DISTRIBUTION OF *MYRSIPHYLLUM ASPARAGOIDES*, IN RELATION TO ENVIRONMENTAL PARAMETERS WITHIN THE YOU YANGS REGIONAL PARK

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Abstract The distribution of Bridal Creeper *(Myrsiphyllum asparagoides (L.) Willd),* an environmental weed, was mapped and analysed in relation to some local environment parameters in a section of the You Yangs Regional Park near Geelong in southern Victoria. The seven hectare study site was located on a gentle southern slope with a uniform geology, soil type and local climate. The major factors that determined the distribution of Bridal Creeper within the study area were the height of trees within the immediate vicinity of the infestation, whether the trees were dead or alive and the distance of the infestation from trees. Infestations were found to be not significantly associated with roads and tracks. Bridal Creeper was significantly correlated with dead trees greater than five metres in height and live trees greater than fifteen metres in height. Dead trees had a much greater impact on the distribution of Bridal Creeper than live trees. Observations of Bridal Creeper surrounding trees increased as tree height increased, for both dead and live trees. Despite the fact that Bridal Creeper distribution was closely associated with dead trees it is unlikely that it is responsible for their death. It is believed that the relationship is most likely to be the result of perching birds dropping seeds at the base of the larger trees.

INTRODUCTION

Two major environmental weeds Bridal Creeper *Myrsiphyllum asparagoides,* and Boneseed (*Chrysanthemoides moniliferum (L.) Norlindh),* are already found extensively throughout the You Yangs Regional Park.

Bridal Creeper is a perennial climber with green, thin, wiry, twisting stems, reaching up to six metres in length. Subterranean tuber masses occur at the base of the stem and contain the greatest proportion of the plants total biomass (Raymond, 1996). Bridal Creeper in Mediterranean type climates has above ground growth from autumn to spring, and remains dormant as underground stems and tubers over summer. In summer rainfall areas, above ground sections of the plant grow actively in summer whilst dying off in winter. In regions with year-round rainfall, Bridal Creeper will grow throughout the year (Scott and Kleinjan, 1991). Initial growth after rainfall is rapid due to food reserves in the tuberous roots (Cooke and Robertson, 1990). Flowers are present from June and open in late August or September. Seeds generally germinate in autumn or early winter, the first tubers developing about nine weeks after emergence (Parsons and Cuthbertson, 1992).

Through garden escapes Bridal Creeper is now naturalised in south-west Western Australia, South Australia, Victoria and along the central coast of New South Wales (Cooke and Robertson, 1990; Scott and Kleinjan, 1991). Bridal Creeper is highly competitive and can establish itself in disturbed areas and natural bushland (Parsons and Cuthbertson, 1992). Birds act as a major seed dispersal mechanism for Bridal Creeper. Birds eat the berries and drop the seeds in their faeces, often considerable distance from the parent plant (Raymond, 1996).

Bridal Creeper is considered a threat to native vegetation as it has the potential to replace native vegetation by covering the ground during winter, and preventing the germination of native plants by depriving them of light (Parsons and Cuthbertson, 1992; Cooke and Robertson, 1990). The seeds germinate much quicker than some native species, thus placing them at risk of displacement (Parsons and Cuthbertson, 1992).

MATERIALS AND METHODS

The study site was chosen due to the extensive amount of Bridal Creeper, as well as large areas that were free of Bridal Creeper. The study site was located in the south-west of the You Yangs Park on a gentle slope between 85 metres and 115 metres above sea level.

Mapping of Bridal Creeper was performed using the Navstar Global Positioning System (GPS). The GPS receiver used was a Trimble Pathfinder Basic Plus. All Bridal Creeper was mapped within the study area, which measured approximately 250 metres by 300 metres. To define the edge of each particular growth of Bridal Creeper a GPS receiver was placed at a position around the perimeter of the Bridal Creeper growth and a series of ten points were recorded. The receiver was then moved to another position at the perimeter of the Bridal Creeper growth and another series of ten points were taken. This procedure continued until an accurate description of the perimeter was mapped. The ten points that were collected at each position around the perimeter were collected under a particular computer filename so that averaging of the ten points for each file and hence each position around the Bridal Creeper infestation could take place later on. The filenames associated with the perimeter of each Bridal Creeper growth were carefully noted, so that individual Bridal Creeper growths could be mapped and analysed separately.

The location of every tree greater than 5 metres in height was recorded within the study site. To map each tree a GPS receiver was placed at the base of the trunk and ten points were recorded. Each tree was given a particular filename to assist in the averaging of the ten points at a later date. The height and whether each tree was dead or alive was recorded on paper as the GPS receiver used during the mapping process did not have the capability to record information associated with the positions collected.

