SAWMILL ROAD BUSH, BOWYERS STREAM, STAVELEY, MID-CANTERBURY

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INTRODUCTION

A remnant of the once-extensive mixed beech-broadleaf forest, with scattered podocarps, of the upper Mid-Canterbury plains (385 m a.s.l.), Sawmill Road Bush (Fig. 1) is an approximately 8 ha area beside the Presbyterian-Methodist camp site at Staveley (G.R. NZMS 260, K36/843284). It is administered by the camp site committee. The Bush adjoins Bowyers Stream and most of the terrain on which it grows is a gently-sloping, old stream fan surface, with a silty, stony soil, over alluvial gravel. It is bounded on the west by the present floodplain of the stream and there is a fluvial terrace at its south-western end.

As the *Nothofagus solandri*-dominated forest is one of the largest surviving patches of the abundant forest which covered this part of the Canterbury Plains in 1850, it is important in its own right. It is also important for the insights about the former forest which can be gained by studying it and as an example of the reactions of native vegetation to invasion by introduced plants over the last 140 years.

Sawmill Road Bush (hereafter S.R.B.) is fenced to exclude stock. Possums* and rabbits* are present in it, but apparently cause little harm. The birds seen there in January 1995 were: bellbird, kereru, fantail, grey warbler, silvereye*, blackbird*, song-thrush*, chaffinch*, house-sparrow*, starling*, white-backed magpie* (* introduced species).

Possibly 80-100 years ago part of the forest was cut-over; large cut stumps (beech or podocarp trees) are present at the north-western end. There is, otherwise, no indication of the prior presence of old trees and, at that time (i.e. at the beginning of this century) the beech trees which are well grown adults now would have been only about 100 years old. Older, fallen trees may have been removed for firewood. Some deliberate planting of tree species has also been done on the forest margins probably about 50 years ago. Otherwise little is known about the specific history of the forest (but cf. Vance, 1976).

In this account the composition of the forest is briefly described. Emphasis is placed on some features of plant form and reproduction and on the impact which some introduced plants are having. The final part of the article consists of suggestions about options for management, so that S.R.B. can continue to be a healthy and vigorous forest area, in which native plants regenerate.

COMPOSITION OF THE FOREST

Table 1 lists the plant species in S.R.B. *Nothofagus solandri* (both var. *solandri* and var. *cliffortioides*), 20-22 m high, is the most prominent species. A few *N. fusca* and *N. menziesii* trees have been planted along one part of the western margin. The impression of uniform beech composition is dispelled once inside the forest; common trees of the broad-leaved

understorey, 6-15 m high, are *Aristotelia serrata* (wineberry), *Carpodetus serratus* (marble leaf), *Fuchsia excorticata, Griselinia littoralis* (broadleaf), *Pittosporum tenuifolium* (kohuhu) and *Pseudopanax crassifolius* (lancewood).

Oaks (*Quercus robur**) and willows (*Salix fragilis**) have been planted on the west side and sycamore maple (*Acer pseudoplatanus**) is invasive in places, as are some smaller naturalized tree species and shrubs. As large, old beech trees die and fall over, often the gaps are filled by the broadleaved native trees, or by sycamore. Some patches of beech saplings and poles are also present, especially at the north end.

The most prominent shrubs are *Coprosma propinqua, C. rhamnoides, C. rigida, Pseudopanax colensoi* and *Cotoneaster simonsii**. Broom, *Cytisus scoparius** is common along parts of the forest margin. *Rubus cissoides* (lawyer) is the most abundant native vine, but *Tropaeolum speciosum** (flame creeper) is very abundant and *Hedera helix** (ivy) forms a very large patch in one place, both on the ground and creeping on trees.

Among the commonest ground cover plants of the field layer are the hook sedge *Uncinia uncinata* and the ferns *Blechnum discolor, B. "procerum"* and *Polystichum vestitum*. Many other herbaceous species, especially grasses, are abundant along margins of paths and bordering the outer limits of the fenced forest area.

Ignoring all species which have been deliberately planted, because they do not seem to be spreading, there are, in the forest, 11 native and five naturalized tree species; 20 native and nine naturalized shrubs; five native and three naturalized vines; 1 native stem parasite; 13 native and 22 naturalized herbs; 14 native and one naturalized fern; 1 native lycopod. The naturalized plants have spread into the forest from nearby locations, such as farm gardens, hedgerows, or pastures, or the stream floodplain where, in turn, they had been planted, or established by natural means.

