TUSSOCK GRASSLANDS OF THE RYTON VALLEY: An Assessment of the Likely Effect of Skifield Development on Spread of Naturalised Plants

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Introduction

The Canterbury Botanical Society conducted a field trip into the Ryton Valley in March 1987. In April 1987 a road was bulldozed up the valley from the Mt Olympus Skifield Road, almost to the Mt Cheeseman ridge. The road was intended as an access for skifield feasibility studies.

Naturalised plant species are often abundant near skifield roads and buildings (e.g., Norton and Burrows, 1979; Vickers, Norton, and Meurk, 1987). However, attempts to determine the origin of these plants are often frustrated by lack of information as to what adventive species were present before the skifield was constructed.

Here, I report observations on adventive plants currently present near the Ryton Valley road, in order to provide an information base for future studies on naturalised plants in the Ryton Valley. Emphasis is placed on upper valley snowtussock grasslands, where skifield activities would be centred. Botanical and landscape values which may be threatened by skifield development are discussed.

Study area

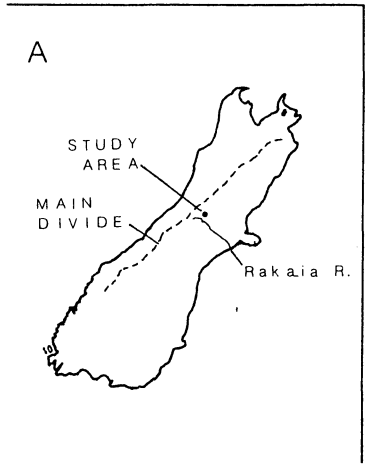
The Ryton River Valley, Canterbury, runs from Mt Cheeseman in the Craigieburn Range to Lake Coleridge (Fig 1). The study area comprises the upper valley from the junction of the Mt Olympus Skifield and Ryton Valleys (1,020m) to the Mt Cheeseman-Mt Olympus ridge (1,830m) (Fig 1B). The upper Ryton Valley is part of the Mt OLympus Crown Leasehold Run 179, retired from grazing since 1967 according to Soil and Water Conservation Plan No 35, Lake Coleridge, (North Canterbury Catchment Board).

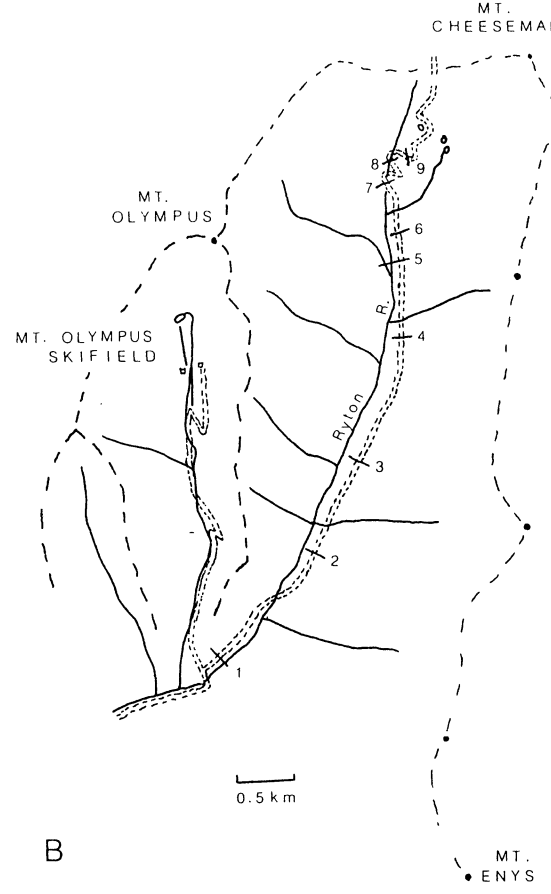
Figure 1. Study area. a) Location map. b) Upper ryton Valley, road and transect positions. c) Ryton Valley snowtussock grasslands (traced from aerial photograph) and upper road. Site d is a *Chionochloa macra* grassland on flat terrain at the valley head. Sites a, b, and c are basins in upper snowtussock grasslands


a
b
c
d

C

0.5 km


A
STUDY AREA
MAIN DIVIDE
Rakaia R.


MT. CHEESEMAN
MT. OLYMPUS
MT. OLYMPUS SKIFIELD
Rylon R.
1
2
3
4
5
6
7
8
9
0.5 km
MT. ENYS

B

Methods

Transects were placed across the access road at nine locations between 1,042m and 1,658m at approximately 100m altitudinal increments (Table 1). Adjustments were made in transect location so as to sample major vegetation types. At the valley head two transects were laid in a *Chionochloa macra* grassland on flat terrain (Fig 1C, site d) which is designated as a parking area and site for skifield buildings. Transects were photographed and key landscape features and compass direction noted.

