Disclaimer: This document refers to Proposed Plan Change 5 to the Land and Water Regional Plan (Nutrient Management and Waitaki). All aspects of this Plan Change are currently under appeal. The final form of Plan Change 5 will not be known until all appeals are resolved.

Memo

Date	11 August 2017
To	Craig Davison
cc	Dan Clark, Lyn Carmichael, Zach Hill
From	Ogi Mojsilovic

Subject: Winter Forage under Plan Change 5 permitted activity rules

1 Introduction

I assessed what the Plan Change 5 (PC5) rules could mean for the scale of winter forage activity permitted within the proposed OTOP Freshwater Management Units (FMUs). Specifically, the initial problem is estimating the additional area that could be available for winter forage activities under the permitted activity rules.

The reported areas estimate the full potential for winter forage increases under the PC5 permitted activity rules. I have not assessed the likelihood of additional activities. For instance, I have not considered biophysical or economic factors that could mediate the full uptake of the permitted activity rule, such as farm sizes, agricultural enterprise types, availability of cattle stock, or any biophysical or economical limitation to viable crop yields.

1.1 Methodology

We first need to understand the existing winter forage land use, at a farm level, in order to estimate the potential for change. I relied on a 2016 classification of winter forage paddocks (North et al., 2017). The method achieved a high confidence in classifying winter forage brassica paddocks, reporting a 96% accuracy in identifying paddocks used for winter forage grazing within an independent validation dataset. In the absence of data discriminating between stock types, I assumed that all the paddocks were grazed by cattle stock. This aligns with the definition of “winter grazing” under Plan Change 5 to the Land and Water Regional Plan.

The winter forage classification data was combined with the farm boundary and irrigation layers, aggregated at the farm level, and then summarised at the FMU level. These represent the layers developed for the sub-regional technical work.

I allocated additional winter forage areas if properties satisfied the following conditions:

- Property size has to exceed 10 ha. Property size refers to the area contained within the FMUs, excluding the Department of Conservation estate.
- Area of irrigation is less than 50 ha (irrigated land threshold). This is because if the area of irrigation on a property exceeds 50 ha, the property is subject to its existing nitrogen loss limits, and any intensification of winter grazing could only be done within this limit. Again, this refers to the area of irrigation within the FMUs

File reference:

- The 2016 winter forage area is less than the maximum of 10 ha or 10 % of the property size, up to a total of 100 ha (winter forage threshold).

Provided all the conditions above are met, the additional winter forage is estimated as the difference between the permitted and the 2016 areas.

1.1.1 Assumptions

- I have not looked at any constraints in full realisation of the additional areas. For instance, forestry blocks were included as properties.
- I assumed that there are no existing consents for farming activities and that land within the modelled farm units is not leased.
- I filtered the winter forage layer to retain paddocks classified as kale, fodder beet, and other brassica winter forage. This excluded cereal forage, or other paddocks identified by Landcare as being grazed out in winter, but without confident crop-level classification.
- In absence of information enabling discrimination of stock, I assumed that all winter brassica crop paddocks were grazed by cattle.
- I allocated each property to a single FMU. In the permitted activity considerations, I excluded farm areas falling outside of the full extent of the proposed FMU.

1.2 Results

Table 1 breaks down the existing winter forage activity, as estimated from the 2016 Landcare Research classification, and the additional area of winter forage activity permitted by PC5. Figure 1 shows the spatial distribution of the 2016 winter forage classification.

Approximately 200 properties would require a consent because of the PC5 irrigated land threshold, while further 135 would require a consent because of the PC5 winter forage area threshold. Approximately 965 properties would meet the permitted activity conditions. The preceding estimated counts are rounded to the nearest 5. The following sections break these estimates down to the scale of individual FMUs.

1.2.1 Opihi FMU

- 60 properties would need a consent because of the irrigation threshold,
- 40 properties would need a consent because of the winter forage threshold,
- 250 properties would meet the permitted activity conditions, and be in a position to increase the area of winter forage activity. The PC5 would allow for additional 5,330 ha of winter forage under the permitted activity rule (Table 1).

