Soil Test Interpretation

Nigel Phillips
NSW DPI Wagga Wagga

Nutrients Removed in Products

PRODUCT	NUTRIENTS REMOVED				
	Nitrogen	Phosphorus	Potassium	Sulphur	Calcium
1 beast (500 kg) or 10 lambs	11	3.5	1	1	10
1 bale of wool (200 kg greasy)	27	0.06	3.5	5.5	0.25
1 ton pasture hay	25	2.5	17	2.5	5
1 ton cereal grain	20	3	4	2	3
Uneven Distribution					
1 ton of dung	30	7	13	4	20

1 dry sheep = 146 kg dung/year; 25% deposited in sheep camps

What values on a per hectare basis?

NSW GOVERNMENT Industry & Investment

Nutrients Removed /ha in Products

PRODUCT/ha @ 10 dse/ha	NUTRIENTS REMOVED/ ha @ 10 dse/ha				
	Nitrogen	Phosphorus	Potassium	Sulphur	Calcium
500 kg liveweight	11	3.5	1	1	10
50 kg wool	7	0.015	0.9	1.4	0.06
4 t pasture hay	100	10	70	10	20
5 t cereal grain	100	15	20	10	15

NSW GOVERNMENT Industry & Investment

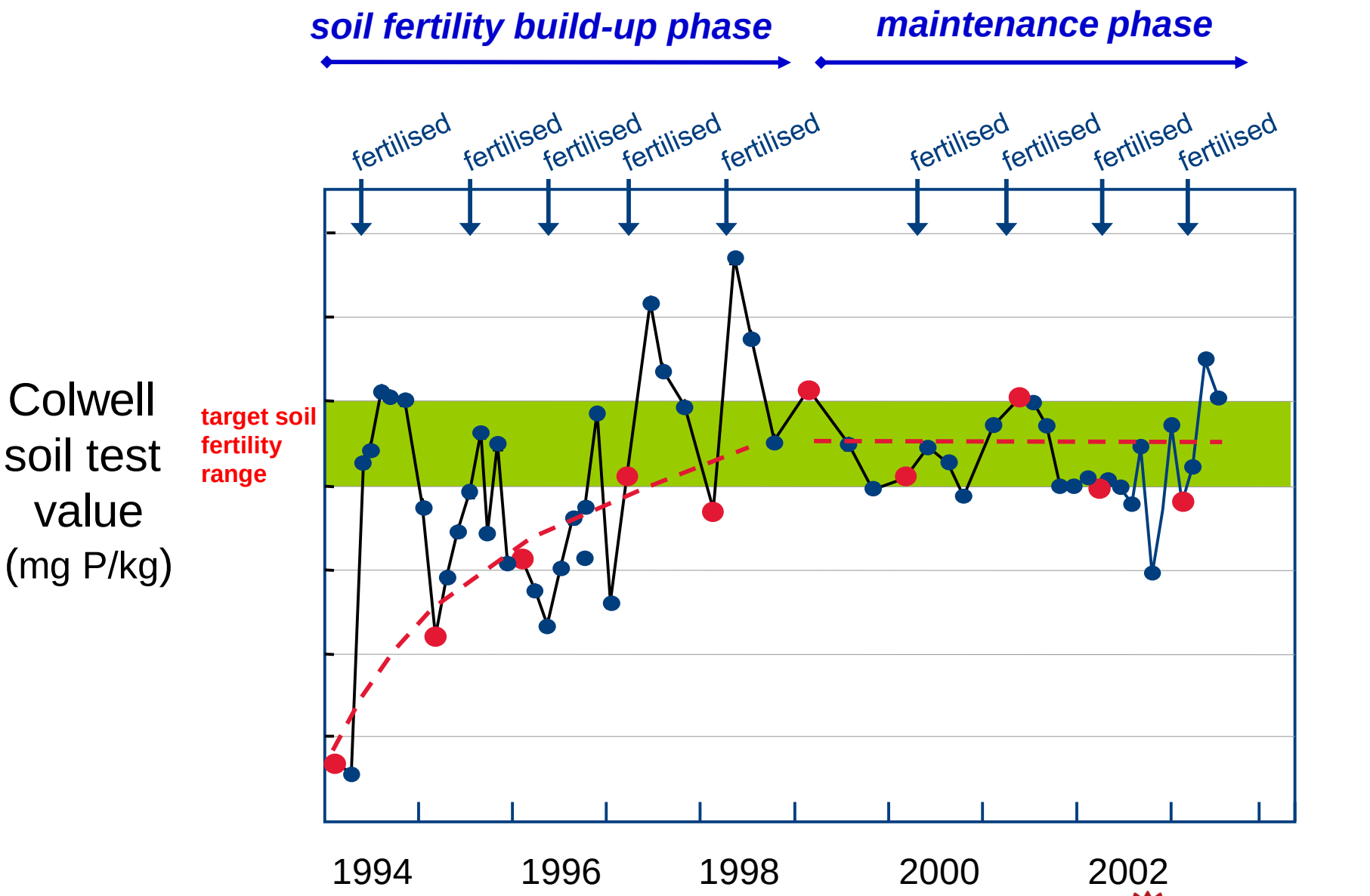
Why soil test?

- Can you effectively manage your soil fertility if you don't know where you are at?

- The current P status of any paddocks will be an accumulated history of P removal and fertiliser input. It is difficult to calculate this accurately over time.

- Soil tests seem to be highly variable! – using a different approach to soil test interpretation you can make them a very valuable tool.

NOTE: importance of regular soil testing DO NOT SAMPLE WITHIN 3 MONTHS OF FERTILISING



