

Perennial pasture nutrition trials

WMG crop updates

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Background

- Part of “Transforming the northern sandplain project”
- Designed to determine the nutrient status of perennial pastures in the West Midlands region and ultimately, the fertiliser requirements
- Extensive experience in developing fertiliser recommendation systems for annual crops and pastures

The process

1. Current fertiliser practices and on what are they based?
2. Survey the nutrient status of the pastures using soil and tissue analyses
3. Determine if pastures are responsive to fertiliser and if so, which nutrients are deficient?
4. Develop a fertiliser recommendation system for perennial pastures in the region, or better, adjust existing recommendation systems to serve this industry

1. Current fertilising practices

We have NOT determined what current fertilising practices – except growers tend to believe they can use less fertiliser on perennial pastures than on crops and annual pastures because of more efficient use of fertiliser inputs and better recycling of nutrients from depth

2. Surveying soil and plant nutrient status

- Rather than survey by examining growers' historic soil and tissue test levels and referring them to text book critical levels we decided to lay out a set of “nutrient adequate” strips on perennial pastures.
- Can then measure the soil and species nutrient status. Also, if the strips show significant responses to the fertiliser, we can diagnose which nutrients are deficient for which species

2. Surveying soil and plant nutrient status - continued

- Process is analogous to how I have used responses to windrow residues to diagnose nutrient deficiencies. (Could possibly use the same method for on and off dung and urine patches if they are obvious in ungrazed pastures)
- A direct comparison of nutrient levels in tissue for species on and off the strips is a far better method of diagnosis than referring tissue or soil levels to standard critical levels in text books – provided you have a significant, positive growth response (>15% increase)

Wheat crop, Varley 2000

Showing 1998 frosted wheat crop windrows
a phosphorus or potassium response?