Reproductive Modes

The woody species reproduce mainly by means of seeds. Exceptions will be noted later. Among the 43 native or naturalized woody species are a remarkably high number, 34 (79.1%) with fleshy fruit, or accessory tissues, that are attractive to birds. Blackbirds* are almost certainly the main seed-dispersers, but bellbirds, kereru and silvereyes* will be important in this role, also, and song-thrushes* and starlings* probably disperse some seeds. The main colours of fleshy fruit tissues, among these species with bird-dispersed seeds are black or purplish-black (13 species, 38%) or shades of red (seven species, 20%). These are also the most common fruit colours for woody plants in temperate regions in the Northern Hemisphere, as well as in the New Zealand flora in general (Burrows, 1994a). Apparently these are the hues which contrast most strongly with foliage, so that they are perceived readily by foraging birds. Species with seeds dispersed other than by birds have uniformly brown fruit colours.

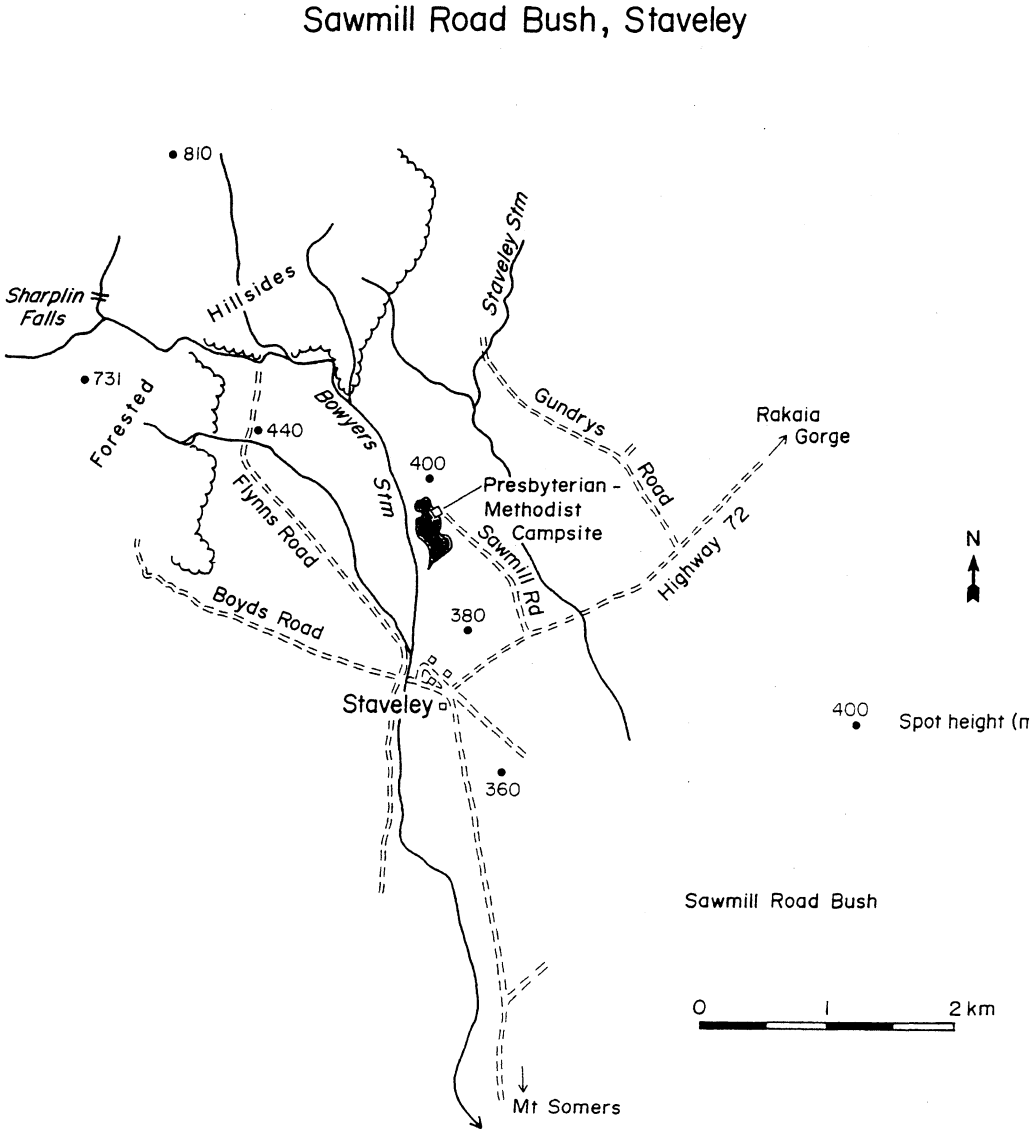

Fig. 1 Sawmill Road Bush in relation to nearby features

Almost all the other woody species in Sawmill Road Bush have seeds which, at least to some degree, are dispersed by wind. *Nothofagus* seeds, with very small wings, usually travel over relatively short distances in that way, but they may occasionally disperse over several kilometres by wind (Burrows & Lord, 1993) and over longer distances in streams. *Acer pseudoplatanus** has heavy winged fruit and *Salix caprea** and the vines *Clematis*, and *Parsonsia* spp. have lighter plumed seeds or fruits. *Ulex** and *Cytisus** project their seeds, explosively, over short distances, but the seeds also can be rolled along the ground by wind or transported in streams.

Among the herbaceous seed plants the fruit of *Astelia, Fragaria** and *Nertera* attract birds, which eat them and disperse their seeds. Fruit of *Acaena* and *Uncinia* are specialised for transport attached to the fur or feathers of vertebrate animals. Ground birds such as wekas probably dispersed them in the past. Now they adhere to human clothing, or leg hair, or to the fur of possums or rabbits. *Cirsium**, *Lapsana** and *Senecio** fruit are wind-transported. The dispersal mode for all other herbaceous seed plants is not easily determinable. Various scenarios can be envisaged, including: wind-dispersal or attachment to fur for awned grass-seeds; carriage on human clothing or footwear for some; carriage in the gut of mammals, then excretion, for others (e.g. *Trifolium* spp.*).