At each transect five 0.5m plots were placed, at 10m to the left of the road, in vegetation immediately adjacent to the left edge, in the centre of the road, in vegetation immediately adjacent to the right edge , and 10m to the right of the road (forty five points in all). Species cover was measured to 1%. Species occurring alongside the road were listed in order of dominance at ten further sites.

Photographs of transects and quadrats and information relating to their locations can be obtained for future reassessment from the Editor of the Canterbury Botanical Society Journal.

Results

1. Vegetation, landforms, and route of road

Vegetation types sampled at road transects are listed in Table 1. The road begins in fescue (*Festuca novae-zelandiae/Festuca matthewsii)* dominated grassland at 1,020m. *Dracophyllum uniflorum, Podocarpus nivalis, Chionochloa flavescens* and *Celmisia spectabilis* are common and *Chionochloa macra* and *Poa cita* occasional. A variety of subalpine and low alpine herbs and native grasses are present. *Hieracium pilosella* is very common, forming large patches and apparently excluding other plants. Many other naturalised species are present, with some species distributed throughout the grassland (e.g.,*Agrostis capillaris, Anthoxanthum odoratum, Rumex acetosella, Hypochoeris radicata)* and others restricted to the roadside (e.g., *Cirsium arvense, C. vulgare, Verbascum thapsus, Plantago lanceolata*).

This shrub-tussockland grades into scree at 1,074m. The road crosses from the west to the east side of the valley at 1,080m near a relict stand of mountain beech (*Nothofagus solandri*) and rises gradually on scree slopes, crossing occasional tongues of snow totara (*Podocarpus nivalis.*).

On these lower scree slopes the road crosses the base of a *P. nivalis-Chionochloa flavescens* shrub-tussockland which contains an interesting variety of intertussock species.

TABLE 1: Vegetation and naturalised species at transects.

No.	Altitude (m)	Vegetation/Surface	Naturalised species
1	1042	*Dracophyllum uniflorum - Chionochloa macra - Ch. flavescens/ Hieracium pilosella - Festuca* sp tussockland and *Podocarpus nivalis*	*Hieracium pilosella, H.lepidulum, Anthoxanthum odoratum*
2	1140	*Podocarpus nivalis*	-
3	1240	Scree	-
4	1350	Scree - *Rytidosperma setifolium*	-
5	1371	*Chionochloa macra/Celmisia lyallii - Coprosma atropurpurea* - tussockland on flat terrain	*Rumex acetosella, Juncus effusus, Hieracium pilosella*
6	1380	*Chionochloa macra/Celmisia lyallii - Festuca* sp - *C. spectabilis - Pimelea oreophila* tussockland on flat terrain	*Rumex acetosella, Hieracium pilosella, H. praealtum*
7	1445	Scree and *Chionochloa macra - Celmisia spectabilis* tussockland	-
8	1580	*Chionochloa macra* x *crassiuscula - Ch. pallens/Celmisia viscosa - C. lyallii*	-
9	1658	*Chionochloa macra - Ch. macra* x *oreophilia/Celmisia viscosa - C. lyallii* tussockland	-

The slash (/) separates vegetation in an upper tier (2-0.3m) from vegetation in a lower tier (<0.3m)

On the valley floor below the road naturalised species including *Hieracium* spp, *Agrostis stolonifera, A. capillaris, Rumex acetosella, Cirsium arvense,* and *Cerastium fontanum* are associated with the dry stream bed (Vickers et al, 1987)

At the valley head (c.4km from the start of the road) a nearly flat area of *Chionochloa macra* tussockland is present. The road traverses the eastern side of this grassland. *C. macra* is dense and a diverse intertussock community of more than thirty species is present, with *Celmisia lyallii* and *Coprosma atropurpurea* the most common species. *Celmisia macra* cover is greatest in central parts of the grassland (Table 2) and lower towards the east and west sides. In the north eastern part of the grassland, fescue tussock occurs in patches and *C. macra* cover is lowest. The intertussock community is complex with *Pimelea oreophila* especially common. Total vegetation cover is somewhat lower in fescue areas, with moss cover increased.

