

**1992-93 Assessment and Reorganisation  
of the Tussock Flowering Line  
in Takahe Valley, Fiordland National Park**

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## 1. Summary

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- The tussock flowering transect line in Takahe Valley, Fiordland National Park was assessed by Manaaka Whenua - Landcare Research for the Department of Conservation on 22 March 1993.
- Over the 1992-93 summer minimal flowering (1%) occurred in *C. rubra* ssp. *cuprea*, while no flowering was present in other tall tussock species (*Chionochloa crassiuscula* ssp. *torta*, *C. rigida* ssp. *amara*, *C. teretifolia*, *C pallens* ssp. *cadens*).
- A new transect system was established to standardise the number of tussocks monitored per species (100), to provide a basis for assessing flowering intensity, to clarify the position of the lines, and to enable the accurate sampling of all the major tussocks in a single day in a heavy flowering year. The endangered species *Chionochloa spiralis* was added to the transect line.

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## 2. Introduction

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An improved system of monitoring flowering frequency and intensity of tall tussock species was established in Takahe Valley, Fiordland National Park, at the request of the Southland Conservancy, Department of Conservation.

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## 3. Background

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A permanent transect line was established in 1972-1973 in Takahe Valley, Fiordland, by Jim Mills and Alan Mark to monitor the annual frequency and intensity of flowering of five tall tussock species (*Chionochloa crassiuscula* ssp. *torta*, *C. rigida* ssp. *amara*, *C. pallens* ssp. *cadens*, *C. teretifolia*, *C rubra* ssp. *cuprea*). The main objective for establishing the transect was to record the periodic availability of seeds for the endangered takahe, and to assess the relationship between seed supply and reproductive success of the birds. The transect has been recorded annually for 20 years, usually in March or April.

The Takahe Recovery Group, established by the Department of Conservation in 1991 to provide co-ordinated implementation of the Takahe Recovery Plan, recommended that the monitoring of flowering of the major tall tussock species continue as the information was useful for assessment of annual variation of food resources available to the birds and for prediction of possible short-term increases in the stoat population.

Originally, two transects were located in the Takahe Valley headbasin above treeline and another along the valley floor below the lower treeline induced by cold air



drainage. To assess tussock flowering, a line was stretched between metal marker pegs and the number of flowering stems was counted and the species of all tall tussocks on or overlying the line were recorded.

The original design had several weaknesses. Firstly, the number of tussocks sampled of each species was not consistent, ranging from a low of approximately 100 (*Chionochloa crassiuscula* ssp. *torta*) to a high of over 375 (*C. rubra* ssp. *cuprea*). Also the numbers of tussocks of each species counted along the lines varied from year to year, mainly because the long distances between marker pegs meant the position of the tape varied. Secondly, the number of flowering tillers per tussock was used as an index of flowering intensity. This meant that to compare flowering intensity for different species it had to be assumed that they maintained tussocks of similar size, which is possible but unlikely. To calculate flowering intensity adequately, we need to know the total number of vegetative tillers available. Finally, in a heavy flowering year the large total number of tussocks along the length of the transects (>2000) would take two people at least several days to sample for information that could be more effectively obtained in a shorter period.

During the 1992-93 sampling we made changes to improve the effectiveness and efficiency of the tussock flowering transects.

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#### 4. Objectives

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- Shorten and permanently mark the tussock flowering transect lines to decrease possible sampling differences due to movement of the line.
- Standardise the number of tussocks sampled per species.
- Monitor the number of tillers per tussock in a representative subsample of tussocks of each species.
- Assess the number of flowering tillers on all tussocks on transects.

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#### 5. Methods

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We established a new set of transects in the Takahe Valley headbasin (in the vicinity of the original sampling line) in monospecific stands of each of the tall tussock species (*Chionochloa pallens* ssp. *cadens*, *C. crassiuscula* ssp. *torta*, *C. rigida* ssp. *amara* (informally called *C. flavescens* in the past), and *C. teretifolia*). *C. rubra* ssp. *cuprea* was sampled on the valley floor, and a new species (*C. spiralis*) restricted to limestone soils was added to the sampling programme, mainly because of its endangered status. This gave a total



of six transects, one for each species.

The upper end of each transect was marked with an aluminium or iron standard, and a red tag with the species name. Additional marker pegs were included where necessary to maintain an unambiguous line. All tussocks whose canopies lay along the line were assessed for number of flowering tillers.

A subsample of 10 individual tussocks per species, selected on a restricted randomisation basis, were numbered (electrician tags attached to bike spokes placed in the tussock centre) and ringed with nylon string to help identify the tussock in future sampling. The distance of each tussock along the transect was recorded and a numbered nursery label was attached to the string, which was secured near the ground with wire clips. For these 10 numbered tussocks all tillers were counted, as well as the number of flowering tillers, and the flowering intensity was calculated.

The transect was terminated with metal marker pegs after 100-110 tussocks were included, and the total transect length was recorded.

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## 6. Results

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### Flowering intensity

The location, tussock numbering and position, total tiller number and number of flowering tillers are given in the following tables for each species.

