A form for assessing the risk of conifer spread in the high country

Nick Ledgard

Background

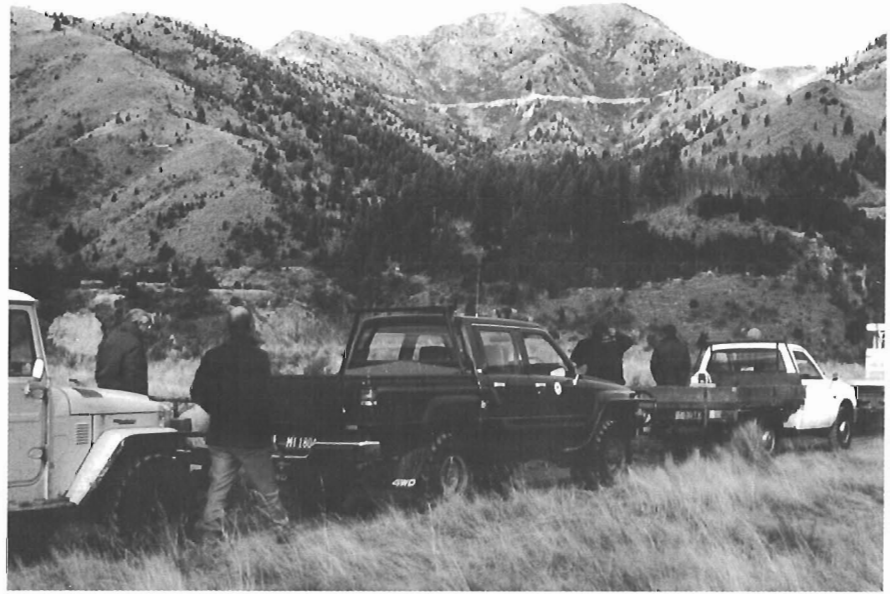
Although much of New Zealand's hill and high country had a woody species cover centuries ago, most has now succumbed to man's use of fire, axe and grazing animals. Today much of the South Island's eastern high country is treeless; a situation considered "natural" by many land managers as well as visitors to the area. However, much of the area remains a natural forest environment and this encourages not only good growth of some introduced species but also natural regeneration of wildings spread. Such is the success of woody species on unimproved land, especially now that grazing pressure (from rabbits as well as sheep) is declining and the use of fires is restricted, that choosing between "woody revegetation cultures ... and improved pastures" will be one of the "principal landscape planning issues for the tussock grasslands and mountainlands for the next 20 years" (O'Connor, 1981).

The spread of introduced conifers in New Zealand's rangelands has received a reasonable amount of attention in recent years. Hunter and Douglas (1984) summarised the history and incidence of tree spread up to that time. Ledgard (1988) gave more detail about the biology and sequence of spread and outlined how knowledge of these could be incorporated into control strategies. Since that time research trials have looked at palatability of a range of conifers and control by browsing (Crozier and Ledgard, 1990), building on earlier work by Benecke (1967) on grazing trials with Lodgepole pine (*Pinus contorta*); chemical control of wildings (Crozier et al, 1988; Crozier, 1990) and delayed germination (Langer, in press). Managers, particularly in Canterbury through the Regional Council's Wilding Tree Advisory Group, have also been concerned with quantifying the extent of spread (Belton and Ledgard, 1991) and with drawing up guidelines for control and management (Ledgard and Crozier, 1991). In addition, a number of reports have been contracted to determine management options for existing tree spread situations such as in the Amuri Range alongside Hanmer Forest.

Predicting spread

One criticism of some of the publications has been that most of the attention to date has focused on existing spread in situations where one could be accused of trying to "close the door after the horse has bolted". It is important that attention in the future moves more towards prevention of unwanted spread before it occurs or in other words concentrating on "a stitch in time saving nine". This is not as difficult an undertaking as it may appear, for conifer spread is generally very predictable and most species are very visible long before serious seed production begins. Therefore there is plenty of time for management to intervene if spread is not desired.

The best means of control is removal of the source of seed. Sometimes, such as in the Amuri Range situation where the source trees are scattered over thousands of hectares, this is impossible and containment is virtually the only control option remaining. However, there are many situations where tree removal is not difficult but it is ignored because the risk of unwanted spread resulting from these trees is not fully appreciated. Commonly, the trees in question are lone 'outliers', which, because of their small numbers in wide open landscapes, appear innocuous and are therefore left intact until the risk of spread is made obvious by the appearance of masses of young wildings around the parent trees. When this occurs the work involved in removal is increased considerably. Unwanted tree spread can also be avoided by calculating the potential spread risk before any trees are planted.