Vegetative spread is very important for only a few woody plants. However, many trees and shrubs, native and introduced, can sprout from the base and regenerate if the stems are damaged (cf. Burrows, 1994b). Production of roots on stems which lie along the ground (layering) is common among vines (*Rubus* spp., *Clematis, Muehlenbeckia*) and some trees (*Salix caprea**, *Carpodetus, Schefflera*). Some shrubs spread by production of root suckers or by layering (*Myrtus pedunculata, Berberis**, *Euonymus**, *Cotoneaster**). The outstanding examples of vegetative spread among the vines are *Tropaeolum** (rhizomes), *Hedera** (layered stems, stolons) and *Rubus fruticosus** (stolons), each of which can travel a metre or more a year by these means.

Vegetative spread (over relatively short distances) is prominent among the perennial herbs, possibly because proliferation in this way is more reliable for low-growing plants than is reproduction by means of seeds. Large patches of species of *Acaena, Hydrocotyle, Lagenifera, Nertera, Ranunculus**, *Trifolium**, and *Prunella** and various grasses indicate the efficacy of rhizomes and stolons in these plants. The same applies to the ferns *Blechnum pennamarina, Histiopteris, Hypolepis, Phymatosorus* and *Pteridium*.

The Impact of Introduced Plant Species

By now S.R.B. is well occupied by introduced and herbaceous plants, yet, with a few exceptions, there is little indication that they are taking over to the serious detriment of the native flora. Most of the introduced species are either confined to large open spaces (along paths, or adjacent to the forest perimeter) or "fit into" the native community reasonably harmoniously without displacing native species much. The spaces which most of the adventives occupy would probably be occupied, otherwise, by the commoner native species. This even applies to the common vine *Tropaeolum speciosum** which, though it festoons many shrubs and trees, is deciduous in winter, allowing "host" plants to recover.

Exceptions to this rule of lack of severe competitive pressure on native plants by adventives are *Acer** and *Hedera**, which, in places, are vigorously expanding and out-competing the native species. The most serious threat to the forest (except by fire or large grazing mammals) undoubtedly comes from *Hedera**, which has the potential to invade comprehensively and change the whole character of the forest. It could, ultimately, cover all of the ground and climb up most of the trees. This could happen within about 40 years.