Hieracium pilosella, H. praealtum, and Rumex *acetosella* were found within the grassland, and these species and *Cerastium fontanum, Hypochoeris,* and *Cirsium arvense* are associated with the streambed to the west. *Juncus effusus* is present in damp grassland to the west.

From the valley head the road begins to climb again. It traverses the base of the *Chionochloa macra* grassland which is floristically related to the grassland below but is less dense and diverse, and *Celmisia viscosa* is more common. The road then traverses steep scree slopes and enters *Chionochloa macra* grassland at 1,570m. The road runs nearly continuously in snowtussock grassland from here to the tussock limit (1,760m), passing through three basins (Fig 1C, sites a, b, and c). *C. macra* is dominant in these upper basins, *C. macra* x *crassiuscula* is common, with *C. macra* x *oreophila* also present. *C. pallens* occurs on steep slopes between basins. Species diversity is much lower than in the valley head grassland, with *Celmisia viscosa* the most common intertussock species. Snow-tussock cover on basin floors is higher than on sloping scree, but is not so high as in the valley head grassland below.

The road crosses some of the densest areas of these upper valley grasslands. Near the tussock limit the road passes through *Chionochloa oreophila* and alpine herbfield, terminating at 1,760m. A small tarn is rounded on the uphill side at 1,750m (Fig 1C, just above site c). Species found in these areas are listed in Appendix 1. The road surface is almost entirely scree. Small amounts of damaged vegetation remain rooted on the road surface through the valley head snowtussock grassland.

TABLE 2: Vegetation cover values for plots in valley head *Chionochloa macra* tussockland.

Area	Plot	Naturalised plants		Total cover	Tussock cover		Total cover	No. native species
		species	cover(%)	(%)	*Ch . macra*	*Festuca*	(%)	
Central	5G	-	0	132	88	0	44	12
	5F	-	0	167	100	0	67	13
	5A	-	0	114	88	0	26	10
	5B	-	0	152	96	0	56	13
Side	5h	*R. acetosella*	2	102	46	0	53	9
		J. effusus	1					
	5D	-	0	120	46	0	74	8
	5E	*H. pilosella*	12	145	68	0	65	9
Fescue	6A	*R. acetosella*	<1	109	28	10	70	10
	6B	*H. pilosella*	3	104	6	14	80	14
		H. praealtum	<1					
	6D	-	0	29	0	26	3	4
	6E	*R. acetosella*	1	38	24	2	11	11

2 Naturalised plant species at road transects

Naturalised species found at road transects are listed in Table 1. Only three of the adventive species present in fescue grasslands were seen at transect 1. *Hieracium pilosella* is the dominant species on the west side of the road, with 70% cover measured in the roadside plot and 22% cover 10m to the west. The road apparently passed through a large *H. pilosella* patch. *H. pilosella* also occurred at low cover density (2%) immediately to the east of the road. *H.. lepidulum* (1%) was found, 10m to the west, just beside the road to the east, and at 4% cover 10m to the east, associated with *Podocarpus nivalis. Anthoxanthum odoratum* (1%) was also present here.

No naturalised plants were seen near the road on scree in the lower valley or in *Chionochloa flavescens* or Podocarpus *nivalis* communities on scree slopes. The absence of *Hieracium lepidulum* is notable, as it is especially common in the Mt Olympus Skifield Valley at these altitudes.

Three of the naturalised species present in the valley head *Chionochloa macra* grassland occurred at transect sites. *Hieracium pilosella* was found 10m to the east (12%) and immediately to the west (3%) of the road. *Rumex acetosella* (1-2%) was presents in plots 10m to the east and west of the road, and with *Juncus effusus* (1%) at the west end of a transect laid across the grassland. *Hieracium praealtum* (1%) occurred just beside the road to the west.

Naturalised species occurred in plots where *Chionochloa macra* cover is somewhat lower, towards east and west sides of the grassland and in areas with fescue tussock. Naturalised species were not found in plots in the centre of the grassland, where *C. macra* cover is densest. Intertussock cover is about the same in plots with and without adventive species. More data are needed to determine if these trends describe the grassland in general. The data, nevertheless, do show that adventive species are already present near the road, concealed among intertussock plants. *Hieracium pilosella* may be one of the more abundant of these adventive species. The highest sighting of a naturalised plant near the road was made at just above the valley head grassland, at 1,463m, where one plant of *H. lepidulum* was seen on the east side of the road in *Chionochloa macra* grassland. No naturalised plants were found near the road in the upper snowtussock grasslands.

Discussion

Naturalised species are likely to increase in the Ryton Valley now that the road is present, and may become much more abundant if skifield development proceeds. The greatest increase will probably occur at the valley head near skifield buildings and facilities.