Ginninderra Grazing Trial, CSIRO Canberra

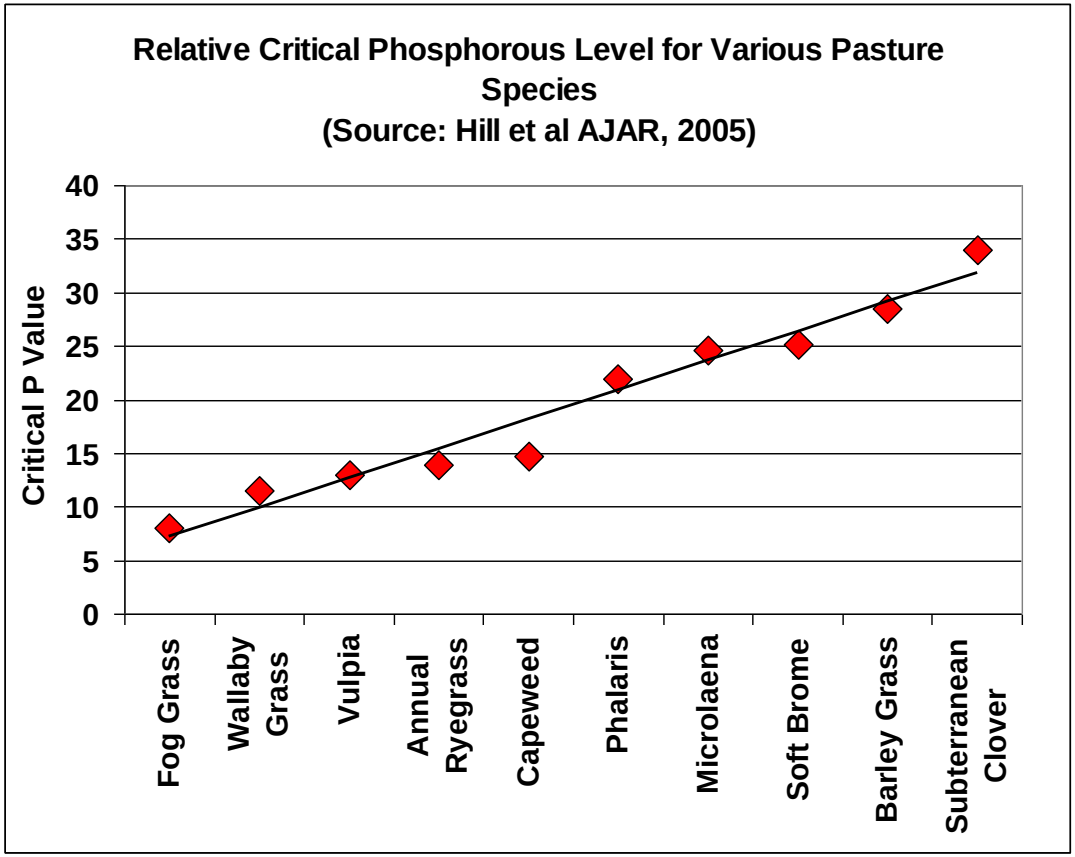
NSW GOVERNMENT Industry & Investment

NSW GOVERNMENT | Industry & Investment

Phosphorous

The importance of Phosphorus

- Most Australian soils are naturally deficient in phosphorus
- The required level of phosphorus nutrition is driven by the needs of the legume.
- Legumes provide Nitrogen which drives grass production



NSW GOVERNMENT Industry & Investment

Critical Colwell Phosphorus for Pastures

PBI Category	Critical value[1] for mid point of PBI category Colwell value (Range)
< 15	23 (20 - 15)
15 - 35	26 (25 - 28)
36 - 70	30 (28 - 31)
71 - 140	34 (31 - 37)
141 - 280	41 (37 - 44)
281 - 840	56 (45 - 65)
> 840	n/a

Source: Better Fertilizer Decisions Project (2007)

1= Critical Colwell P value at mid-point of PBI class. Values in parenthesis are critical Colwell P values at the lowest and highest PBI values within the range.
n/a = insufficient data to derive response relationship.

NSW GOVERNMENT Industry & Investment

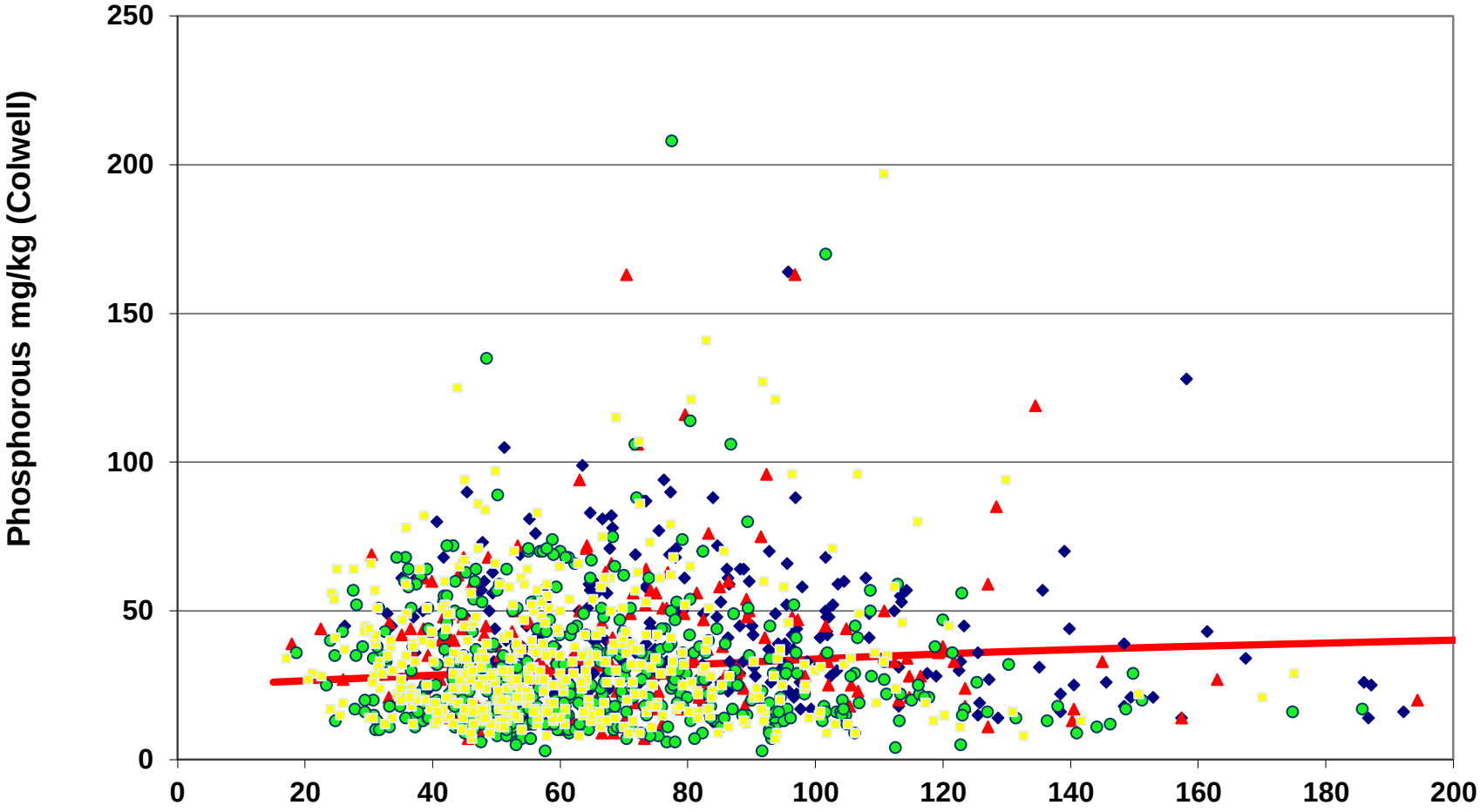
Colwell-P criteria – South

Crop	Soil type	Critical values (mg/kg)	Critical range (mg/kg)
Wheat and barley	Vertosols	17	12-25
	Chromosols/sodosol	22	17-28
	Brown/red chromosol	25	18-35
	Calcarosol	34	26-44
Barley	Ferrosol	76	46-130
Canola	All Soils	18	16-19
Field pea	All Soils	24	21-28