To increase the accuracy of the recorded points to within five metres two procedures were used, these being differential positioning and averaging of GPS points. Differential positioning is a technique that improves positioning accuracy by measuring the size of GPS errors at one point, known as the Base Station, and applying them as corrections to other GPS receivers, called Rovers, which are typically roving field GPS units (GPSCO, 1998). Averaging not only increased the accuracy of positions collected but also eliminated the possibility of collecting a single rogue point, potentially tens of metres removed from its actual position.

After each mapping session the data collected by the GPS equipment was downloaded into Pathfinder Office® (Trimble Navigation Corporation Sunnyvale, California). The GPS data then underwent differential positioning and the position points for each file were averaged. The resulting points were then exported from Pathfinder Office to MapInfo® (Mapinfo Corporation New York), which is a geographical information system. Once within MapInfo the GPS data was converted to points, and maps were produced showing the distribution of Bridal Creeper as well as tree locations. The data recorded for the trees in paper format was then transferred to a database within MapInfo and the database linked to the graphical objects displayed on the map.

Soil, geological, topographical and hydrological maps for the study site already existed in digital format. This data was supplied by the Department of Natural Resources and Environment. Statistical analysis was then performed to identify relationships between Bridal Creeper and environmental variables.

RESULTS

A significant relationship was found to exist between the height of trees, distance from the perimeter and the tree status. The percentage of dead trees within the perimeter of Bridal Creeper growth was found to increase as tree height increased. Fifty percent of dead trees 5 to 9 metres, 73% of trees 10 to 14 metres, 74% of trees 15 to 19 metres and 100% of dead trees greater than 20 metres were found within the perimeter of Bridal Creeper growth (Figure 1).

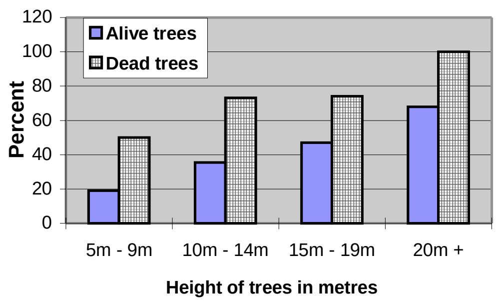

Figure 1. Percentage of dead and alive trees of varying heights within the perimeter of Bridal Creeper growth

The percentage of live trees within the perimeter of Bridal Creeper growth also increased as tree height increased. Nineteen percent of live trees 5 to 9 metres, 36% of trees 10 to 14 metres, 47% of trees 15 to 19 metres and 68% of trees greater than 20 metres were found within the perimeter of Bridal Creeper growth (Figure 1). Conversely there was a reduction in the percentage of live trees outside the perimeter of

Bridal Creeper growth as tree height increased. For instance the percentage of live trees 5 to 9 metres outside the perimeter of growth is 81%, for trees 10 to 14 metres 64%, 15 to 19 metres 53%, and for trees greater than 20 metres in height 32%.

There was a greater percentage of dead trees compared to live trees within the perimeter of Bridal Creeper growth for each set of height measurements. The results show that Bridal Creeper is predominantly found associated with larger dead and live trees, in particular dead trees greater than ten metres in height and live trees greater than twenty metres. For any given height Bridal Creeper is more likely to be found in association with dead rather than live trees.

There was a significant relationship between the height, location and status of trees. A greater percentage of dead trees was found within the perimeter of Bridal Creeper growth i.e. 67% within Bridal Creeper growth compared to 33% outside the perimeter of growth. There was a lower percentage of alive trees within the perimeter of Bridal Creeper growth i.e. 38% within the perimeter compared to 62% outside the perimeter of growth.

A significant relationship was found to exist between tree status (whether it's dead or alive) and the location of trees in relation to Bridal Creeper. As stated previously, dead trees were far more likely to be found within the perimeter of Bridal Creeper growth, whilst alive trees were more likely to be found outside the perimeter of growth.

There was a significant relationship between tree status (whether its dead or live) and distance from perimeter. A large percentage i.e. 67% of dead trees were observed within the perimeter of growth, 18% between 0 and 2.5 metres from the perimeter, 7% between 2.5 and 5 metres from the perimeter and 8% further than 5 metres from the perimeter. Thirty-eight percent of live trees were found within the perimeter of growth, 18% between 0 and 2.5 metres from the perimeter, 8% between 2.5 and 5 metres from the perimeter and 36% further than 5 metres from the perimeter of Bridal Creeper growth. A higher percentage of dead trees were found within the perimeter of Bridal Creeper growth compared to live trees. Only 8% of dead trees were found further than 5 metres from the perimeter of growth compared to 35.9% for live trees.

