

- Proceedings of the Bushfire 99 conference, Albury, 7-9 July 1999, pp. 111-7. (Charles Sturt University, Albury).
- Downey, P.O. and Smith, J.M.B. (2000). Demography of the invasive shrub Scotch broom (*Cytisus scoparius* (L.) Link) at Barrington Tops, NSW: insights for management. *Austral Ecology* 25(5).
- Fernandez-Santos, B., Gomez-Gutierrez, J.M. and Moreno-Marcos, G. (In press). The effect of traditional Spanish rural-practice perturbations on the regenerative response in *Cytisus multiflorus*.
- Grabe, D.F. (ed.) (1970). Tetrazolium Testing Handbook for Agricultural Seeds, The tetrazolium testing committee, The Association, Amherst, Massachusetts, 62 pp.
- Hardman, D.C. (1980) Scottish Broom (*Sarothamnus scoparius*): Control Programme, Barrington Tops National Park. New South Wales National Parkes and Wildlife Service unpublished report.
- Hosking, J.R., Smith, J.M.B. and Sheppard, A.W. (1998). *Cytisus scoparius* (L.) Link ssp. *scoparius*. In 'The Biology of Australian Weeds', Volume 2, eds F.D. Panetta, R.H. Groves, and R.C.H. Shepherd, pp. 77-88. (R.G. and F.J. Richardson, Melbourne).
- Humphries, S.E., Groves, R.H. and Mitchell, D.S. (1991). Plant invasions of Australian ecosystems: a status review and management directions. *Kowari* 2, 1-134.
- Mack, M.C. and D'Antonio, C.M. (1998). Impacts of biological invasions on disturbance regimes. *Tree* 13, 195-8.
- Nicholson, P.H. (1981). Fire and the Australian Aborigine-an enigma. In 'Fire and the Australian Biota', eds A.M. Gill, R.H. Groves and I.R. Noble, pp. 55-76. (Australian Academy of Science, Canberra).
- Parsons, W.T. and Cuthbertson, E.G. (1992). 'Noxious Weeds of Australia'. (Inkata Press, Melbourne).
- Peterson, D.J. and Prasad, R. (1999). The biology of Canadian weeds. 109. *Cytisus scoparius* (L.) Link. *Canadian Journal of Plant Sciences* 78, 497-504.
- Rees, M. and Paynter, Q. (1997). Biological control of scotch broom: modelling the determinants of abundance and the potential impact of introduced insect herbivores. *Journal of Applied Ecology* 34, 1203-22.
- Robertson, D.C., Morgan, J.W. and White, M. (1999). Use of prescribed fire to enhance control of English broom (*Cytisus scoparius*) invading a subalpine snowgum woodland in Victoria. *Plant Protection Quarterly* 14, 51-6.
- Schroder, M. and Howard, C. (2000). Controlling broom (*Cytisus scoparius* (L.) Link) in natural ecosystems in Barrington Tops National Park. Proceedings of the broom symposium held at Ellerston and Moonan, 16-17 November 1998, eds A.W. Sheppard, J.R. Hosking. *Plant Protection Quarterly* 15, 169-72.
- Smith, J.M.B. (2000). An introduction to the biogeography and ecology of broom (*Cytisus scoparius*) in Australia. Proceedings of the broom symposium held at Ellerston and Moonan, 16-17 November 1998, eds A.W. Sheppard, J.R. Hosking. *Plant Protection Quarterly* 15, 140-4.
- Syrett P., Fowler S.V., Coombs E.M., Hosking J.R., Markin G.P., Paynter Q.E. and Sheppard A.W. (1999). The potential for biological control of Scotch broom (*Cytisus scoparius*) (Fabaceae) and related weedy species. *Biocontrol News and Information* 20, 17N-34N.

Cutting and mulching broom (*Cytisus scoparius* (L.) Link): a Tasmanian perspective

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Summary

This paper reviews current practices for broom control used in north-west Tasmania and describes the instigation and operating of the first community-based regional weed management strategy developed in Australia. It also presents and costs the 'cut and mulch' method developed for broom control as part of a project by the West Coast Weed Strategy and funded by the National Heritage Trust.