1.2.2 Orari FMU

- 75 properties would need a consent because of the irrigation threshold,
- 10 properties would need a consent because of the winter forage threshold,
- 60 properties would meet the permitted activity conditions, and be in a position to increase the area of winter forage activity. PC5 would allow for additional 980 ha of winter forage under the permitted activity rule (Table 1).

1.2.3 Pareora FMU

- 20 properties would need a consent because of the irrigation threshold,
- 25 properties would need a consent because of the winter forage threshold,
- 170 properties would meet the permitted activity conditions, and be in a position to increase the area of winter forage activity. PC5 would allow for additional 2,760 ha of winter forage under the permitted activity rule (Table 1).

1.2.4 Temuka FMU

- 30 properties irrigation properties would need a consent because of the irrigation threshold,
- 40 properties would need a consent because of the winter forage threshold,
- 225 properties would meet the permitted activity conditions, and be in a position to increase the area of winter forage activity. PC5 would allow for additional 2,720 ha of winter forage under the permitted activity rule (Table 1).

1.2.5 Timaru FMU

- 15 properties irrigation properties would need a consent because of the irrigation threshold,
- 25 properties would need a consent because of the winter forage threshold,
- 260 properties would meet the permitted activity conditions, and be in a position to increase the area of winter forage activity. The PC5 would allow for additional 2,360 ha of winter forage under the permitted activity rule (Table 1).

A full uptake of the provisions in the PC5 permitted activity rules would be associated with large increases in winter forage activities. The PC5 permitted activity rule would allow for winter forage activities to increase by 40%, on average, for properties within the 100-500 ha range. For larger properties, those above 500 ha, a 75% average increase in winter forage areas would be permitted by the PC5 rules.

The Orari FMU is an exception, showing small increases allowed as permitted activities. Due to the existing distribution of irrigation, most of properties within Orari FMU would not meet the PC5 permitted activity conditions.

Within the Timaru FMU, the permitted expansion is predominantly allocated to properties less than 50 ha in size.

1.3 References

North, H. C., Belliss, S. E., & Pairman, D. (2017). *Winter livestock forage map: Canterbury region 2016*. Prepared for Environment Canterbury. Contract Report No. LC2742. Landcare Research.

Table 1. The estimates total and per-farm average areas of winter forage activities and the additional changes enabled under the Plan Change 5 permitted activity rules. Each property is allocated to a single freshwater management unit (FMU).

Freshwater Management Unit (FMU)	Farm Size bins	Farm Count	*FMU Sums (ha)*		*Farm Averages (ha)*	
			2016 Winter Forage	Additional Winter Forage permitted under PC5	2016 Winter Forage	Additional Winter Forage permitted under PC5
Opihi FMU	> 10 ha & <20 ha	37	20	350	0	10
	20-50 ha	48	90	400	2	8
	50-100 ha	33	140	160	4	5
	100-500 ha	154	2,770	1,210	18	8
	500-1000 ha	40	1,620	1,210	41	30
	>1000 ha	37	1,610	1,990	43	54
	All		6,250	5,330		
Orari FMU	> 10 ha & <20 ha	16	20	140	1	9
	20-50 ha	20	130	110	6	6
	50-100 ha	15	40	90	3	6
	100-500 ha	70	1,460	130	21	2
	500-1000 ha	12	730	0	61	0
	>1000 ha	15	900	500	60	33
	All		3,280	980		
Pareora FMU	> 10 ha & <20 ha	38	10	370	0	10
	20-50 ha	35	70	290	2	8
	50-100 ha	25	110	160	4	6
	100-500 ha	89	1,260	1,010	14	11
	500-1000 ha	15	860	490	57	33
	>1000 ha	8	350	440	44	55
	All		2,650	2,760		
Temuka FMU	> 10 ha & <20 ha	61	50	560	1	9
	20-50 ha	58	110	480	2	8
	50-100 ha	45	220	300	5	7
	100-500 ha	111	1,620	680	15	6
	500-1000 ha	9	300	250	34	28
	>1000 ha	7	270	450	39	65
	All		2,570	2,720		
Timaru FMU	> 10 ha & <20 ha	119	80	1,120	1	9
	20-50 ha	95	180	780	2	8
	50-100 ha	39	260	190	7	5
	100-500 ha	44	590	260	13	6
	500-1000 ha	4	260	10	66	3
	>1000 ha	0	0	0	0	0
	All		1,370	2,360		
All	All	1299	16,123	14,146	12	11

