Pastures

on New England wool properties

Land, Water & Wool
Northern Tablelands
Project Fact Sheet
4
A technical guide

Introduction

Pastures are the engine room of every grazing property. As part of the Land, Water & Wool (LWW) Northern Tablelands Project (NSW), pasture composition was assessed in relation to land management and environmental factors on Monitor farms.

This Fact Sheet reports on the diversity of pasture types and pasture species on southern New England wool properties, and the relationships with soil type, grazing, fertiliser and cultivation.

Pasture diversity on Monitor farms

At least 219 plant 'taxa' (species and subspecies) in 52 families were recorded in pasture surveys. The most diverse families were the grasses (Poaceae, 26% of taxa), daisies (Asteraceae, 13%), legumes (Fabaceae, 9%), eucalypts and allies (Myrtaceae, 5%), wild carrot and pennywort relatives (Apiaceae, 3%), pinrushes (Juncaceae, 3%) and sedges (Cyperaceae, 2%).

At least 72% of taxa were perennial, and at least 18% were annual or biennial. Grasses (26%) and other herbs (56%) were more frequent in the species list than shrubs (11%) or trees (7%). About 68% of taxa were native; the remainder were introduced.

The most abundant pasture plants across the 107 sites were microlaena (average cover of 10% per site), poa tussock and redgrass (8% each), couch (5%), fescue (4%), Parramatta grass, native lovegrass and phalaris (3% each) and wallaby grass, crab grass, paddock lovegrass, hairy panic, Brazilian whitlow and flatweed (2% each).

Botanical nomenclature follows Harden G.J. (1993-2002) *Flora of New South Wales. Volumes 1-4.* New South Wales University Press, Sydney, and Wheeler D.J.B., Jacobs S.W.L. and Whalley R.D. B. (2002). *Grasses of New South Wales.* University of New England, Armidale, NSW.

Pasture types

Seven main pasture types were identified by classification analysis: six native pasture types and pastures dominated by sown species.

1. Redgrass - Parramatta grass - paddock lovegrass

Native and naturalised pastures dominated by redgrass, Parramatta grass and native lovegrasses were the most widespread pasture type and were found on all soil types (Table 1).

Minor species included hairy panic, phalaris, red lovegrass, poa tussock, wallaby grass and windmill grass, as well as crab grass, couch, flatweed and wiregrass (*Aristida personata*). Native species contributed 74% to pasture cover, on average.

All pastures of this type had been cleared in the past, almost all had been fertilised and were commercially grazed, and almost half the sites had reverted to native dominance after cultivation or a sown pasture phase (Table 2).

In 2004, 24 paddocks of this pasture type on Monitor farms ran 7.1 DSE/ha, with a sheep to cattle DSE ratio of 83% (Table 2).

2. Poa tussock

Native pastures dominated by poa tussock were generally found on high-nutrient or heavily fertilised soils at higher elevation (Table 2). Minor species were redgrass, wallaby grass, microlaena, white clover, Parramatta grass, native lovegrass and plantain, as well as flatweed, cudweed, spear thistle and couch (Table 1).

Native species comprised an average of 85% of the sward (Table 2). Most sites of this pasture type had been fertilised but never cultivated or sown to pasture. About half the sites occurred among scattered trees or denser timber, including occasional sites with planted trees.

Twelve paddocks of this pasture type ran 6.6 DSE/ha (78% sheep) in 2004.

Above—A redgrass-Parramatta grass naturalised pasture, with cocksfoot.

Above—A tussock poa pasture. Photo—Michael Taylor.

Above—A kangaroo grass-wild sorghum pasture. Inset—Kangaroo grass seed head.

3. Wild sorghum - kangaroo grass - poa tussock

A small number of sites on Monitor farms had herbaceous vegetation similar to that occurring prior to European settlement.

The dominant perennial grasses were wild sorghum, kangaroo grass, poa tussock and barbed wire grass. Minor species included native lovegrass, redgrass, native geranium, glycine (*Glycine tabacina*), slender sedge, common woodruff, wallaby grass, microlaena and Parramatta grass, as

Above and inset—Microlaena pastures.

Above—Timber with a bracken fern understorey.

Above—A couch pasture.

Above—A sown pasture.