Management Suggestions

Sawmill Road Bush is an excellent representative patch of the once-continuous forest of the upper Canterbury Plains in the Mount Somers - Pudding Hill districts. If some relatively straightforward management procedures can be carried out it should be possible to maintain the Bush as a vigorous and healthy forest, into the forseeable future.

1. Check the integrity of the fencing to ensure that stock (especially cattle, deer or goats) cannot enter.
2. As a safety precaution, especially at the northern and north-western sides, make a clear, wide firebreak in the scrub outside the Bush.
3. Over the next one to three years remove ivy wherever it is established in the Bush. This can be done by a team of half a dozen determined people, by hand-pulling the vine and taking it outside the Bush to be burnt. Patches cleared in this way need to be checked annually to pick up any portions of vine that were missed.
4. In the next few years kill all adult sycamore maples. This can be done by cutting the bark round the stem with a slasher and spraying the cut (with a squirt bottle) with Escort herbicide. This is best done in spring and summer. Also hand-pull any seedling and sapling sycamores encountered.
5. Over the next five years or so, when gorse, broom, cherry, hawthorn, barberry, cotoneaster, elderberry and blackberry are encountered in the forest, either hand-pull, or kill with Escort (most of these will simply sprout again if cut off). Kill adult trees of cherry, hawthorn, elderberry found on the forest margin.
6. Not much can be done to clear herbaceous weed species from the Bush, but they will not spread if open areas such as paths are kept as narrow as possible. Encourage high growth along the existing paths to close over to ensure that there is good shade. It would be beneficial to have one longitudinal path in the forest to give access to all parts of it for weed control (and for class studies etc.). If such a track is opened up it need not be straight (i.e. it can deviate around established trees or shrubs) and it should be very narrow.
7. The inegrity of the forest is maintained by the high canopy of beeches. Regeneration of the dominants in large gaps may need some encouragement - essentially seedlings and saplings need to be free of too much competition from field layer, or shrubs and saplings of other species, or vines.
8. The Canterbury Botanical Society could assist in some practical ways by monitoring the condition of the forest and interpretation of its main features. We could establish two or three permanent study plots (20 x 20 m mapped and photographed quadrats). We could also prepare a simple handbook on the Bush and the plants present (with outline drawings of foliage) to be used by visitors to the campsite.

9. It may be beneficial to have this forest area established as a Queen Elizabeth II National Trust covenant area, thus ensuring its ongoing protection for generations to come.

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Table 1 Checklist of Plant Species in Sawmill Road Bush

Δ - deliberately planted; x - indicates common sprouting from base; s - indicates common spreading by vegetative means

TREES		SEED DISPERSAL	COLOUR OF FLESHY RIPE FRUIT	VEGETATIVE PROLIFERATION
Native				
Aristotelia serrata	wineberry	birds	purple-black	x
Carpodetus serratus	marble leaf	birds	black	x
Cordyline australis	cabbage tree	birds	white	x
Fuchsia excorticata	tree fuchsia	birds	purple-black	x
Griselinia littoralis	broadleaf	birds	black	x
Nothofagus solandri var. *solandri*	black beech	wind, gravity		
N. s. var. *cliffortioides*	mountain beech	wind, gravity		
Pittosporum tenuifolium	kohuhu	birds	black seeds, yellow gum	
Pseudopanax arboreus	five-finger	birds	purple-black	x
P. crassifolius	lancewood	birds	green to purple-black	
Schefflera digitata	pate	birds	white to purple	x
Introduced				
Acer pseudoplatanus	sycamore maple	wind		x
Crataegus monogyna	hawthorn	birds	red	x
Malus domestica	apple	birds	green to red	
Nothofagus fusca	red beech Δ			
N. menziesii	silver beech Δ			
Prunus avium	cherry	birds	red	x
Pyrus communis	pear	birds	green to yellowish	x
Quercus robur	oak Δ			
Salix fragilis	crack willow Δ			
S. caprea	pussy willow	wind		xs
Sorbus aucuparia	rowan	birds	red	x