Adventive plants already present beside the road in the valley head grassland may provide a source of seed. *Hieracium pilosella, H. praealtum* and *Rumex acetosella* immediately adjacent to the road may spread vegetatively onto the road surface. Seeds of *Hieracium lepidulum, Agrostis capillaris, Cerastium fontanum, Cirsium arvense, Hypochoeris radicata, and Trifolium repens* could disperse from populations in the streambed to the west (Vickers, Norton, and Meurk,1987), and germinate on disturbed ground. Species which form variable populations on the road surface in particular *Hieracium pilosella* may spread back into the grassland.

H. pilosella is the dominant plant at places beside the start of the road, and is likely to be carried up the valley along with *H. lepidulum* and other adventive species. All of the species listed above are already present in fescue grasslands traversed by the road, and are well established in the Mt Olympus Skifield Valley at altitudes exceeding the altitudes at the head of the Ryton Valley. Seeds of these species may be carried up the valley by road traffic, and germinate on the roadside or near skifield buildings, *H. lepidulum* has a tendency to establish under *Podocarpus nivalis* and will probably appear in *P. nivalis* tongues crossed by the road.

Naturalised species *Poa annua, P, pratensis*, and *Festuca rubra* which apparently appear nowhere else in the valley, are well established at 1,640m near the skifield hut in the Mt Olympus Valley. Such direct introductions of adventive species may be avoided in the Ryton Valley by careful disposal of packing materials, careful organisation of foodscrap disposal and sewerage systems, and revegetation of bare areas with native rather than adventive species.

Six naturalised species, *Hieracium pilosella, H. praealtum, H. lepidulum, Agrostis capillaris, Rumex acetosella,* and *Hypochoeris radicata*, occur at high altitudes in the Ryton and Mt Olympus Valleys (Vickers et al. 1987). All of these species , except H. radicata, appear to become more abundant with disturbance at high altitude areas and may become established on the road through the upper valley snowtussock grasslands. All, except *Hieracium praealtum*, are established at a tarn in the Mt Olympus Valley at 1,830m, well above the altitude at which the Ryton Valley road terminates.

The extent to which naturalised species may become established within upper valley tussockland is a matter of speculation. Studies in the valley head *Chionochloa macra* grassland suggest that high *C. macra* cover , rather than intertussock cover, may be a deterrent to the establishment of adventive species. As snowtussock cover is somewhat lower in the upper valley tussockland than in the valley head grassland, naturalised species may more readily become

established in the upper tussocklands. However, their establishment and spread may be hindered by higher altitude conditions.

These arguments would apply also to the spread of naturalised species, especially *H. pilosella,* introduced along with tussock species in any tussock revegetation programme for the upper valley road (see following discussion). I recommend that tussock revegetation be attempted, as adventive species will probably become established on the road at any rate and snowtussock cover may slow their spread.

Conservation issues

The Ryton Valley tussocklands are of considerable botanical, landscaping, and historical interest, as there is no other area of alpine grassland in the Craigieburn Range as extensive (C.J. Burrows, pers comm). The Ryton Valley road has already adversely affected the vegetation of the valley and has the potential to act as a route for the spread of naturalised plants.

Bulldozed materials from the road are likely to erode into the high altitude tarn sited by the road, disrupting its plant communities. Two small huts have been sited beside the tarn, and their use could affect the tarn.

Landscape values (Ashdown and Lucas, 1986) are also degraded by a highly visible track which zigzags across grassland areas. Furthermore, the road is likely to have disrupted scree plant communities, as scree plants are well developed in the Ryton Valley below.

This tussockland on flat terrain is apparently designated in the development plans as a parking area. It is likely that skifield development in the Ryton Valley would mean the end for this snowtussock grassland.

Skifield development may adversely affect the grasslands in other ways. Snow grooming compacts snow, which then takes longer to melt (Bayfield, 1970) and the snowtussock growing season may be shortened. Compaction from snowgrooming or parked vehicles may damage grassland plants.

Landcorp has claimed that the road was put in without permission ('The Press', 12 Aug 1987) and has stipulated that the road be removed above 5,000 ft (1,524m) by restoring original contours and revegetating with tussocks, and that the lower road should be taken out if no skifield is underway in three years time.

No arrangements have been made for supervising this revegetation project or providing botanical expertise and no deadline has been designated. The road is approved through the flat *Chionochloa macra* grassland (1390m), which is botanically interesting in that its intertussock community is diverse and its tussock cover high.