- 0-10 cm depth and 90% RY
- Currently insufficient data to provide similar calibration criteria for DGT-P

Source: Better Fertiliser for Crops 2013

Holbrook Phosphorous vs PBI



NSW GOVERNMENT Department of Primary Industries

Holbrook Landcare Network

NSW GOVERNMENT | Investment

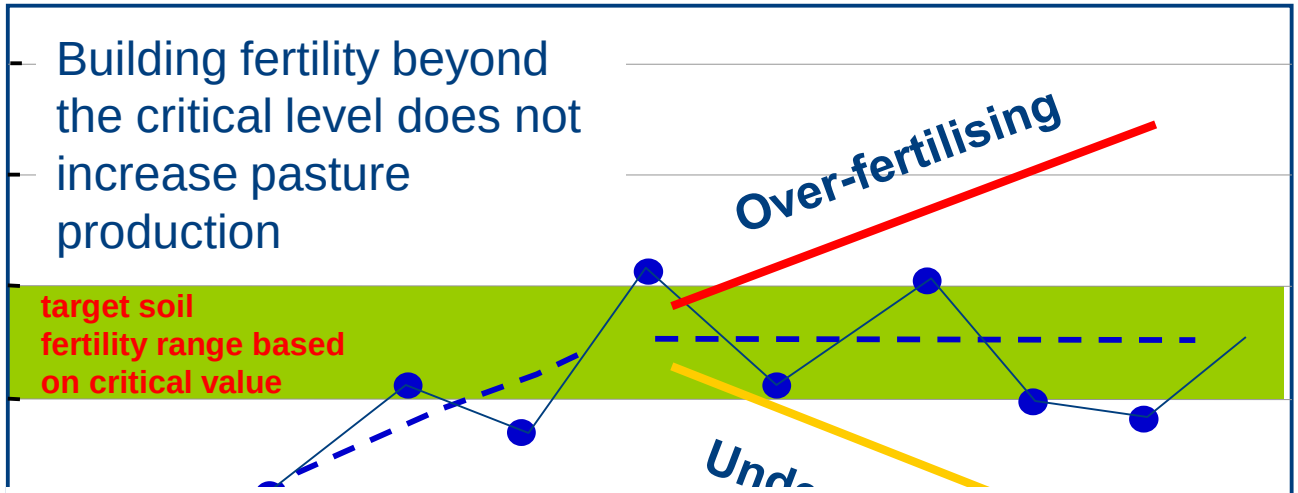
What level should I target?

- Your target soil fertility will depend on a number of factors including:
    - Which soil test?
    - Where are you at now?
    - Your production goals.
    - Financial evaluation

- Your starting point is to understand the “Critical Soil Level” for optimum pasture production.

“Managing the Trend”

Colwell/Olsen soil test value (mg P/kg)



Maintaining fertility below the critical level will have reduced pasture production but may be a valid option

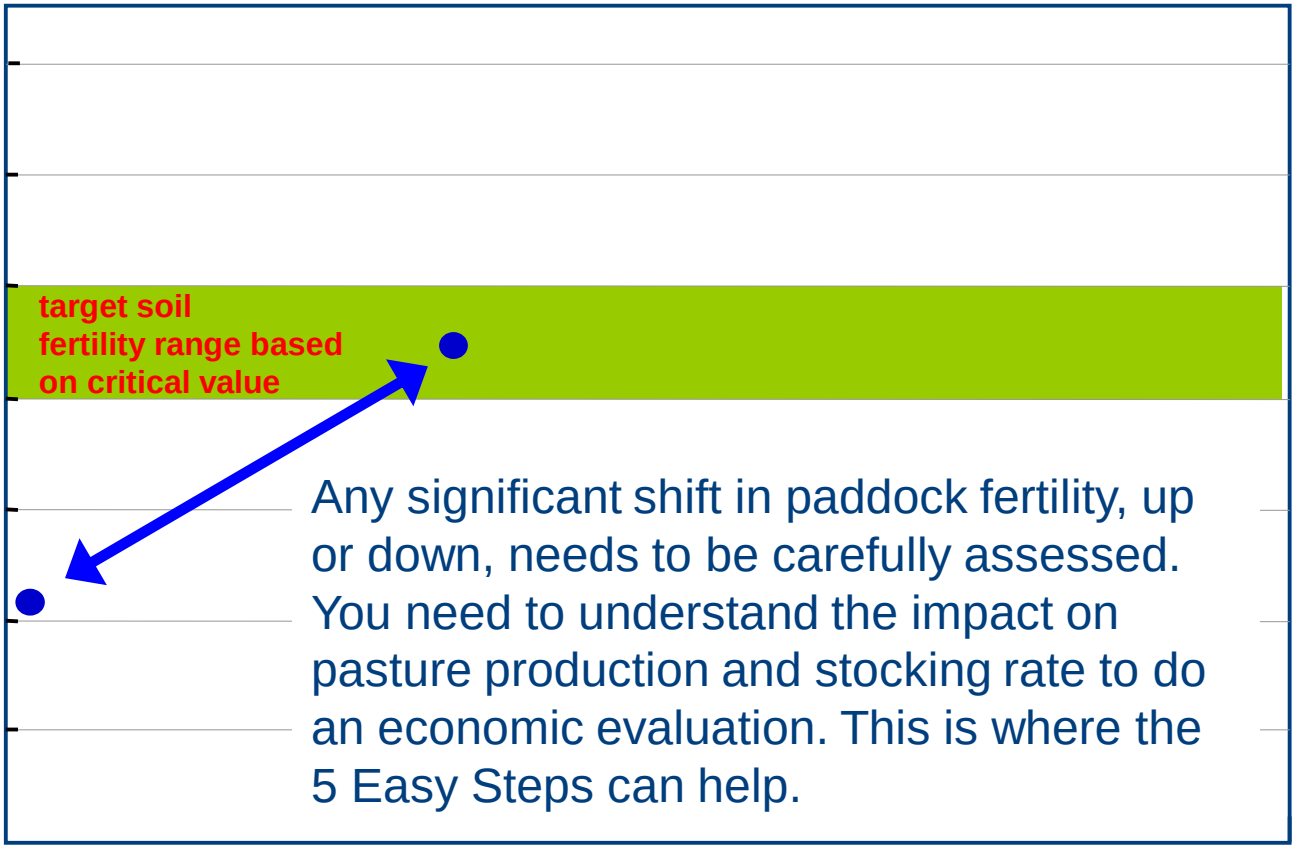
You need to have a plan to decide where to sit on this scale

Too low and you may change pasture composition i.e. lose legumes

NSW GOVERNMENT Industry & Investment

Plan carefully any changes to paddock fertility

Colwell/Olsen soil test value (mg P/kg)



NSW GOVERNMENT Industry & Investment

How much P to apply

- P Application = P Removal + P Losses + Capital P
- P removal is calculated from stocking rate with allowances for factors such as erosion and sheep camp effects.
- The trend over time will help you refine this figure for your property and grazing management.