VINES

Native

Clematis paniculata	white clematis	wind		x
Muehlenbeckia australis	pohuehue	birds	white	xs
Parsonsia capsularis	small N.Z. jasmine	wind		x
P. heterophylla	large N.Z. jasmine	wind		x
Rubus cissoides	lawyer	birds	reddish	xs

Introduced

Hedera helix	ivy	birds	purple-black	s
Rubus fruticosus	blackberry	birds	black	xs
Tropaeolum speciosum	Chilean flame creeper	birds	blue	xs

SHRUBS

Native

Coprosma crassifolia	thick-leaved C.	birds	yellow	x
C. linariifolia	yellow-wood	birds	white	x
C. propinqua	miki miki	birds	blue	x
C. rhamnoides	variable-leaved C.	birds	red	x
C. rigida	rigid C.	birds	yellow	
Myrsine divaricata	weeping mapou	birds	purple	x
Myrtus pedunculata	myrtle	birds	orange	xs
Pseudopanax colensoi	three-finger	birds	green to purple-black	x
Pseudowintera colorata	pepper-leaf	birds	black	x

Introduced

Berberis darwinii	orange barberry	birds	purple-black	xs
Cotoneaster simonsii	cotoneaster	birds	red	xs
Cytisus scoparius	broom	projected		
Euonymus europaeus	spindle berry	birds	orange (aril)	xs
Hypericum androsaemum	tutsan	birds	black	xs
Rhododendron sp.	rhododendron Δ			
R. sp.	azalea Δ			
Sambucus nigra	elderberry	birds	black	x
Ulex europaeus	gorse	projected		x

PARASITE

Native

Peraxilla flavida	yellow mistletoe	birds	yellow	

HERBS

Native

Acaena anserinifolia	bidibidi	fur/plumage		s
Astelia fragrans	bush lily	birds	orange	
Hydrocotyle moschata	hairy pennywort	?		s
H. sp.	pennywort	?		s
Lagenifera petiolata	small daisy	?		s
Leptinella squalida	common cotula	?		s
Microlaena avenacea	bush rice grass	?		s
Nertera sp. aff. *dichondraefolia*	nertera	birds	orange	s
Stellaria parviflora	N.Z. chickweed	?		s
Uncinia uncinata	large hook-sedge	fur/plumage		s
U. sp.	small hook-sedge	fur/plumage		s
U. sp.	small hook-sedge	fur/plumage		s

Introduced

Agrostis capillaris	browntop	?		s
Anthoxanthum odoratum	sweet vernal	?		s
Dactylis glomerata	cocksfoot	?		s
Digitalis purpurea	foxglove	?		
Carex ovalis	oval sedge	?		s
Cirsium vulgare	scots thistle	wind		
Cynosurus cristatus	crested dogstail	?		s
Fragaria vesca	strawberry	birds	red	s
Holcus lanatus	yorkshire fog	?		s
Lapsana communis	nipplewort	wind		
Leucanthemum vulgare	dog daisy	?		s
Phleum pratense	timothy	?		s
Plantago major	broad-leaved plantain	?		

Poa pratensis	bluegrass	?	s
Prunella vulgaris	self heal	?	s
Ranunculus acris	giant buttercup	?	
R. repens	common buttercup	?	s
Senecio jacobaea	ragwort	wind	
Stellaria graminea	stitchwort	?	s
S. media	chickweed	?	s
Trifolium pratense	red clover	?	s
T. repens	white clover	?	s

FERNS

Native

Asplenium gracillimum	beautiful spleenwort	
A. hookerianum	hooker's spleenwort	
A. richardii	richard's spleenwort	
A. terrestre	ground spleenwort	
Blechnum discolor	two-coloured hard fern	
B. fluviatile	stream hard fern	
B. penna-marina	little hard fern	s
B. "procerum"	big hard fern	s
Histiopteris incisa	water fern	s
Hypolepis millefolium	soft fern	s
H. tenuifolia	soft fern	s
Phymatosorus diversifolius	tongue fern	s
Polystichum vestitum	prickly shield fern	
Pteridium esculentum	bracken	s

Introduced

Dryopteris filix-mas	male fern	

LYCOPOD

Native

Lycopodium varium	variable lycopod	