Introduction

Broom (*Cytisus scoparius* (L.) Link), has a long history of cultural uses in its native range. In addition to being adopted by the English king, Henry II (the 'Plantagenet' from *planta genista*) as a personal emblem, these cultural uses also included: an agent for tanning leather; as a source for yellow dye; for broom, rope and paper manufacture; as rabbit feed; and for making an alternative medicine for use as a heart tonic, diuretic, emetic, purgative and relief from

liver complaints (Launert 1981, Chevallier 1996). Despite this diverse utilitarian history, none of these uses have yet been transferred to Australia where the plant has become as serious noxious weed.

Following introduction into Tasmania soon after colonization, broom has spread to be a significant weed of forestry, mining company and public land and native vegetation in north-west Tasmania, particularly around the town of Waratah where this weed has special 'secondary weed' status under the State *Noxious Weeds Act* 1964. It is also a scattered weed in other parts of Tasmania (J. Ireson personal communication). It is now estimated to have infested at least 33 000 ha in the state (Hosking *et al.* 1998). This paper first describes the West Coast Weed Strategy; a project which developed a five-year plan to coordinate major weed control efforts in north-west Tasmania and then reviews past broom control methods in this region and describes a successful 'cut and mulch' control method for broom.

West Coast Weed Strategy

The West Coast Weed Strategy was a five-year plan put forward by Bob Curley (Ranger, Parks and Wildlife Service) in 1992 to coordinate weed control activities currently being undertaken by a number of organizations with independent goals. This was the first community-based regional weed management strategy set up in Tasmania and led to the setting up of a West Coast Landcare Group. The major weed species included were gorse (*Ulex europaeus* L.), brooms (*C. scoparius* and *Genista monspessulana* L.A.S.Johnson), pampass grass (*Cortaderia* spp.), blackberry (*Rubus fruticosus* L. complex), and Elisha's tears (*Leycesteria formosa* Wall.). Landcare and various private and government organizations sponsored a part-time coordinator position from May 1994. The coordinator's role is to coordinate weed control efforts in the group, provide relevant information, represent the group at meetings, organize weed control meetings and promote and sustain interest in the Strategy. The coordinator is also responsible for maintaining in-kind funding from affected organizations and councils and to obtain external grants (e.g. from the National Heritage Trust) to run this weed control initiative. However, without active involvement of supporting organizations and their adherence to the agreed plan the strategy would fail. Areas of concern to the Strategy were to tackle weed problems

in urban areas, monitor spread of weeds into bush via off-road tracks and control weeds in areas adjacent to the World Heritage Areas.

Since 1997 the West Coast Weed Strategy has obtained regular financial support from the National Heritage Trust, the West Coast Council and other stakeholders such as the Hydro Electric Commission and Renison Bell Gold Mines. The main successful management strategy for broom trialed by the West Coast Weed Strategy is the cut and mulch method.

Lessons to be learned from north-west Tasmania

A number of different broom control procedures have been used in the region. These and their effectiveness are discussed below.

Bulldozing and fire

Bulldozing infestations into heaps and burning resulting weed mounds has been a common practice. This causes massive soil disturbance and physical movement of broom plants not only burying seeds but also spreading seeds beyond the original infestation and leaving a perfect seed bed for regrowth. Topsoil is often buried in the process. In at least one situation (i.e. Waratah, Tasmania) this practice and a lack of follow up treatments exacerbated the broom problem throughout the town.

Herbicides

In the past the general practice in the region has been to control broom along roadsides with herbicides. This approach generally led to poor control. Plants along roadsides were sprayed to a set distance onto the verge resulting in only half of many plants being affected by herbicide. Such plants regrew and produced many seeds allowing continued spread out into adjacent paddocks or bush. These attempts to control broom also failed due to inadequate consultation with adjoining landowners. Since the instigation of the Strategy cooperation between adjacent landholders and a strategic spraying program by the Civil Construction Company has improved the success of chemical control programs.