Table 1. The average foliage cover (%) of the 29 most abundant species in each pasture type on Monitor farms in 2004. An asterisk indicates an introduced species. Pasture types: 1—redgrass-Parramatta grass; 2—poa tussock; 3—wild sorghum-kangaroo grass; 4—microlaena; 5—timber with various pasture dominants; 6—couch-microlaena; 7—sown pastures.

Common Name (*Latin Name*)	Pasture Type						
	1	2	3	4	5	6	7
Brazilian whitlow (*Paronychia brasiliana**)	2.2	0.8	0.3	2.4	0.3	2.7	0.6
Cocksfoot (*Dactylis glomerata**)	0.5	0	0	0.3	0	1.5	6.4
Couch (*Cynodon dactylon*)	3.2	1.1	0	0.7	0.1	33.0	3.4
Crab grass (*Eleusine tristachya**)	5.4	1.0	0	0.2	0	3.5	1.1
Cudweed (*Euchiton involucratum/sphaericum*)	1.1	1.3	0.8	0.9	0.3	0.7	0.7
Flatweed (*Hypochaeris glabra/radicata**)	2.1	1.9	2.0	1.4	0.8	1.8	1.1
Hairy panic (*Panicum effusum*)	6.0	0.9	0.8	0.3	0	0	0.5
Knob sedge (*Carex inversa*)	0.8	0.9	0	0.8	0.3	0.5	1.8
Meadow fescue (*Festuca pratensis**)	0.8	0	0	0.8	0	0	24.6
Microlaena (*Microlaena stipoides*)	1.3	3.1	1.3	36.8	4.3	14.4	1.5
Native geranium (*Geranium solanderi* var. *solanderi*)	0.2	0.8	3.0	1.4	0.8	0.7	0.5
Native lovegrass (*Eragrostis trachycarpa*)	6.3	1.5	6.5	1.0	0	0.4	2.3
Paddock lovegrass (*Eragrostis leptostachya*)	6.2	0.8	0.5	0.5	0.1	1.2	0.4
Parramatta grass (*Sporobolus creber*)	8.7	1.7	1.3	1.1	0.1	1.6	0.2
Paspalum (*Paspalum dilatatum**)	0.6	0.5	0	0.4	0.6	0.2	3.0
Phalaris (*Phalaris aquatica**)	2.4	0.4	0.5	0	0.1	0.7	14.3
Plantain (*Plantago lanceolata**)	0.3	1.4	0.3	0.4	0.5	1.6	6.3
Poa tussock (*Poa sieberiana*)	2.9	39.1	9.5	4.2	0.9	1.2	0.5
Rat's tail fescue (*Vulpia bromoides/muralis/myuros**)	2.2	0.3	0	0.1	0	0.1	0.1
Red lovegrass (*Eragrostis* sp. A*)	3.2	0.7	0	0.7	0	0.1	0.4
Redgrass (*Bothriochloa macra*)	17.8	7.9	3.3	4.2	0.5	1.8	0.8
Slender sedge (*Fimbristylis dichotoma*)	2.1	0.4	1.4	0.6	0.1	0.4	0.1
Sorrel (*Acetosella vulgaris**)	0.8	0.1	0.3	0.5	0.3	2.6	0.3
Spear thistle (*Cirsium vulgare**)	0.4	1.1	0.5	0.8	0.5	1.5	0.8
Wallaby grass (*Austrodanthonia racemosa* var. *racemosa*)	2.3	4.3	1.3	2.5	3.8	0.9	0.9
White clover (*Trifolium repens**)	0.9	2.0	0.6	0.8	0.1	0.4	2.1
Wild sorghum (*Sorghum leiocladum*)	0.6	0.8	23.8	0.5	0.1	0	0
Windmill grass (*Chloris truncata*)	1.6	1.0	0.1	0.1	0	0.3	1.0
Wood sorrel (*Oxalis exilis*)	0.9	0.8	0.5	0.9	0.7	0.7	0.5

well as flatweed and wiregrass. Native species contributed almost all the herbaceous cover (93%).

Although all four sites had been fertilised and two were grazed, none had been cultivated (Table 2). Monitor woolgrowers on two farms had recognised the special quality of the vegetation and were managing the remnant vegetation associated with this pasture type for conservation in small reserves.

4. Microlaena

Grazed native pastures amongst timber were generally dominated by microlaena, and occurred on all soil types. Minor species included redgrass, poa tussock, wallaby grass, slender tick-trefoil (*Desmodium varians*), glycine, native geranium, pennywort (*Hydrocotyle laxiflora*), Parramatta grass and native lovegrass, as well as Brazilian whitlow, kidney weed and flatweed (Table 1).