No significant relationship was found to exist between tree status (whether trees were dead or alive) and height of trees. This result was surprising as previous results with analysis of height of trees and tree status with a third factor, these being distance from perimeter and location, showed a significant relationship. This combined with the previous results indicates that location and distance from perimeter were significant factors in determining tree status i.e. whether a tree was dead or alive.

There was a significant relationship between tree height and location i.e. whether it is within or outside the perimeter of Bridal Creeper growth. As the height of trees increased there was a corresponding increase in the percentage of trees within the perimeter of Bridal Creeper growth. Thirty-seven percent of trees 5 to 9 metres, 51% of trees 10 to 14 metres, 62% of trees 15 to 19 metres and 81% of trees greater than 20 metres were located within the perimeter of growth. Overall 52.1% of trees were found within the perimeter of Bridal Creeper and 47.9% outside. This result does not take into account whether the trees are dead or alive.

Statistical analysis was not used to study the location of geology and soils and their possible relationship with Bridal Creeper. Both geology and soils were uniform across the study site. Due to the uniformity no comparisons were possible between the location of Bridal Creeper and varying geology and soils areas within the study site. Bridal Creeper did not appear to be closely associated with roads or tracks. Approximately 600 metres of sealed road was found bordering the study site of which 120 metres or 20% had Bridal Creeper within 10 metres from the edge. Approximately 390 metres of unsealed track was within the study site of which 78 metres or 20% had Bridal Creeper within 10 metres either side.

DISCUSSION

Overall 67% of dead trees were found within the perimeter of growth and 33% outside. This indicates that either Bridal Creeper killed trees or that Bridal Creeper grew where dead trees were located. It is highly unlikely that Bridal Creeper has the ability to kill trees greater than 10 metres as the vast majority of the canopy would not be affected by shading and the root system of large trees too extensive to be effected by Bridal Creeper rhizomes. This indicates that Bridal Creeper was more likely to grow where large trees were found, rather than Bridal Creeper killing the trees.

There was found to be a general decrease in the number of dead trees as the distance away from Bridal Creeper increased. Ninety-two percent of dead trees were located within or from 0 to 5 metres from the perimeter of growth. Only 8% of dead trees were found to be growing further than 5 metres from Bridal Creeper.

This shows that Bridal Creeper is rarely found growing further than 5 metres from dead trees. Bridal Creeper growth was also more likely to be found surrounding alive trees as they increased in height. However only one height grouping of alive trees (greater than 20 metres) had more than 50% of trees within the perimeter of Bridal Creeper growth. Overall 38% of live trees were found within the perimeter of growth and 62% outside. This indicates that Bridal Creeper growth was likely to be found surrounding large live trees. Small live trees, in particular trees less than 15 metres, had a much lower chance of being located within the perimeter of Bridal Creeper growth.

The major factors that determined the distribution of Bridal Creeper within the study site were the height of trees, and whether the trees were dead or alive. Table 1 shows the percentage of instances that dead and live trees of varying heights were found within the perimeter of Bridal Creeper growth.

Table 1. Trees of varying status and the percentage of observations that each was found within the perimeter of Bridal Creeper growth.

Tree Status and Height	Percent Observations
1. Dead trees >20 meters	100%
2. Dead trees 15 to 19 metres	74%
3. Dead trees 10 to 14 metres	73%
4. Alive trees >20 metres	68%
5. Dead trees 5 to 9 metres	50%
6. Alive trees 15 to 19 metres	47%
7. Alive trees 10 to 14 metres	36%
8. Alive trees 5 to 9 metres	19%

Table 1 illustrates that mortality was probably more important than height in determining the distribution of Bridal Creeper. Dead trees accounted for the top three observations of where Bridal Creeper was found whilst alive trees accounted for the bottom three. The most likely explanation as to why Bridal Creeper is found growing around large dead trees is that they act as perching sites for birds. Fifteen species of birds within the You Yangs Regional Park are known to feed on the berries of Bridal Creeper (Jessop *et al*. 1988; Loyn and French, 1991; Stansbury, 1996). These birds have the potential to act as a major seed dispersal mechanism. Birds eat the berries and drop the seeds in their faeces as they perch on trees. The soil under large trees would be expected to have a larger amount of seed than surrounding areas due to the seed present in bird faeces. Other animals in particular possums which are found at the study site may also spread the seed.

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