Treating large infestations

Large infestations have been generally treated haphazardly, such as by spraying herbicides around the perimeter, then when dry setting fire to the infestation. There are inherent fire risks in this practice and it has failed to be used in any regulated manner. Risks of such methods getting out of control will be high in, for example, semi-urban settings. The treatments also initially leave the land unusable due to the many burnt stems sticking out of the ground.



Figure 1. Broom demonstration site at Waratah prior to the cut and mulch method being applied on 26 March 1996.



Figure 2. Picture of tractor and mulcher attachment used during the broom control demonstration trial.

Cut and mulch method using machinery
The cut and mulching method was developed as a response to the tendency of many landholders to think that herbicides are the only answer to woody weed control. The Coordinator teamed up with the commercial operations of a small company (Silvi Culture Contracting, Launceston) marketing vegetation mulching of inter-row weeds in plantations, where access was required for pruning, thinning or as a means of retarding fire. The longest running trial started on 29 March 1996 and used the cut and mulch method on a 0.4 ha plot of relatively flat ground that was densely covered by mature broom (3.5 m high) that had been present on the site for many years (Figure 1).

The tractor and mulcher consisted of a 115 horse power four wheel drive tractor pulling a Seppi Heavy Duty Forest Mower which has a large rotating drum equipped with what are termed 'Hammers', driven by the power take-off (Figure 2). As the tractor pushes and flattens plants the machine chews them up and deposits the leftovers as mulch. The mulcher did not disturb the soil surface and the tractor caused much less disturbance than a bulldozer and therefore offered little opportunity for sunlight to stimulate buried dormant seeds. Both a forward and reverse cut were necessary and the treatment lasted 2–3 hours at a contracted cost of \$1110 ha⁻¹. A further contract cleared 21 ha at a total cost of \$17 800, which reduced

costs ha⁻¹, and was cheaper and more effective than earlier contracts to clear the land of broom using bulldozers.

The thickness of the mulch depended upon biomass of broom plants per unit area. Mulch, 15–20 cm thick, significantly suppressed and retarded broom regeneration. No regeneration from seed was observed in these areas after 12 months. Variation in terrain and broom biomass, however, did lead to some variation in mulch thickness and effective broom suppression. In 1998, at 24 months (Figure 3), a few regenerating broom plants were found that had reached 30 cm, amongst a thick layer of regenerating grasses that excluded most broom seedlings. These plants were easily treated by hand pulling, slashing or carefully sprayed with an appropriate herbicide by ground staff. The cut and mulch control is based on the principle of removing seed producing plants before dealing with recruitment from the seedbank and is effective because of specific aspects of broom biology. These are that the broom only reproduces by seed and, in the area of Waratah, only flowers and sets seed between October and December when it is at least 40 cm tall. In the trial, the cut and mulch method allowed approximately three years of breathing space between mulching and follow up treatments that must be part of any integrated management strategy.

The cut and mulch method may also be applicable on a smaller scale for small infestations using a smaller portable mulcher in combination with the cut stump method of applying herbicide (see Hosking *et al.* 1998). The cut and mulch technique may be equally effective against gorse.



Figure 3. Picture of broom demonstration trial site showing degree of broom regrowth on 1 February 1998.

Conclusions

On suitable ground the cut and mulch method described here is cost effective and, with forward planning, will decrease costs of long-term broom control. It is most effective when applied to a small area initially. This area can be extended in stages. This method results in a longer period before broom regeneration needs to be treated when compared with other mechanical broom control methods. This allows the incorporation of biological control to assist in control of any untreated regrowth.

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References

- Chevallier, A. (1996). 'The encyclopedia of medicinal plants.' (Dorling Kindersley Ltd, London).
- Hosking, J.R., Smith, J.M.B. and Sheppard, A.W. (1998). *Cytisus scoparius* (L.) Link ssp. *scoparius*. In 'The biology of Australian weeds', Volume 2, eds F.D. Panetta, R.H. Groves and R.C.H. Shepherd, pp. 77-88. (R.G. and F.J. Richardson, Melbourne).
- Launert E. (1981). 'Country life guide to edible and medicinal plants of Britain and Northern Europe'. (Hamlyn Publishing Group Ltd., London).