High altitude tussock revegetation programmes have been successfully carried out at Porters Pass, and at the Rastus Burn Skifield in Queenstown (Ashdown and Lucas, 1986), and in the Old Man Range (I Payton, pers. comm.).

Revegetation with subdivided mature tussocks is a feasible method by which the snowtussock grassland of the Ryton Valley may be partially restored

If the developers of the Ryton Valley are as 'environmentally sensitive' as they claim to be, they will be guided by the following quote: ***'Like a forest, tussock grassland is the product of a long, slow development. Like a forest, it is much easier to destroy than to rebuild.'*** (Moore, 1955).

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APPENDIX 1: Species at road sites

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Chionochloa macra	•		•		•	•	•	•	•	•			•	•
*Hieracium pilosella**	•				•									
Raoulia subsericea	•													
*Hieracium lepidulum**	•					•								
Polytrichum juniperinum	•				•		•	•						
Dracophyllum uniflorum	•													
Chionochloa flavescens	•		•											
Festuca matthewsii/F.novae-zelandiae	•		•		•									
Lichen (unidentified)	•	•			•	•								
Podocarpus nivalis	•	•	•											
Moss (unidentified)	•	•			•	•	•							
Anthoxanthum odoratum	•													
Carex wakatipu	•	•			•									
Celmisia spectabilis	•		•		•	•								
Poa kirkii	•													
Hymenanthera alpina		•												
Gentiana sp			•											
Asperula propinqua		•												
Rytidosperma setifolium				•		•								
Deyeuxia avenoides			•											
Gaultheria crassa			•											
Pimelea traversii			•											
Muehlenbeckia australis			•											
Colobanthus acicularis			•											
Senecio cassinioides		•												
Phyllocladus alpinus		•												
Coprosma atropurpurea					•									
Celmisia lyallii					•	•	•	•	•	•				
Leucopogon fraseri					•									
Luzula rufa			•		•									
Poa colensoi			•		•	•	•	•		•		•	•	•
Wahlenbergia albomarginata					•									
Koeleria cheesemanii					•									
Asperula perpusilla					•									
Cardamine debilis					•									
Acaena caesiiglauca					•									
Pimelea oreophila					•									
Luzula traversii					•									
*Hieracium praealtum**					•									
Senecio bellidioides					•									
Colobanthus strictus					•									
Brachycome sinclairii					•									
Luzula crinita					•	•								
Anisotome aromatica					•			•						
*Rumex acetosella**					•									
Euphrasia zelandica					•									
*Cerastium fontanum**					•									
*Cirsium arvense**					•									
*Hypochoeris radicata**					•									
*Juncus effusus**					•									
Poa buchananii						•								
Agrostis subulata					•									
Epilobium pycnostachyum						•								

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Celmisia viscosa						•	•	•	•	•	•	•	•	•
Aciphylla monroi						•	•							
Lycopodium fastigatum					•	•								
Anisotome imbricata						•				•				
Drapetes dieffenbachii						•								
Juncus novae-zelandiae					•									
Celmisia laricifolia						•								
Anisotome flexuosa			•		•	•								
Gaultheria depressa					•									
Epilobium atriplicifolium s.s.					•									
Chionochloa crassiuscula													•	
Chionochloa macra x *crassiuscula*									•				•	•
Chionochloa pallens							•	•			•			
Hebe lycopodioides							•							
Uncinia fuscovaginata								•						
Chionochloa macra x *oreophila*										•				
Celmisia haastii							•				•	•		
Dracophyllum pronum													•	•
Phyllachne colensoi													•	•
Chionochloa oreophylla														•

Key to sites:

1. *Festuca* sp tussocklands (1020-1070m)
2. *Podocarpus nivalis* (1140m) - scree
3. *Chionochloa flavescens* (1202m) - scree
4. Scree (1350m)
5. *Chionochloa macra* (1371-1380m) - flat
6. *Chionochloa macra* (1432-1451m)
7. *Chionochloa pallens* (1463m)
8. *Chionochloa macra* - *Ch. macra* x *crassiuscula* (1570-1590m)
9. *Chionochloa macra* - *Ch, macra* x *crassiuscula* (1618m) a.
10. *Chionochloa macra* - *Ch. macra* x *oreophila* (1650-1660m) b.
11. *Chionochloa pallens* (1667m)
12. Alpine herbfield (1695-1700m)
13. *Chionochloa macra* - *Ch. crassiuscula* (1730-1760m) c.
14. *Chionochloa macra* herbfield (1770m)