Pasture cover was dominated by natives (87%) (Table 2). Microlaena-dominated pastures had generally been fertilised

but not cultivated, and in a couple of sites, the tree cover was planted. Occasionally, this pasture type occurred away from trees.

Microlaena pastures carried 6.0 DSE/ha (85% sheep) on Monitor farms in 2004.

5. Timber with various pasture dominants

A few timbered sites and tree plantings were characterised by a range of dominant grasses or ferns which varied from site to site, as well as generally low amounts of microlaena and wallaby grass (Table 1).

Dominant plants in different sites included wallaby grass, brome (*Bromus brevis*), kidney weed (*Dichondra repens*), berry saltbush (*Einadia hastata*), bracken (*Pteridium esculentum*), wiregrass, three-awn speargrass (*Aristida vagans*), blady grass (*Imperata cylindrica*), peach heath (*Lissanthe strigosa*) and spiny-headed mat-rush (*Lomandra longifolia*).

These sites were generally only lightly stocked, if they were grazed at all (Table 2).

6. Couch - microlaena

Native pastures dominated by couch and microlaena were found on all soil types. Perennial rye grass (*Lolium perenne*), smooth brome (*Bromus racemosus*) and weeds such as Brazilian whitlow and sorrel were sometimes more abundant than the couch or microlaena (Table 1).

Minor species included crab grass, redgrass, plantain, Parramatta grass, poa tussock, paddock lovegrass and strawberry clover, as well as flatweed and spear thistle.

Pastures with a substantial amount of couch occurred in smaller fertilised paddocks, often amongst scattered timber. About a third of such sites had been cultivated or sown to pasture in the past.

Couch-microlaena pastures ran 6.7 DSE/ha (82% sheep) in 2004.

7. Sown pasture

Sown pastures were dominated by meadow fescue, phalaris, cocksfoot and plantain. Minor species included paspalum, chicory, native lovegrass, white clover, knob sedge, microlaena and windmill grass, as well as couch, crab grass and flatweed (Table 1). The cover of native species was only 22%.

Fertilised sown pastures were mostly sampled on basalt and trap soils, and had sometimes regenerated in windbreaks of planted trees as well as being sown in paddocks. Grazed sown pastures carried an average of 8.4 DSE/ha (66% sheep) in 2004 (Table 2).

Table 2. Attributes of the main pasture types on Monitor farms in southern New England. Values are percentages or averages of all sites in each pasture type. n.d. = no data. Pasture types as in Table 1. Two sites (with little or no pasture beneath dense trees) were excluded.

Pasture Attributes		Pasture Type						
		1	2	3	4	5	6	7
No. of sites		31	16	4	21	8	11	14
Soil type	Basalt	23%	63%	25%	14%	13%	36%	71%
	Trap	48%	38%	50%	52%	38%	36%	21%
	Granite	29%	0%	25%	33%	50%	27%	7%
Previously cultivated or sown to pasture		42%	13%	0%	14%	13%	36%	100%
Fertilised		94%	88%	100%	86%	63%	100%	100%
Commercially grazed		97%	88%	50%	90%	50%	82%	57%
Tree cover	No trees	94%	56%	25%	10%	0%	18%	50%
	Scattered trees	3%	19%	50%	29%	0%	45%	0%
	Woodland/forest	0%	19%	25%	52%	50%	9%	0%
	Planted trees	3%	6%	0%	10%	50%	27%	50%
Species richness	Native	16.9	20.9	23.5	19.8	15.9	12.9	8.3
	Introduced	8.1	8.9	6.5	6.9	5.0	10.4	11.2
Native species (%)		68%	71%	77%	74%	73%	55%	41%
Cover of native species (%)		74%	85%	93%	87%	71%	69%	22%
Available phosphorus (Bray, mg/kg)		26	52	28	33	65	45	32
Organic carbon (%)		2.7	4.8	3.6	4.7	3.1	5.0	3.2
Altitude (m)		1072	1131	1059	1093	1036	1105	1113
Paddock area (ha)		34	31	12	45	45	19	9
Stocking rate (DSE/ha)		7.1	6.6	n.d.	6.0	3.0	6.7	8.4
Wool yield (kg/ha)		14.2	13.0	n.d.	9.2	10.3	12.8	11.1
Sheep stocking rate (DSE/ha)		5.9	5.2	n.d.	5.1	2.7	5.5	5.5
Cattle stocking rate (DSE/ha)		1.2	1.5	n.d.	0.9	0.3	1.2	2.9
Percentage sheep		83%	78%	n.d.	85%	90%	82%	66%
No. of grazed sites with production data		23	12	n.d.	13	3	7	5

Measuring pastures and production

One hundred and seven paddocks were sampled on 22 Monitor farms in southern New England between 15 March and 3 May 2004. Paddocks were stratified by soil type, cultivation history, grazing management and tree cover (natural and planted).