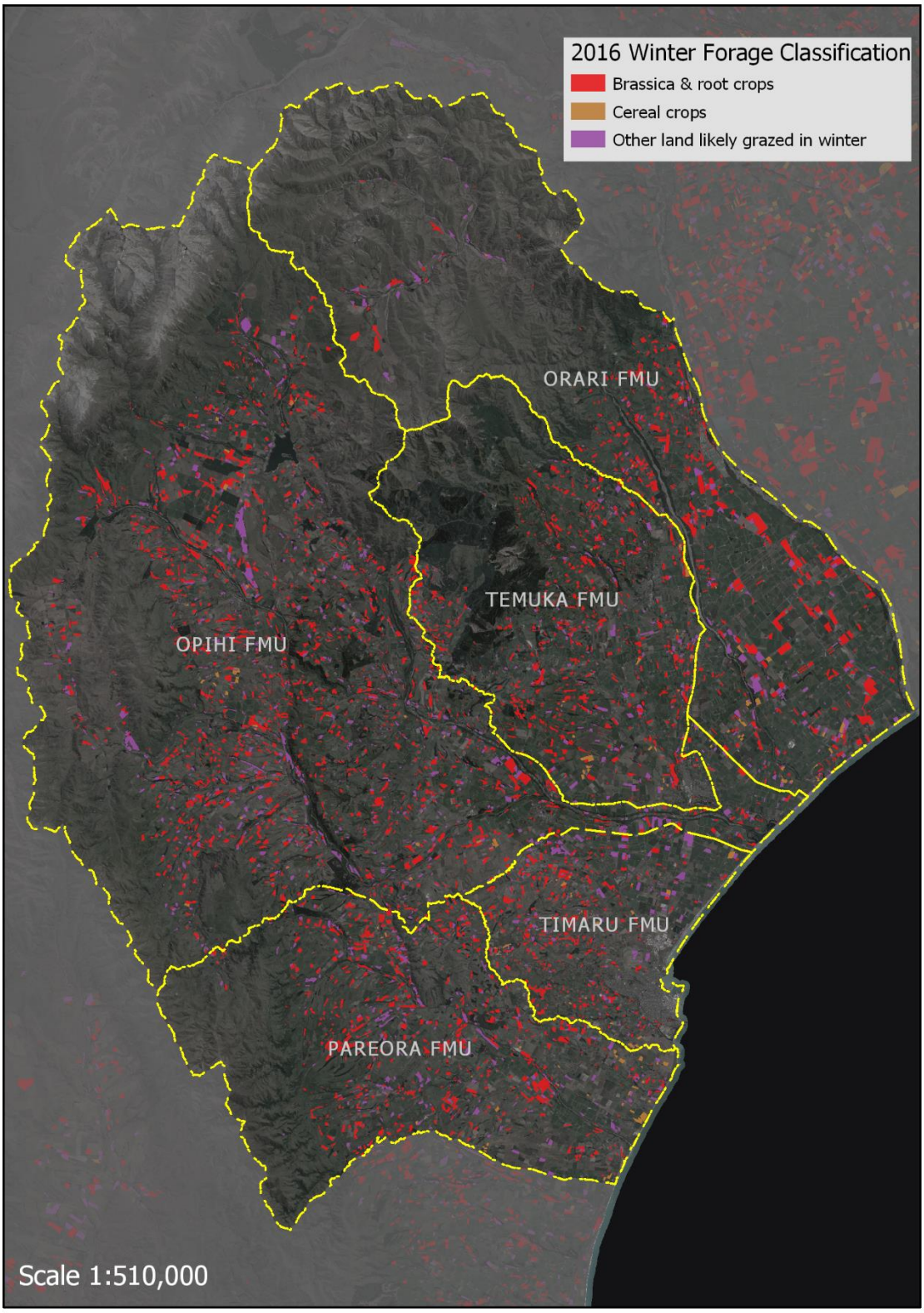

Figure 1. Spatial distribution of the winter forage activities estimated from the Landcare Research classification of the 2016 satellite imagery (North et al., 2017).