How do you know it is going to pay?

- If investing in fertiliser you need to capture the expense through increased stocking rate or crop yield
- The 5 Easy Steps provides a process to estimate pasture response and animal enterprise response to a planned change in soil fertility.
- Maximum production is not always the most profitable (or the most relaxing!).

NSW GOVERNMENT | Industry & Investment

Tools to help

- Five Easy Steps booklet and tool available for download from: www.mla.com.au/nutrients
- Paddock DSE Tool –
  - nigel.phillips@dpi.nsw.gov.au
- Seek advice from reputable experienced agronomist

NSW GOVERNMENT Industry & Investment

NSW GOVERNMENT | Industry & Investment

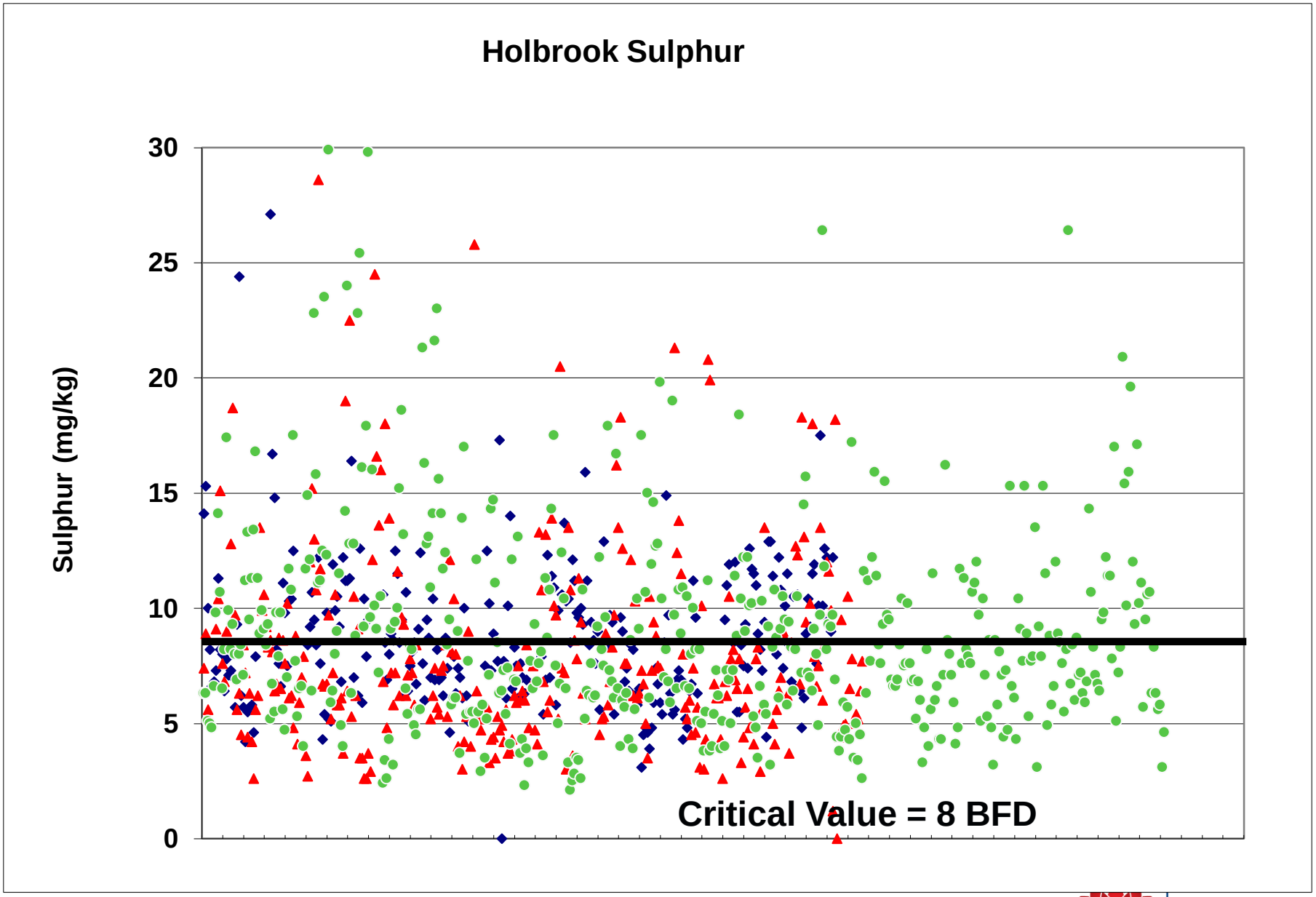
- Sulphur

Potassium

Organic carbon

Electrical conductivity

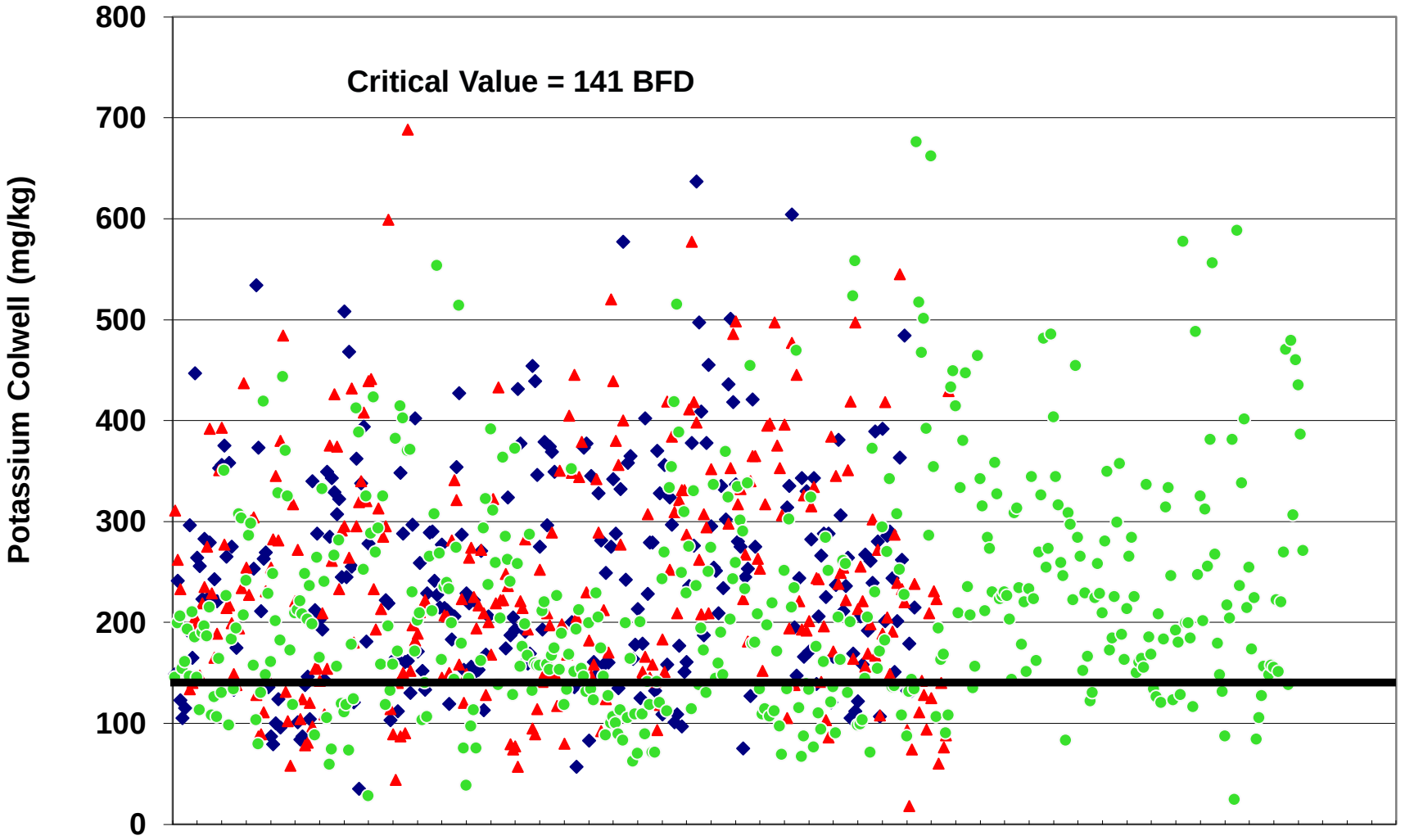
Soil pH



NSW GOVERNMENT Industry & Investment

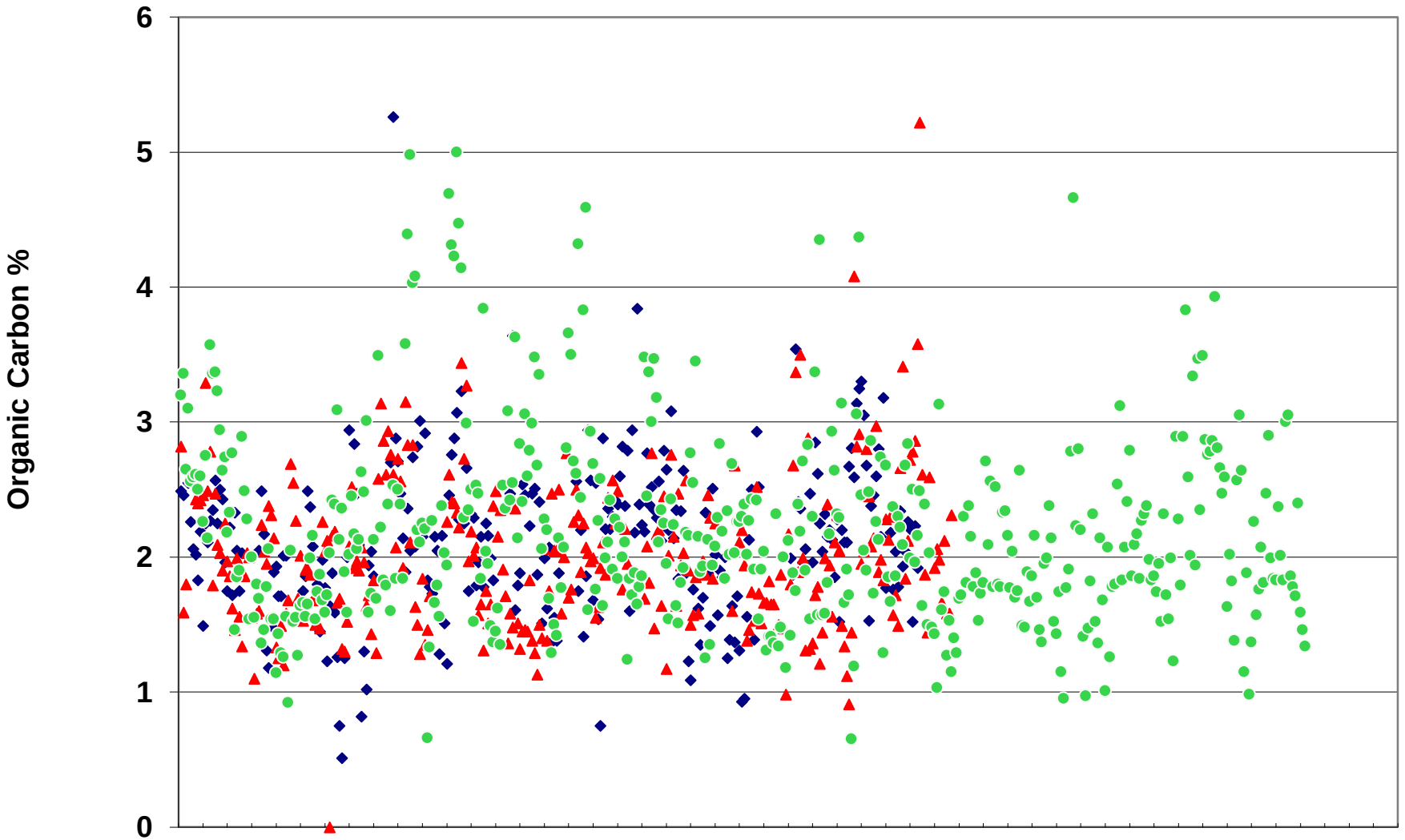
- Pastures @ 10DSE
- S exported off farm = 1kg S/Ha
- S moved to sheep camp = ~2kg S/Ha
- Need to replace ~3 kg S/Ha/year
- 125 kg/Ha Single = 13.8 kg S/Ha
- 400kg/Ha Gypsum = 60 kg S/Ha
- Maybe 1-2 kg s in rainfall from west
- Plan? Keep monitoring soil S