A field-day visit to the Amuri Range downwind from Hanmer Forest. Some 8000 ha are currently affected by spread of Corsican pine.

Calculating Wilding Tree Spread Risk From New Plantings

1. Species

(a) Spreading vigour varies with species:

- Radiata and muricata pine 1
- Ponderosa pine and larch 2
- Corsican pine and Douglas fir 3
- Scots pine and Lodgepole pine (*P.contorta*) 4

(b) Palatability: Enter score (1, 2, 3 or 4) here ☐

- Radiata and ponderosa pine 1
- Lodgepole pine and larch 2
- Scots pine and Douglas fir 3
- Corsican pine 4

2. Siting Enter score (1, 2, 3 or 4) here ☐

- Flat (<10°) sheltered, or slopes facing NE to SSW 1
- Flat (<10°) partially exposed to N and W 2
- Flat (<10°) fully exposed to N and W 3
- Take off site, i.e. ridgetops, on or at base of slopes (>10°) or undulating land fully exposed to N and W 4

Key: < less than; > greater than

Enter score (1, 2, 3 or 4) here ☐

3. Downwind Landuse

(a) Within 200m:

- Developed pasture/regular mob stocking (sheep) or closed canopy scrub/forest 1
- Semi improved grazing/occasional mob stocking 2
- Extensive grazing only 3
- No grazing 4

Enter score (1, 2, 3 or 4) here ☐

(b) Within 200m - 400m OR if 3 or 4 scored in "Siting", within 200m-2km:

- Developed pasture/regular mob stocking (sheep) or closed canopy scrub/forest 1
- Semi improved grazing/occasional mob stocking 2
- Extensive grazing only 3
- No grazing 4

Enter score (1, 2, 3 or 4) here ☐

NB:
- A score of 12 or more means high spread risk.
- A high risk is also likely if a score of 3 or 4 in "Siting" is followed by a 3 or 4 in "Downwind landuse" (a) or (b).
- A high risk does not necessarily mean that tree planting is ruled out. A change of species, or siting, or downwind land management can significantly lower spread risk.

TOTAL SCORE ☐

Prepared by N Ledgard, NZFRI Ltd, Rangiora, for Canterbury Wilding Tree Advisory Group, 1993.

A spread risk assessment form

On behalf of the Canterbury Regional Council's Wilding Tree Advisory Group, NZFRI has designed a simple form for assessing the risk of wilding spread from coniferous trees. The form asks five questions concerning species, siting and surrounding land use. There are four possible answers to each question with a score of 1-4 attributed to each answer. The higher the score the higher the spread risk. The highest possible score after answering all five questions is 20 and a score of 12 or more indicates a high spread risk.

The form is user-friendly even to those with very limited forestry knowledge. The person filling in the form only needs to know the species present (or to be planted) and the location, and as each question requires 'either/or' answers and is based largely on fact resulting from research findings (rather than value judgements) it is difficult to end up with a grossly incorrect score. The sheet has been tested in the field on a number of people from varying backgrounds. When assessing the same situation, virtually all respondents ended up within a point or two of the same score. Most filled out the sheet within 2-3 minutes.

A score of 12 or more does not necessarily imply that trees should be removed or should not be planted. The spread risk can be lowered by changing the species, the site or the surrounding land management, and the possible options can then be reassessed for risk by means of the assessment sheet.

The assessment form was only drawn up at the end of 1992, so although it has been used in the field on a number of occasions it requires further field testing before it could be considered robust in all situations.

Living with tree spread

Burning, grazing by wild and farmed animals, and a lack of seed sources has limited the spread of introduced trees and woody species generally in the past, but the influence of the first two factors has declined and there is likely to be an increase in seed sources as more land is retired from grazing or planted in trees. Consequently, there is little doubt that the future will see more woody species in the high country and in some areas introduced conifers will be an obvious component. It is important that trees, particularly conifers, are integrated wisely into existing high country land uses without unnecessarily disrupting other important values, such as landscape or conservation. This is the present challenge for administrators and managers and it need not be difficult, even if a significant forestry resource is desired – such is the vast scale and present low utilisation of the high country. It is hoped that a method for assessing potential spread risk will assist in surmounting this challenge.

As described above, it is relatively easy to assess the risk of wildings spreading from an existing or proposed conifer planting. It is less easy, but still possible, to determine the susceptibility of land to invasion by conifer wildings. An assessment form has yet to be developed for this purpose, but it is not difficult to determine the relative susceptibility by evaluating the type and degree of vegetation cover and grazing pressure on the land in question, and the proximity of a seed source upwind, its siting relative to exposure to prevailing winds, and the species involved. If seed from a spread-prone species can reach the site and the grazing pressure and vegetation cover is light, then invasion can be expected and appropriate management decisions should be made. If invasion is likely, but not wanted, there are basically two courses of action – either increase the density of vegetation so that competition is too keen to allow invasion, or increase the grazing so that annual mob stocking with sheep is possible. This is normally done by conventional oversowing and topdressing.