Soil types were basalt, granite and metamorphosed sediment ('trap'). Cultivation types consisted of sown pasture, formerly sown pasture that had reverted to naturalised (native-dominated) pasture, and never-cultivated native pasture. Grazing management consisted of continuously grazed, long rotation, short rotation and ungrazed. Tree cover consisted of no trees, scattered mature native trees, unthinned woodland or open-forest, and planted tree cover (windbreaks and block plantings).

The experimental design was unbalanced because some combinations of these variables did not occur on farms (e.g. long-ungrazed sown pastures) or were more common than others. For instance, there was more sown pasture on basalt and more native pasture on granite and trap soils. Fertiliser history of each site was recorded.

A 6 x 5 m site was selected in each paddock that was representative of the majority of pasture in the paddock. All vascular plant species in the quadrat were recorded and the projected plant foliage cover of each species in the quadrat was estimated.

Woolgrowers measured livestock production (principally cattle and sheep) in all paddocks on Monitor farms throughout 2004. Stocking rate was measured as number of DSE multiplied by number of days in paddock divided by paddock area. Stocking rate per pasture type was the average stocking rate for paddocks of a given pasture type. Wool yield per paddock was calculated by taking woolgrowers' allocation of the 2004 wool yield per flock and distributing it among paddocks, based on the time spent by each flock in a given paddock.

Pasture-environment relationships

Pasture sites were stratified by soil type, cultivation history, grazing and tree cover. Dominant pasture species responded differently to environmental and land use factors.

Effect of tree cover and sown pasture development

Total pasture cover was higher away from trees than in dense tree cover (timber and planted trees) (Table 3), due to overstorey competition.

The cover of native species was greatest in native pastures and amongst trees, intermediate in naturalised (sown-reverted) pastures and beneath planted trees, and least in sown pastures (Table 3). Conversely, the cover of introduced herbaceous species was greatest in sown pastures, intermediate in naturalised pastures and planted trees, and least in native pasture and timber.

The number of native and introduced species in pastures showed similar patterns to cover (Table 3).

Pasture plants responded differently to the various environmental influences (Table 4). Winter-active sown species such as fescue, phalaris, cocksfoot, plantain and white clover were dominant in sown pastures, but some of these species were also common in tree plantings previously sown to pasture.

Grazed native pastures that had never been cultivated were dominated by summer-growing, grazing-tolerant natives, including redgrass, poa tussock, Parramatta grass, paddock and native lovegrasses, and hairy panic.

Sown pastures that had reverted to native dominance (naturalised pastures) contained a broad mix of both the winter-active sown and summer-growing native species.

Native timber was dominated by microlaena, poa tussock and wallaby grass.

Couch was found in most environments. It was associated with heavily grazed sheep pastures on acid soils with low numbers of native species. Crab grass was associated with couch in these situations away from trees, particularly in naturalised pastures.

Table 3. The mean cover and species richness of native and introduced herbaceous species in various environments on 22 Monitor wool properties in southern New England, March-May 2004. Values in each row with a different superscript differ significantly (ANOVA, LSD, P < 0.05).

	Sown Pasture	Natural-ised Pasture	Native Pasture	Scatter-ed Trees	Grazed Timber	Remnant Timber	Tree Plantings
No. of sites	7	14	29	14	15	7	21
Total cover (%)	95 ^{a,b}	101 ^{a}	100 ^{a}	95 ^{a}	79 ^{c}	79 ^{b,c}	75 ^{c}
Native cover (%)	20 ^{a}	61 ^{c}	81 ^{d}	76 ^{d}	69 ^{c}	75 ^{c,d}	38 ^{b}
Introduced cover (%)	75 ^{a}	40 ^{b}	19 ^{c}	19 ^{c}	10 ^{c}	4 ^{c}	36 ^{b}
Total species richness	22 ^{a,b}	26 ^{a}	26 ^{a}	28 ^{a}	25 ^{a}	27 ^{a}	20 ^{b}
No. of native species	8 ^{a}	15 ^{b}	18 ^{c}	20 ^{c,d}	20 ^{c,d}	23 ^{d}	12 ^{a,b}
No. of introduced species	14 ^{a}	11 ^{b}	8 ^{c}	9 ^{b,c}	5 ^{d}	4 ^{d}	8 ^{b,c}

Effect of soil type

Effects of soil type and grazing management were examined within particular environmental units.