Holbrook Potassium

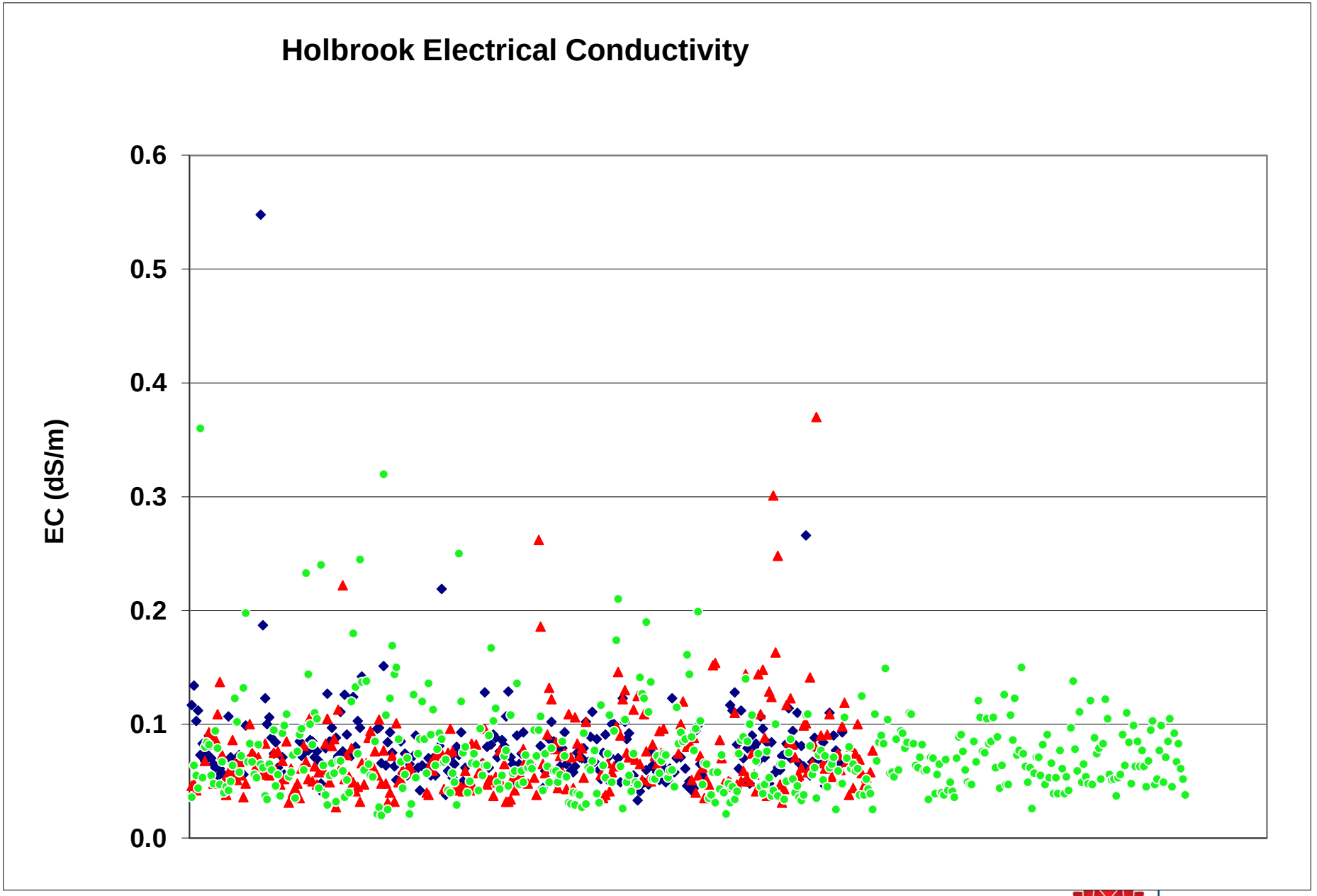


NSW GOVERNMENT Industry & Investment

Holbrook Organic Carbon

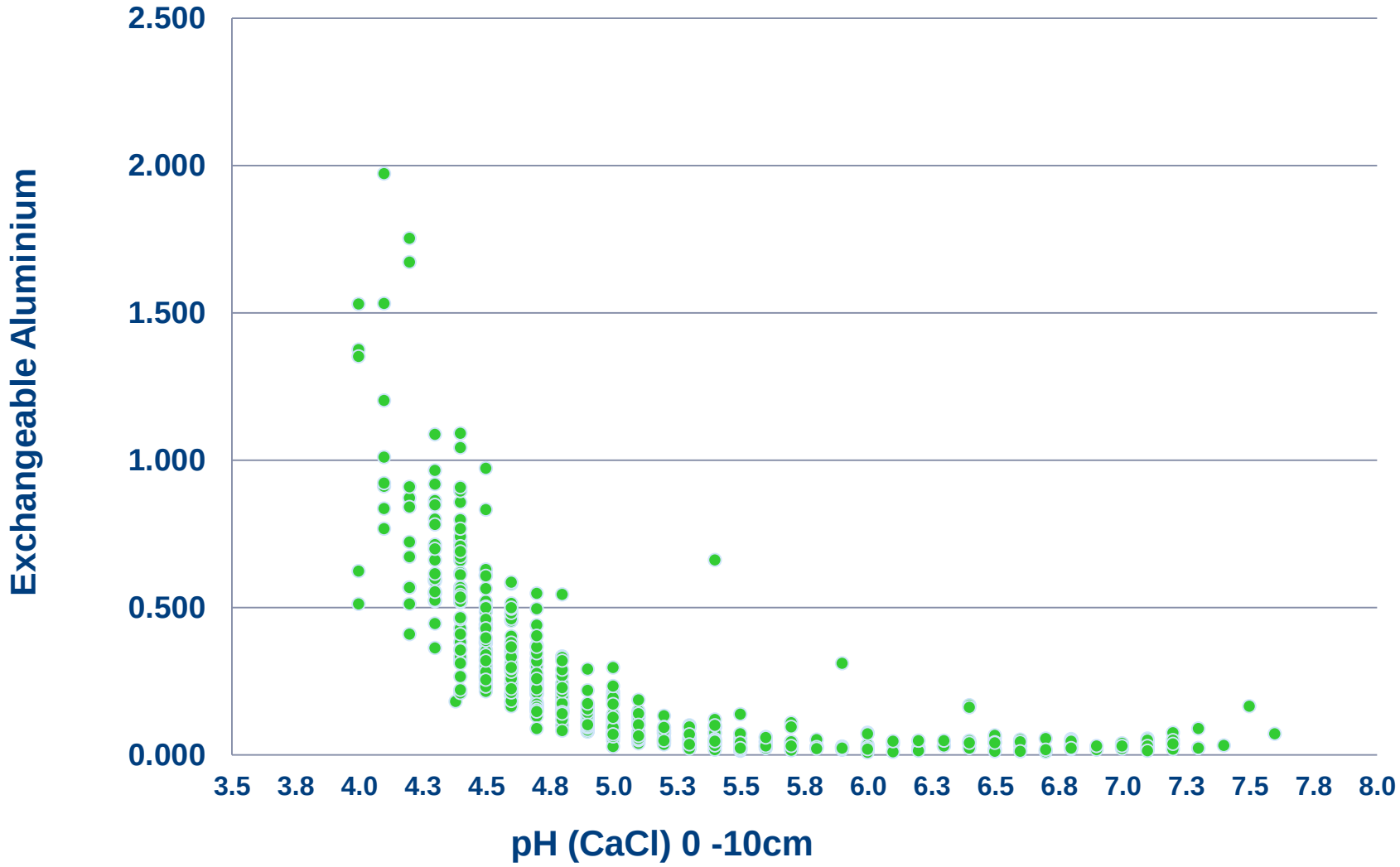


NSW GOVERNMENT Industry & Investment



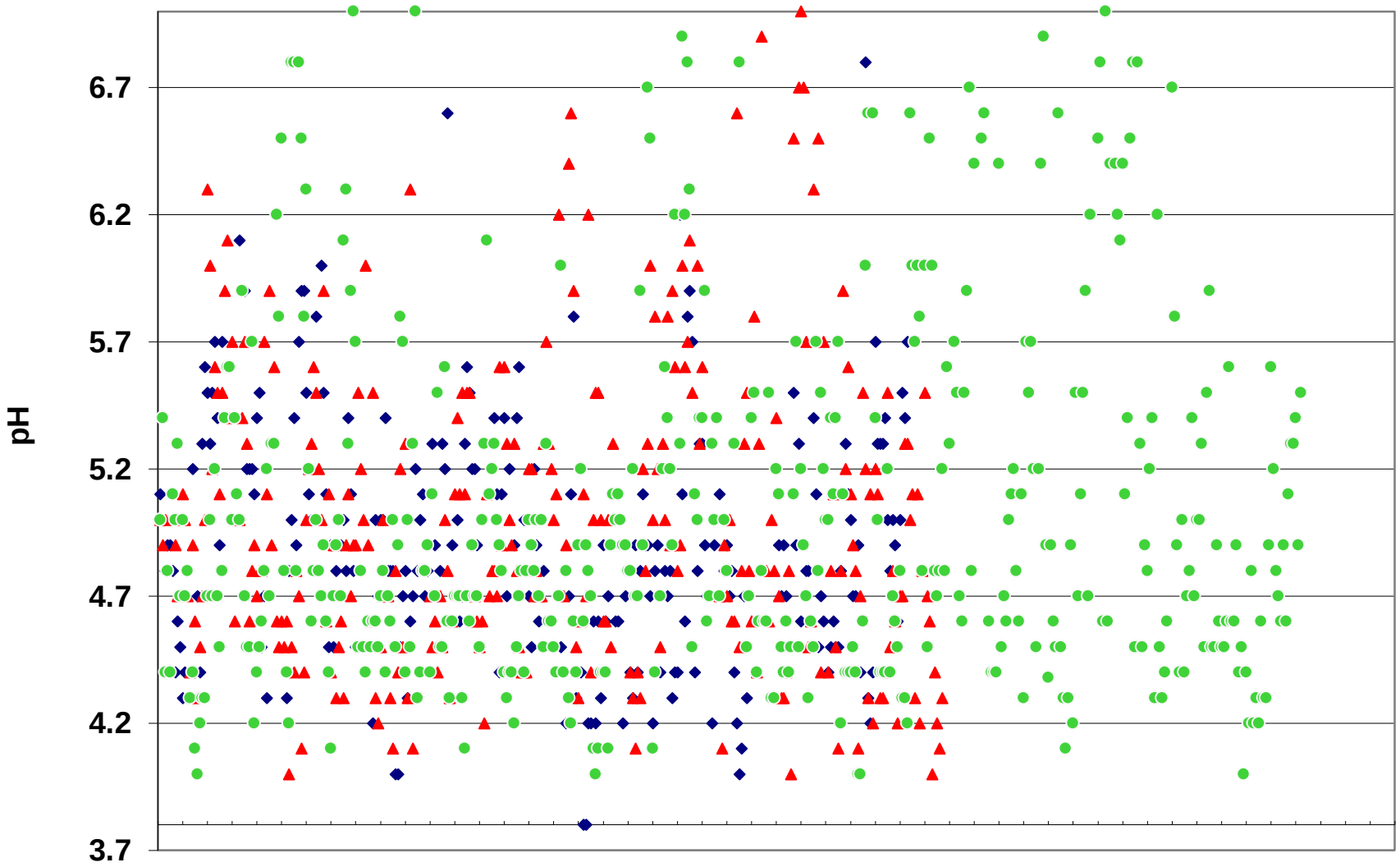
NSW GOVERNMENT Industry & Investment

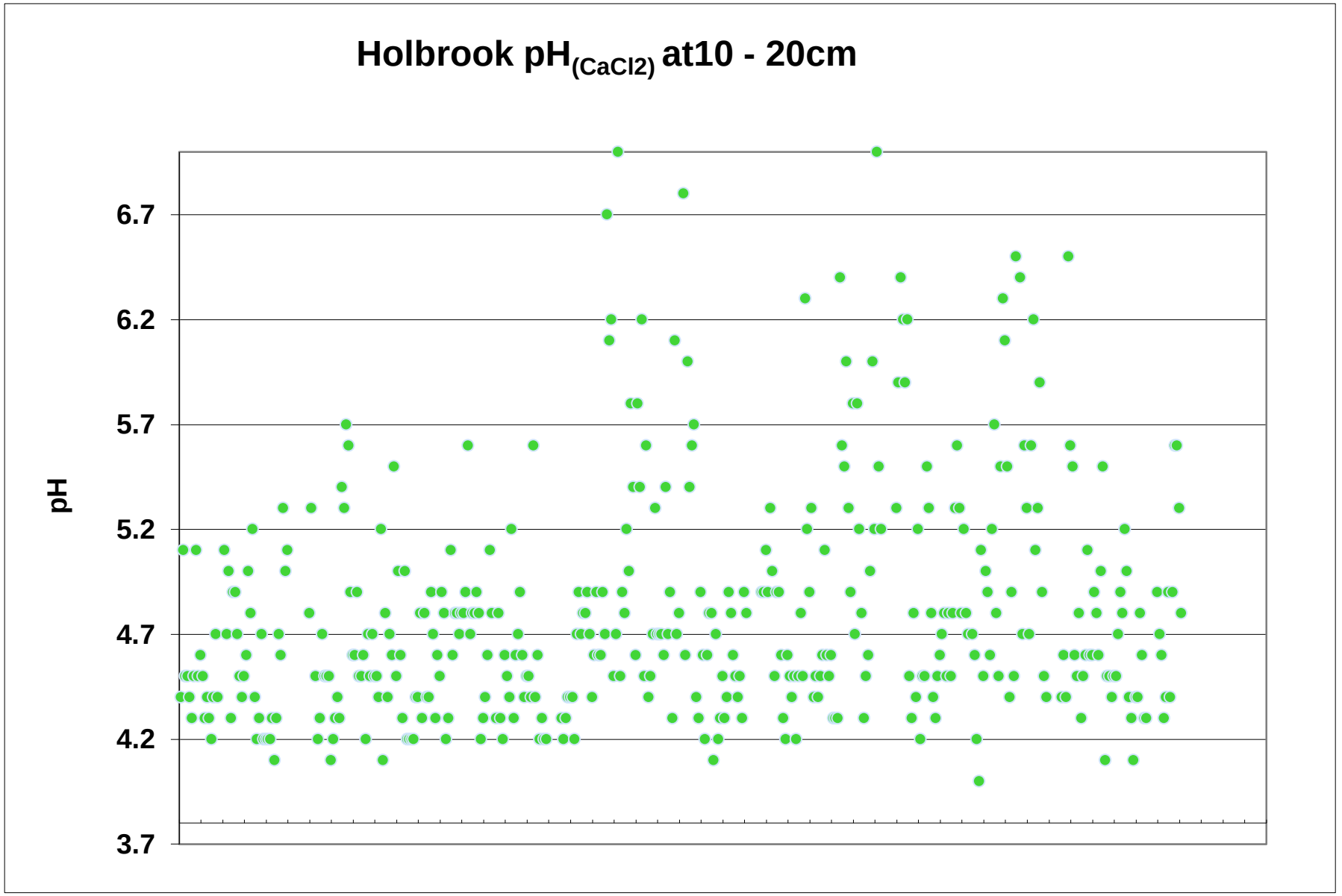
Holbrook 2013



NSW GOVERNMENT Industry & Investment

Holbrook $pH_{(CaCl2)}$ at 0 - 10cm





NSW GOVERNMENT Industry & Investment