**Table 1** *Chionochloa crassiuscula* ssp. *torta*

Tussock Tag number	Distance from origin (m)	Total number of tillers	Number of flowering tillers
131	2.3	30	0
132	4.6	81	0
133	9.0	25	0
134	13.7	22	0
135	18.0	15	0
136	21.2	52	0
137	27.3	21	0
138	30.7	36	0
139	32.8	84	0
140	40.0	44	0

Location: True left of Takahe Valley headbasin on boggy area near lip of cirque.  
Total length of transect 43.0 m



**Table 2** *Chionochloa pallens* ssp. *cadens*

<b>Tussock Tag number</b>	<b>Distance from origin (m)</b>	<b>Total Number of tillers</b>	<b>Number of flowering tillers</b>
111	0	25	0
112	4.5	49	0
113	11.0	71	0
114	18.1	103	0
115	21.6	90	0
116	28.0	258	0
117	35.1	34	0
118	41.0	162	0
119	45.0	53	0
120	50.3	63	0

Location: True left of Takahe valley headbasin amongst dense *Chionochloa pallens* ssp. *cadens* on colluvial debris between small bluffs above *Chionochloa crassiuscula* ssp. *torta* transect.  
Total length of transect 108.7 m

**Table 3** *Chionochloa rigida* ssp. *amara*

<b>Tussock Tag number</b>	<b>Distance from origin (m)</b>	<b>Total Number of tillers</b>	<b>Number of flowering tillers</b>
21	7.9	439	0
22	15.4	138	0
23	25.4	190	0
24	36.3	109	0
25	40.4	109	0
26	48.5	52	0
27	55.5	90	0
28	65.1	218	0
29	74.0	38	0
30	86.2	297	0

Location: True right of Takahe Valley headbasin above and across the small bench along the eastern side of the cirque.  
Total length of transect 87.9 m



**Table 4** *C. teretifolia*

<b>Tussock Tag number</b>	<b>Distance from origin (m)</b>	<b>Total Number of tillers</b>	<b>Number of flowering tillers</b>
1	4.7	43	0
2	12.9	217	0
3	15.4	135	0
4	28.5	75	0
5	39.7	79	0
6	50.0	145	0
7	72.8	282	0
8	78.2	155	0
9	90.2	344	0
10	100.0	110	0

Location: Middle ridge in Takahe Valley headbasin, extending down over lip of cirque.  
Total length of transect 103.7 m

**Table 5** *Chionochloa rubra* ssp. *cuprea*

<b>Tussock Tag number</b>	<b>Distance from origin (m)</b>	<b>Total Number of tillers</b>	<b>Number of flowering tillers</b>
141	1.4	71	0
142	7.0	43	0
143	8.0	45	0
144	17.9	353	1
145	21.1	90	0
146	22.5	126	0
147	32.6	75	0
148	36.2	81	0
149	48.5	180	0
150	50.0	156	0

Location: Valley floor grassland on true left of valley running towards hut from big rock below M Basin.  
Total length of transect 54.6 m



**Table 6** *Chionochloa spiralis*

Tussock Tag number	Distance from origin (m)	Total Number of tillers	Number of flowering tillers
<b>Transect 1 (Down Valley)</b>			
41	5.0	366	0
42	9.7	188	0
43	19.0	100	0
44	22.4	152	0
45	28.5	62	0
Location: Across the flats from the Takahe Valley hut (true left of valley) on upper slopes below limestone bluffs. Total length of transect 37.7 m			
<b>Transect 2 (Up Valley)</b>			
46	0.3	325	0
47	9.5	158	0
48	13.1	158	0
49	16.5	137	0
50	21.4	174	0
Location: Across the flats from the Takahe Valley hut (true left of valley) on upper slopes below limestone bluffs. Total length of transect 30.4 m.			

Flowering over the 1992-93 summer was rare. Only one species *C. rubra* ssp. *cuprea*, had a single flowering tiller on one of the 10 monitored tussocks, representing a flowering intensity of 0.3%. None of the other tussock species had any flowering tillers.

Tussock sizes varied considerably between species, with mean tiller number per tussock increasing from *C. crassiuscula* ssp. *torta* (41), *C. pallens* ssp. *cadens* (91), *C. rubra* ssp. *cuprea* (122), *C. teretifolia* (159), *C. rigida* ssp. *amara* (168), to *C. spiralis* (182).





## Flowering frequency

One hundred individual tussocks per species were assessed for flowering. Only a single tussock of *C. rubra* ssp. *cuprea* had any flowering stems. A summary of the results is given below.

Summary of flowering frequency & intensity			
Species	Number of tussocks flowering	Flowering frequency (%)	Flowering intensity (%)
<i>C. pallens</i> ssp. <i>cadens</i>	1	1	0.3
<i>C. crassiuscula</i> ssp. <i>torta</i>	0	0	0
<i>C. rigida</i> ssp. <i>amara</i>	0	0	0
<i>C. rubra</i> ssp. <i>cuprea</i>	0	0	0
<i>C. spiralis</i>	0	0	0
<i>C. teretifolia</i>	0	0	0

## 7. Discussion

The 1992-93 summer produced minimal levels of flowering in *Chionochloa* species in Takahe Valley, continuing the pattern of the three summers since 1989-1990, when there was a moderate (30% tussock flowering frequency) flowering of tall tussock grasses. It is now 7 years since there was a heavy (>75% tussock flowering frequency) year in eastern Fiordland, and in 6 out of the last 10 summers there has been virtually no flowering. It is difficult to know what impact this may have had on the reproductive success of birds in Fiordland. Takahe feed near continuously on grass seed in summer when seeds are available, and the recent absence of heavy flowering years would have significantly diminished an important food resource.

## 8. Recommendation

Since we now have both long-term tussock flowering and takahe breeding information, priority should be given to investigating whether there is a causal relationship between the seed availability and the reproductive success of the birds. The results may account for recent fluctuations in population size.

The new tussock flowering transects should be monitored annually.