If there is little chance of averting invasion by unwanted wildings, the wise action is to work with it and try to promote the most desirable tree species to establish at the most acceptable densities and age

structure. This will probably involve conventional planting or perhaps seeding, although the results of the latter action are often very variable.

There is a misconception circulating at present that all wilding trees are valuable. To be sure, profits have been made from wilding trees growing close to the parent stand. This is known as 'fringe' spread where the trees are so close together that the form and branching is commercially acceptable. Such spread rarely extends more than 200 m from the parent stand. By far the majority of wilding-affected land is covered in 'distant' spread (or outlier trees) where the trees are widely spaced with consequent poor form (very tapered) and large branches. The chances of profiting directly from these trees is minimal – in fact they are a costly nuisance if the area is to be developed into pasture or trees. Their only value may be in the longer term when they eventually produce dense fringe spread of their own.

In summary then, natural wilding invasion or "forestry by default" is not generally supported because it often leads to stands of the wrong species on the wrong site, and of poor age structure and form.

References

Belton, M.C., N.J. Ledgard, 1991: Canterbury high-country exotic tree spread study. Field Sheet Books Nos 1-5. Ministry of Forestry Contract Report to DOC, Landcorp, local Regional Bodies.

Benecke, U., 1967: The weed potential of Lodgepole pine. Tussock Grasslands and Mountain lands Review 13: 36-43.

Crozier, E.R., 1990: Chemical control of wilding conifer seedlings. In Popay A.J. (Ed) "Proceedings of 41st New Zealand Weed and Pest Conference", P.O. Box 1654, Palmerston North, (FRI Reprint No 2290): 182-186.

Crozier, E.R., T.R. Zych, N.J. Ledgard., 1988: Control of wilding conifers by applying chemicals to cut stumps. In Popay A.J. (Ed) "Proceedings of 41st NZ Weed and Pest Control Conference", P.O. Box 1654, Palmerston North, (FRI Reprint No 2096): 160-163.

Crozier, E.R., N.J. Ledgard, 1990: Palatability of wilding conifers and control by sheep browsing. In: Basset, C., I.J. Whitehouse, J.A. Zabkiewicz (Eds) "Alternatives to the chemical control of weeds". Proceedings of International Conference, Rotorua, July 1989. Ministry of Forestry, FRI Bulletin No 155: 139-143.

Hunter, G.G., M.H. Douglas. Spread of exotic conifers on South Island rangelands. Journal of Forestry 29(1): 78-96.

Langer, E.R. (in press): Delayed germination of introduced conifers in Canterbury. New Zealand J1. of Forestry.

Ledgard, N.J., 1988: The spread of introduced trees in New Zealand's rangelands – South Island high country experience. Tussock Grasslands and Mountain Lands Institute Review 44: 1-7.

Ledgard, N.J., E.R. Crozier, 1991: Guidelines for the control and management of wilding trees in the Canterbury high country. Ministry of Forestry Contract Report for DOC, Landcorp, local Regional Bodies: 13 pp.

O'Connor, K.F., 1981: Changes in tussock grasslands and mountain lands. Tussock Grasslands and Mountain Lands Review 40:47-62.

A brief history of Douglas fir in New Zealand

Douglas fir (*Pseudotsuga menziesii*) is an extremely important tree species in North America, dominating huge areas of the West. It has a reputation for good health and vigour, combined with excellent timber properties.

It was introduced to New Zealand in 1859, at the same time as *Pinus radiata*, by J.B. Acland of Canterbury. It grew well enough to be selected by the newly created State Forest Service as an important timber species, with a growth rate second only to radiata pine (*Pinus radiata*).

The earliest large-scale plantings date from about 1896, using seed whose origin is unknown. Seed importations for large-scale plantings from 1930 were from Washington State, where superb stands of Douglas fir were easy to access, and it is thought that earlier importations came from there also.

These first stands grew very well, starting slowly, as if the newly planted seedlings needed to consolidate their root systems and provide thick and bushy foliage as a protection against browsing. Radiata pine is far ahead in height five years after planting, but from then on Douglas fir growth rate (volume per hectare) catches up, due to its ability to carry a much higher stocking.

Douglas fir seedling and cone.

Douglas fir has remained secondary to radiata pine for forest planting, mainly due to the need to wait longer before harvest-

* *Senior Technical Officer, NZFRI, Rotorua.*