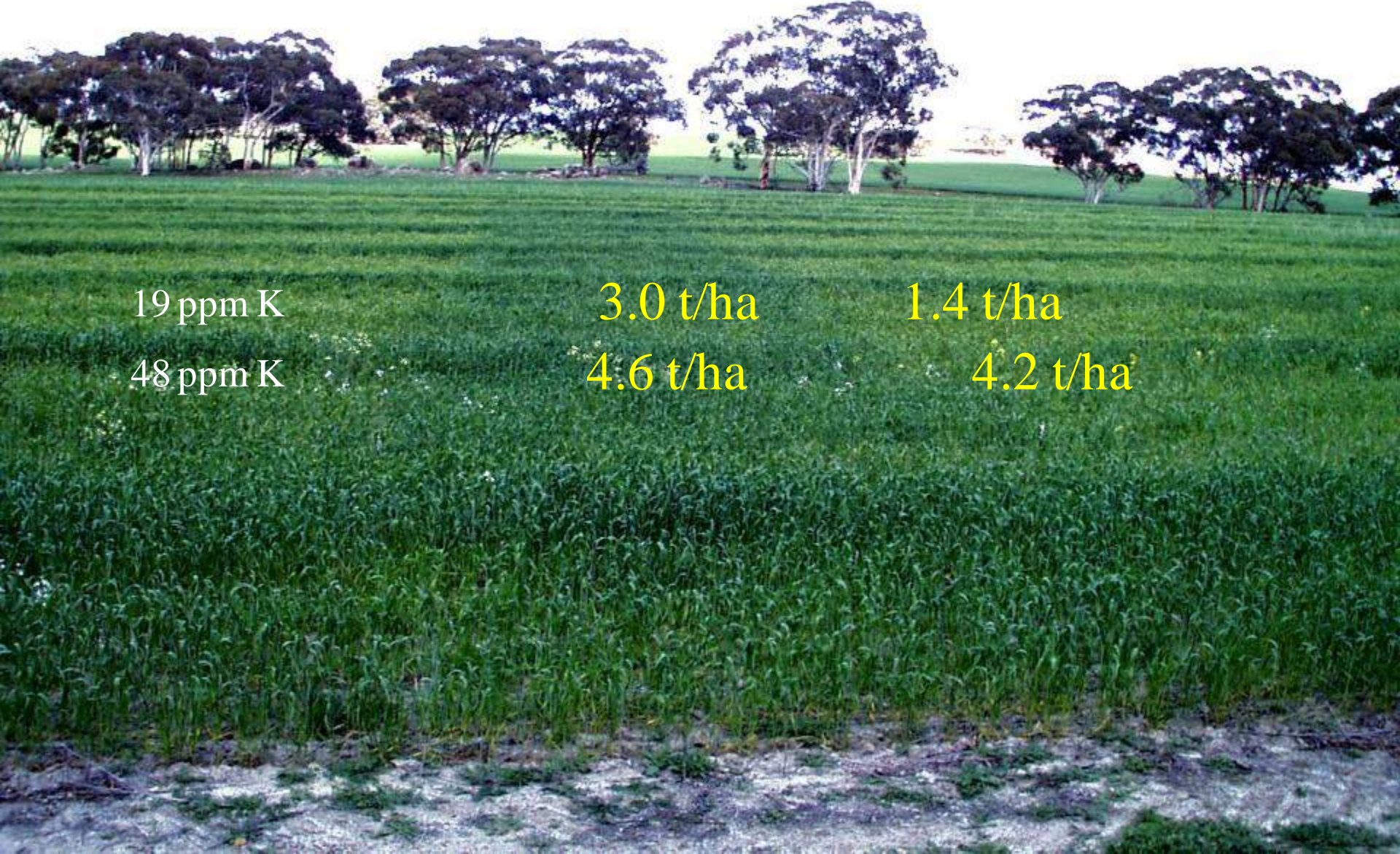


Walebing, barley 2000
an aluminium toxicity upsetting NKK and TE nutrition?



Hardie, Walebing, 3 September 2001

Wheat after canola, K strip applied 31 July 2001



19 ppm K

3.0 t/ha

1.4 t/ha

48 ppm K

4.6 t/ha

4.2 t/ha

Examples of the diagnostic method

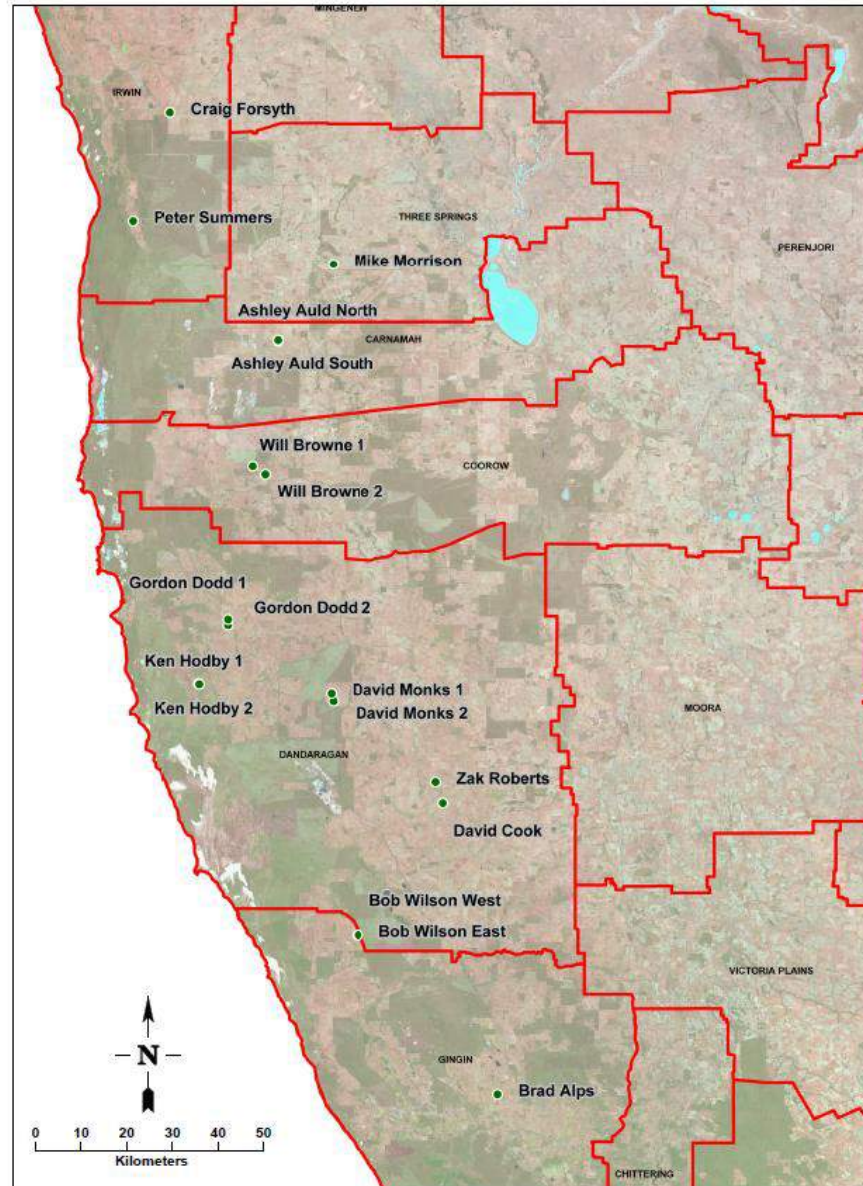
	bowran on strip	bowran off strip	romily on strip	romily off strip
weigh per /plant	0.49	0.18	1.95	0.95
NITROGEN	4.40	4.90	1.64	1.15
PHOS	0.37	0.44	0.19	0.13
POTASSIUM	2.46	1.50	1.97	1.48
SULPHUR	0.33	0.39	0.14	0.11
SODIUM	0.11	0.14	0.66	0.45
CALCIUM	0.53	0.62	0.26	0.27
MAGNESIUM	0.33	0.43	0.16	0.13
COPPER	5.37	6.25	2.50	2.19
ZINC	29	38	7	8
MANGANESE	158	191	56	29
IRON	256	451	82	117
BORON	4.8	5.8	4.4	3.4
Conclude	K deficiency		root problems	