In native pastures, the number of introduced species was greater on basalt than other soil types (Table 5). Paddock lovegrass, Parramatta grass and hairy panic were more abundant on granite than basalt soils, whereas poa tussock and phalaris showed the reverse pattern. Redgrass was marginally more abundant on trap than granite, and wood sorrel was marginally more common on trap than basalt soils.

In native timber, the cover and number of introduced herb species were marginally greater on basalt soils than trap or granite, probably due to the fertility of such sites (Table 5).

Poa tussock was more abundant on basalt and trap soils than granite, while redgrass was marginally more abundant on trap than granite soils.

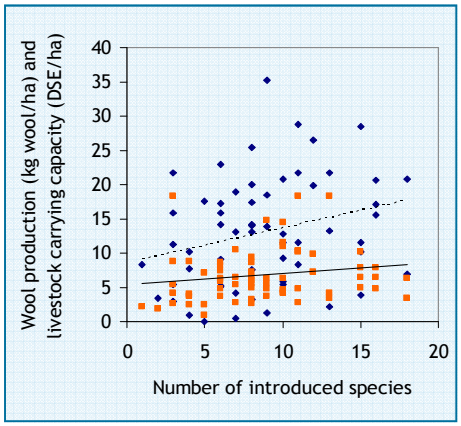


Figure 1. The relationships between wool production (◇) and livestock (sheep and cattle) carrying capacity (□) and the number of introduced species in pastures in 59 and 65 paddocks, respectively, on Monitor farms in 2004. Both linear regressions were significant (P < 0.05).

Relationships between pastures and wool production

Livestock production and soil type

In both native and timbered pastures, various livestock production measurements were higher on basalt and sometimes trap soils than on granite soils. However, this was probably partly due to rainfall, since more granite soils were sampled at lower altitude in the west of the study area, and more basalt soils were surveyed at higher altitude in the east. (Rainfall declines from east to west across the region.)

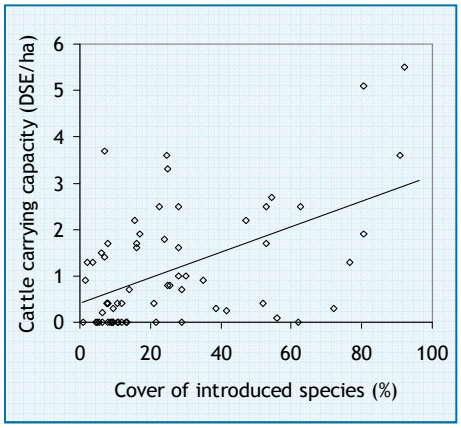


Figure 2. The relationship between cattle carrying capacity and cover of introduced pasture species in 66 Monitor farm paddocks in 2004. The regression was significant (P < 0.05).

For native pastures, wool production was higher on basalt than granite soils, sheep stocking rates were higher on traprock pastures than granite, and overall stocking rates were marginally higher on basalt and trap soils than granite (Table 5).

For timbered pastures, sheep stocking rate was higher on basalt than granite soils. Overall stocking rate (sheep and cattle) and wool production were also marginally higher on basalt than granite soils (Table 5).

Introduced pasture cover and species richness

Livestock production was significantly related to measurements of the introduced pasture component.

Total livestock carrying capacity (sheep and cattle) and wool production were positively correlated with number of introduced pasture species in 2004 (Fig. 1). Cattle carrying capacity was also correlated with the cover of introduced pasture species (Fig. 2).

There were no significant relationships between native pasture cover or number of native species and sheep or cattle production.

Individual pasture species and production

Several dominant pasture species were significantly correlated with livestock production measures on Monitor farms.

Wool production was a positive function of the amount of redgrass, phalaris, native lovegrass and crab grass in pastures, but declined with a high amount of Parramatta grass.

