QUANTIFYING AND PREDICTING MAMMALIAN HERBIVORE DAMAGE IN TASMANIAN EUCALYPT PLANTATIONS

by

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ABSTRACT

In Tasmania, the Bennett's wallaby (*Macropus rufogriseus rufogriseus*), Tasmanian pademelon (*Thylogale billardierii*), brushtail possum (*Trichosurus vulpecula*) and European rabbit (*Oryctolagus cuniculus*) browse eucalypt seedlings growing in forestry plantations. This damage is thought to reduce plantation productivity by reducing seedling growth, reducing seedling survival and changing seedling form. Forestry companies attempt to reduce damage by reducing herbivore populations with 1080 poison. This control strategy, as it is currently employed, is not without problems. No real data exist relating the severity of browsing damage to losses in productivity, herbivore abundance or plantation characteristics. Thus, control tends to be carried out at most plantations without regard to recouped benefits. Furthermore, the use of 1080 is strongly criticised by some community groups. Unfortunately, existing alternatives are either ineffective or too costly to use on a large scale.

This study aimed to quantify the spatial distribution, effect and cost of browsing damage; determine relationships between herbivore abundance and damage; and determine environmental variables important in influencing herbivore abundance and damage. From 1994 to 1997 data were collected at 35 forestry plantations, 32 planted with *Eucalyptus nitens* and three with *Eucalyptus globulus*. Forestry companies carried out poisoning at 28 of the plantations. Growth and damage data were collected at planting and then at six and 12 months after planting. Herbivore abundance was assessed at each plantation over 320 days using scat plots established at planting. Plantations and adjoining cover habitats were characterised by measuring environmental variables. At seven of the plantations, fenced control plots were established at planting (1996). Growth rate, survival and number of leading shoots for these seedlings were compared to unfenced seedlings which were also monitored for damage.

Damage severity varied between plantations, ranging from low (17% of seedlings damaged at 12 months after planting with a mean browse score of 0.5) to severe (100% of seedlings damaged at 12 months after planting with a mean browse score of 4.7). Damage reduced seedling growth but did not influence seedling survival. The amount by which growth was reduced was linearly related to damage severity, but was only reduced significantly when damage exceeded a critical level. Unfenced seedlings developed more leading shoots than fenced seedlings at plantations with intermediate levels of damage. Severity of browsing damage at each plantation was linearly related to cumulative density of possum scats. For most herbivore species cumulative scat density at each plantation was negatively related to frequency of poisoning. A regression model incorporating possum scat density, grass cover and fern cover explained 71% of between-site variation in damage. A second regression model, incorporating variables that could be measured prior to planting, explained 52% of between-site variation. Important variables in this model were the area to perimiter ratio of the plantation, the proportion of the perimiter that was adjacent to cover habitat, canopy closure in adjacent cover habitat and the amount of vegetation at ground level in adjacent cover habitats.

These results can be used to assign meaningful measures of loss to observed damage and to identify 'acceptable' damage levels. Additionally, relationships between herbivore abundance and damage, and plantation characteristics and damage have potential for use in predicting damage severity at plantations.

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