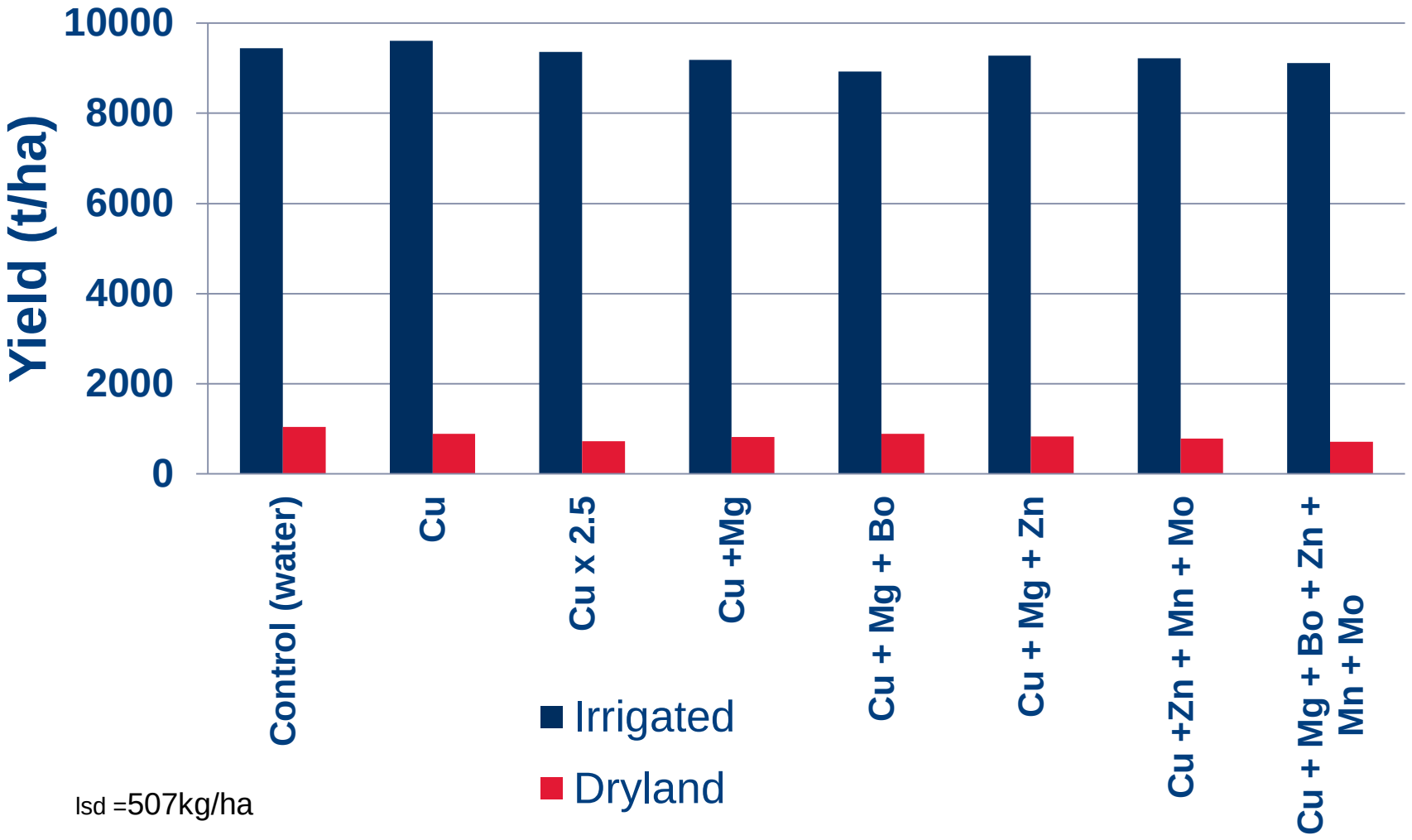
Trace Elements/Micronutrients

Micronutrient concentration/removal

	Wheat grain (mg/kg)	Removal 4t/ha (g/ha)	Canola grain (mg/kg)	Removal 2.5t/ha (g/ha)	Lupin grain (mg/kg)	Removal 2.0t/ha (g/ha)
Boron	2	8	13	33	20	40
Copper	5	20	4	10	5	10
Manganese	44	176	49	125	40	800
Molybdenum	0.2	0.8	0.3	0.8	2	4
Zinc	25	100	34	85	30	60

Source: Rob Norton IPNI

2007 micronutrient trials



lsd =507kg/ha

NSW GOVERNMENT Industry & Investment

Micronutrients

- Do you already have enough in your greater root zone?
- Tissues test better than soil tests.
  - When and what plant part you take is important.
- Trial strips
  - A visual response is not necessarily an economic one.
  - Measure!
- Easy to overdo it and cause toxicity.
- Some will last a long time (Zn & Cu) but varies on soil pH, soil structure, leaching etc.
- Mo 50-100g/Ha every 4-6 years?

NSW GOVERNMENT | Industry & Investment

Questions?