Livestock (sheep and cattle) stocking rate was a positive function of the amount of phalaris, white clover and redgrass, but was negatively related to the abundance of Parramatta grass.

Sheep stocking rate was positively related to phalaris and redgrass, but negatively related to Parrramatta grass. Cattle stocking rate was positively related to fescue.

The negative relationships with Parramatta grass were probably due to the increased abundance of Parramatta grass on granite soils and reduced rainfall and therefore lower stocking rates in the west of the region.

Original vegetation

In surveys of Monitor farms, only 4% of 107 pasture plots consisted of the original groundstorey vegetation of the region—kangaroo grass, native sorghum and tussock poa. The original grassy vegetation of the region contains a range of grazing-sensitive daisies, lilies,

Table 4. The average cover (%) of dominant pasture plants in different environments on Monitor farms. Plant species are ranked in terms of their contribution to sown pasture. Shading indicates pasture species contributing > 1.5% cover, on average, in different farm environments.

	Sown Pasture	Natural-ised Pasture	Native Pasture	Scattered Trees	Grazed Timber	Remnant Timber	Tree Plantings
Meadow fescue*	16.0	1.9	0.0	0.1	1.1	0.0	11.1
Phalaris*	15.3	4.9	0.5	0.2	0.0	0.0	5.2
Cocksfoot*	7.1	1.0	0.2	0.9	0.1	0.0	2.1
Plantain*	6.3	3.1	0.5	1.7	0.3	0.9	0.8
Couch	4.3	5.2	4.4	8.6	3.9	0.0	6.9
White clover*	3.6	2.4	1.2	0.5	0.6	0.1	0.2
Native lovegrass	3.1	6.5	3.7	2.3	0.2	0.9	2.0
Crab grass*	2.4	5.5	3.7	1.2	0.0	0.3	1.0
Wallaby grass	1.3	1.6	2.4	3.9	2.7	1.2	2.1
Redgrass	1.0	13.9	16.3	4.4	1.7	2.1	1.9
Hairy panic	0.7	4.0	4.6	1.0	0.1	0.4	0.2
Paddock lovegrass	0.7	3.5	5.4	0.9	0.2	0.1	0.6
Parramatta grass	0.4	4.5	7.4	3.0	0.4	1.6	0.4
Poa tussock	0.3	7.0	13.9	9.0	5.6	12.6	3.3
Microlaena	0.1	0.5	2.9	21.1	24.7	15.0	10.5

Table 5. The mean cover and species richness of pasture species on different soil types on 22 Monitor wool properties in southern New England, March-May 2004. Values in each row with a different superscript differ significantly (ANOVA, LSD, P < 0.05).

Pasture Attributes	Basalt	'Trap'	Granite
Native (uncultivated pastures)			
No. of sites	*11*	*10*	*8*
No. of introduced species	10.4 [a]	6.7 [b]	7.4 [b]
No. of native species	17.2 [a]	18.4 [a]	18.8 [a]
Hairy panic cover (%)	0.6 [a]	3.1 [a,b]	11.9 [b]
Paddock lovegrass (%)	1.1 [a]	4.9 [a,b]	11.9 [b]
Parramatta grass cover (%)	1.1 [a]	8.6 [a,b]	14.4 [b]
Phalaris cover (%)	1.3 [a]	0.0 [b]	0.0 [b]
Poa tussock cover (%)	26.1 [a]	9.7 [b]	2.5 [b]
Redgrass cover (%)	15.5 [a,b]	23.3 [a]	8.9 [a]
Wood sorrel cover (%)	0.6 [a]	1.3 [b]	0.9 [a,b]
Wooded native pastures			
No. of sites	*4*	*18*	*13*
No. of introduced species	10.3 [a]	5.4 [b]	6.6 [b]
No. of native species	20.3 [a]	20.3 [a]	20.2 [a]
Cocksfoot cover (%)	2.5 [a]	0.1 [b]	0.2 [b]
Fescue cover (%)	3.8 [a]	0.0 [b]	0.2 [b]
Poa tussock cover (%)	21.3 [a]	10.1 [a,b]	2.4 [b]
Redgrass cover (%)	3.0 [a,b]	4.2 [a]	1.1 [b]

Table 6. Plant species that were more frequent in relatively unmodified, little grazed vegetation plots on Monitor farms. These species indicate high conservation value vegetation and may be grazing-sensitive.