Results to date

- 0-10cm soil samples taken from all sites
- Fertiliser strips (200kg/ha DAPSZC plus 100 kg/ha MOP) applied at all sites. Follow up 100 kg urea/ha topdressed at each sampling date
- Tissue samples by species – on and off fertilised area at some sites
- Problem has been to get responsive situations and this requires having a spell from grazing. We thought we could time our sampling to achieve this without cages or fences – but rarely so

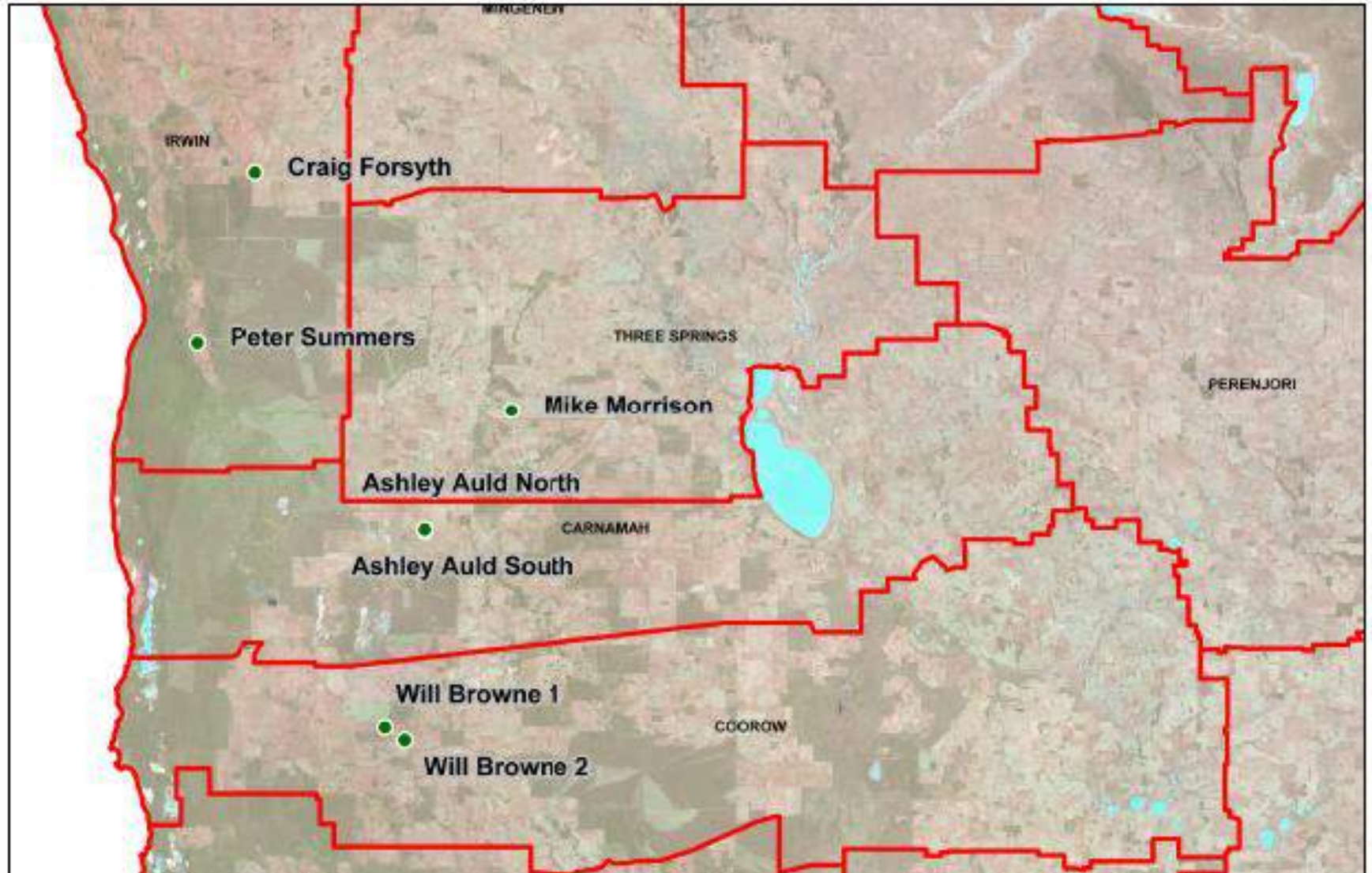
Where are the strips?

