated with high levels of weed cover. Sites with the lowest weed cover were on undisturbed ridgelines dominated by messmate.

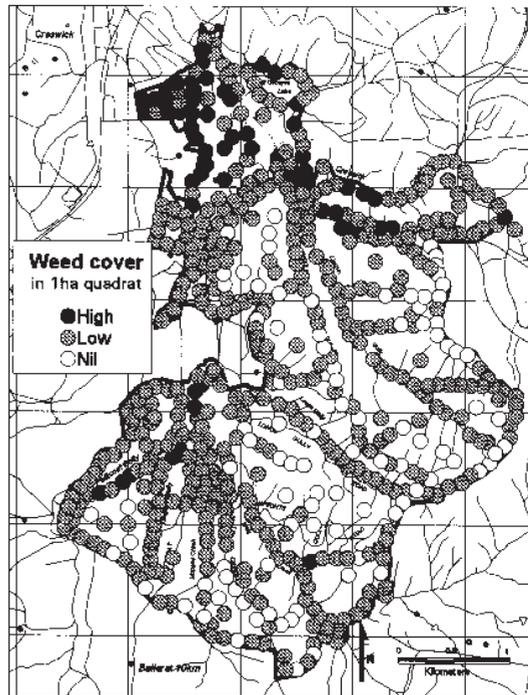
**DISCUSSION**

The distribution of weeds in the proposed Creswick Regional Park was clearly associated with a range of site characteristics. Some of these are useful in predicting site susceptibility to future invasion, and in providing an indication of those factors which may promote weed invasion. Indicators of susceptibility to weed invasion include the level and type of disturbance, and site characteristics as reflected by the dominant tree species. Weed distribution maps were found to be useful in revealing the extent and nature of weed infestations. This type of information provides valuable insight into weed infestations, and is essential to land managers if effective weed management strategies are to be devised.

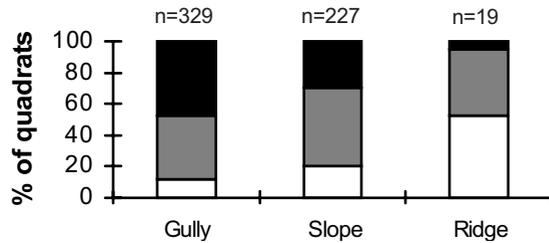
PC based GIS such as MapInfo® can be utilized at a



**Figure 1.** Furze distribution in the proposed Creswick Regional Park.



**Figure 2.** Weed cover in the proposed Creswick Regional Park.

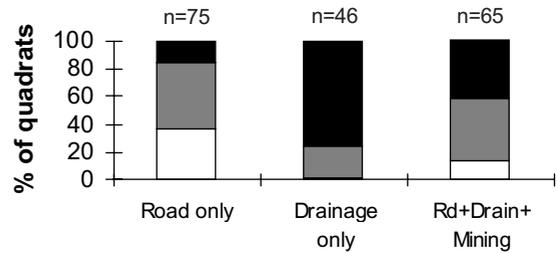


**Figure 3.** Weed cover by landform (percentage values). □ nil ▨ low ■ high.

local level by public land managers to perform dynamic mapping and data analysis of weed distribution. Such programs are ideal for processing data sets generated from public management units such as Regional or National Parks. Trends in weed infestation and spread can be displayed, and associations between weeds and the characteristics of their environment can be analysed by land managers.

GIS weed mapping and analysis is valuable in formulating control priorities and management strategies. Control zones are easily derived from a GIS when weed distribution is overlain with other Park values such as sites of conservation significance.

Local PC based mapping and data analysis avoids the use of larger, more expensive mainframe GIS systems. Control of analysis and output is maintained at the user level, where output needs are best understood. The database becomes a dynamic record readily available for the ongoing input of new data, and most importantly, for the analysis and output of information required in effective management.



**Figure 4.** Weed cover by type of site disturbance (percentage values). □ nil ▨ low ■ high.

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#### REFERENCES

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