Barbed wire grass (*Cymbopogon refractus*)
Common woodruff (*Asperula conferta*)
Cotton fireweed (*Senecio quadridentatus*)
Eucalypt seedlings and suckers
Fern-leaved wattle (*Acacia filicifolia*)
Fine-leaved poranthera (*Poranthera microphylla*)
Flax lily (*Dianella longifolia*)
Forest hedgehog grass (*Echinopogon ovatus*)
Hairy speedwell (*Veronica calycina*)
Kangaroo grass (*Themeda australis*)
Mat-rush (*Lomandra* species)
Narrow-leaved rice flower (*Pimelea linifolia* subsp. *linifolia*)
Native acaena (*Acaena agnipila*/*ovina*)
Native bindweed (*Convolvulus erubescens*)
Native bluebell (*Wahlenbergia luteola*)
Native clover (*Lespedeza juncea* subsp. *sericea*)
Native glycines (*Glycine clandestina* and *G. tabacina*)
Slender sedge (*Fimbristylis dichotoma*)
Slender tick-trefoil (*Desmodium varians*)
Small St John's wort (*Hypericum gramineum*)
Stinking pennywort (*Hydrocotyle laxiflora*)
Urn heath (*Melichrus urceolatus*)
Wallaby grass (*Austrodanthonia racemosa* vars *racemosa* and *obtusata*)
Wild sorghum (*Sorghum leiocladum*)
Yellow buttons or common everlasting (*Chrysocephalum apiculatum*)

legumes and orchids that don't survive in intensively managed pastures.

Indicator species of the original grassy vegetation that were more frequent in unmodified and little grazed plots on Monitor farms are shown in Table 6. These species are likely to be grazing-sensitive.

Conclusions

Three native pasture types, redgrass-Parramatta grass in open pasture, poa tussock on more fertile soils at higher elevation, and microlaena in timbered areas, are particularly important for wool production in southern New England. Redgrass cover was related to several livestock production measures.

Couch-microlaena pastures are important and carry high sheep numbers. However, the acid soils on which these pastures occur are a concern, while the prostrate growth form of the dominant species (couch, microlaena and crab grass) and the low number of species indicate heavy grazing.

Pastures dominated by winter-active sown species such as phalaris, cocksfoot, fescue and white clover, carried the highest average stocking rates. The ratio of cattle to sheep was higher on sown pastures than on pastures dominated by natives.

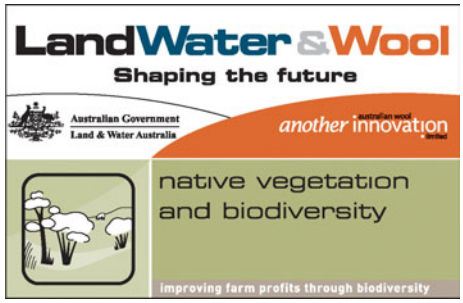
Sown pastures that have reverted to native dominance (naturalised pastures) are characterised by winter-active sown grasses and legumes and summer-active, grazing-tolerant native grasses. Such pastures provide forage in both summer and winter.

Above—Sheep grazing on native pasture.

The retention of native timber is important for pastures dominated by the yearlong green native, microlaena. In areas, where native timber has succumbed to dieback, tree plantings that favour both microlaena and improved pasture grasses may provide the dual benefit of shade and shelter as well as year-round forage production.

The original grassy vegetation dominated by kangaroo grass and wild sorghum is now uncommon on southern New England wool properties. The pasture type is threatened by cultivation, fertiliser and grazing at the district stocking rate, at least on trap and granite soils.

Some woolgrowers have fenced off small patches of kangaroo grass and wild sorghum and the original flora that they harbour as a conservation initiative. This is to be encouraged if representative stands are to be retained across the region.



Land, Water & Wool (LWW) is the most comprehensive natural resource management research and development program ever undertaken for the Australian wool industry. LWW is a partnership between Australian Wool Innovation Limited and Land & Water Australia, and has seven core sub-programs. The Native Vegetation and Biodiversity sub-program is working with woolgrowers and demonstrating that biodiversity has a range of values, can add wealth to the farm business and can be managed as part of a productive and profitable commercial wool enterprise.

The Land, Water & Wool Northern Tablelands Project is led by Associate Professor Nick Reid, University of New England, in collaboration with Southern New England Landcare Ltd, and the Centre for Agricultural and Regional Economics.

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