2013 Fertiliser strips on subtropical pastures

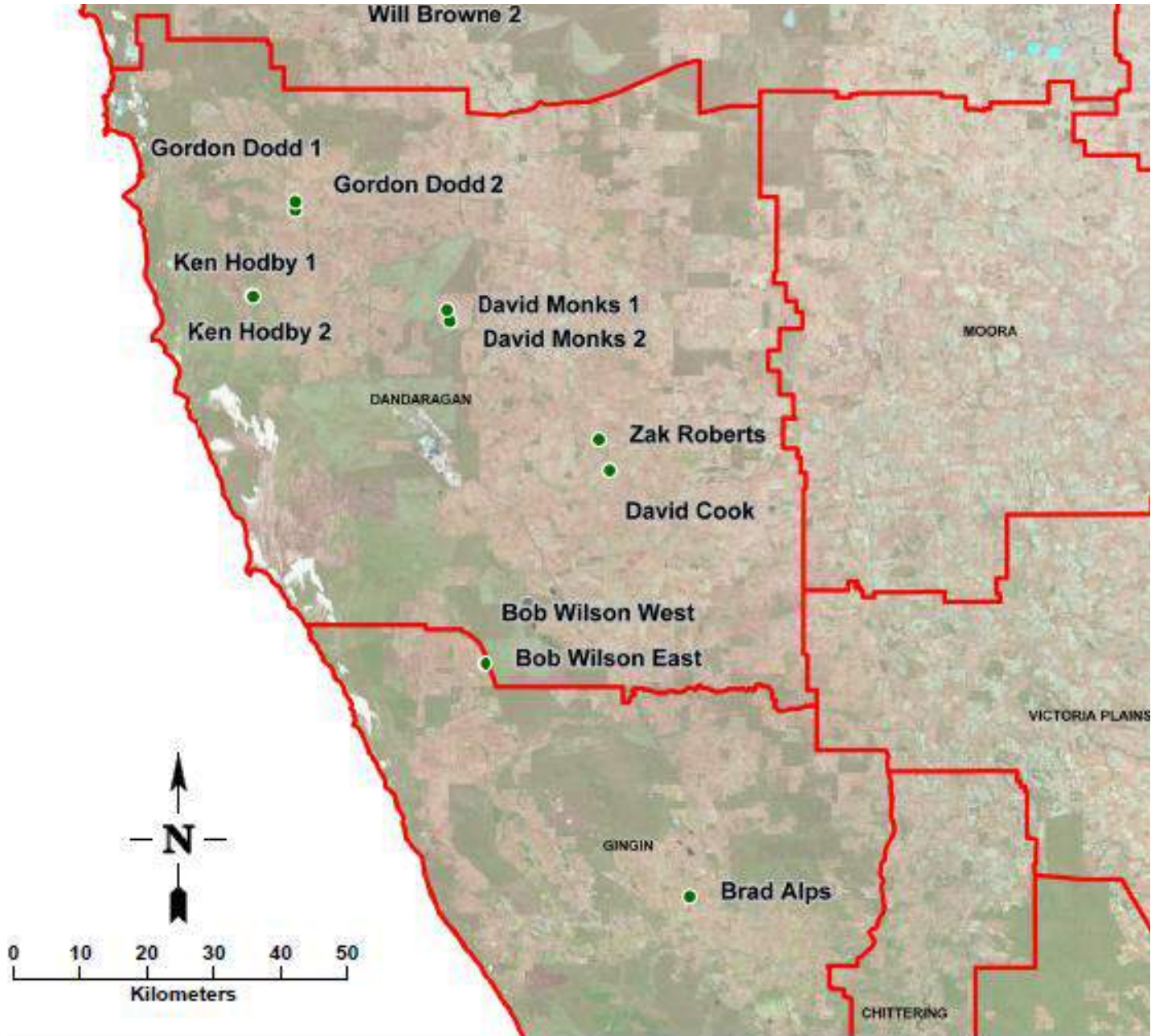


Where are the strips - north?

2013 Fertiliser strips on subtropical pastures



Where are the strips - south?



Zac Robert's strip

September



February



Which nutrients are deficient?

comparisons with critical levels

Zac Roberts		20th September 2012 sampling					
		Perennial grass		Subclover		Annual Grass	
element	units	off strip	"critical"	off strip	"critical"	off strip	"critical"
Nitrogen	%	3.0	2.0	3.2	3.0	2.0	1.5
Phosphorus	%	0.19	0.2	0.20	0.3	0.23	0.2
Potassium	%	2.8	1.5	1.5	1.5	1.9	1.5
Sulfur	%	0.16	0.15	0.16	0.20	0.14	0.15
Copper	mg/Kg	3.2	5.0	5.3	3.5	2.9	3.0
Zinc	mg/Kg	18	13	30	10	23	15
Manganese	mg/Kg	40	40	76	15	49	25
Iron	mg/Kg	79	50	274	50	68	50
Boron	mg/Kg	4.9	5	19.2	15	6.0	5
Calcium	%	0.53	0.20	1.65	0.40	0.38	0.20
Magnesium	%	0.32	0.15	0.35	0.20	0.17	0.15

numbers in red are suspect deficiency indicators

Which nutrients are deficient paired sample comparisons

Zac Roberts		20th September 2012 sampling					
element		Rhodes Grass	Rhodes Grass	Sub clover	Sub clover	Annual grass	Annual grass
	units	off strip	on strip	off strip	on strip	off strip	on strip
biomass ??	kg/ha	700	1000	100	100	500	1500
Nitrogen	%	3.0	2.7	3.2	3.7	2.0	1.8
Phosphorus	%	0.19	0.26	0.20	0.21	0.23	0.33
Potassium	%	2.8	2.2	1.5	1.7	1.9	1.9
Sulfur	%	0.16	0.22	0.16	0.21	0.14	0.18
Copper	mg/Kg	3.2	3.8	5.3	5.3	2.9	2.8
Zinc	mg/Kg	18	17	30	31	23	26
Manganese	mg/Kg	40	62	76	67	49	57

numbers in red are suspect deficiency indicators

2012 soil analyses from perennial pasture strips

and deficiencies predicted from plant analyses

soil test	Name	Roberts	Summers	Auld North	Brown 1	Hodby 1	Hodby 2
Ammonium N	mg/Kg	4	< 1	3	2	5	2
Nitrate N	mg/Kg	7	12	5	5	5	3
Mineral N	mg/Kg	11	12	8	7	10	5
Phosphorus	mg/Kg	20	11	10	9	18	18
Potassium	mg/Kg	32	28	29	28	30	17
Sulphur	mg/Kg	5.3	3.5	2.1	5	5.4	3.7
Organic Carbon	%	1.06	0.49	0.41	0.75	0.85	0.84
pH Level	CaCl2	5.7	5.5	6.3	5.1	5.2	5.4
pH Level	Water	6.4	6.3	7.3	5.8	5.8	6.1

deficiencies as from paired strip comparisons (assumes site is responsive)

annuals	P, S			Mn		K
perennials	P,S,Mn	P K,Mn,Cu	P, Mn,Cu	P	P,K	P,K

deficiencies as from "critical" levels from texts

annual	Cu,S	P,S,N		K,N,B,Fe +	B,Fe,Mn,S	B,Fe,K,S
perennials	Cu,P	P,K,N,Cu, Mn.Zn,B	B,Cu,Zn	Cu,S,Zn	Cu,Mn,Zn+ K,S	Cu,Mn,K

Auld North



Browne north



Hodby 1



Hodby 2



Monks 1



Monks 2 south



Hodby 1



Topdressing AS on Monks 1



Acknowledgements

- Summit for the fertiliser
- The farmers on the map