

4.6 Macrominerals, microminerals & water

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Macrominerals

- In a pre-gastric fermenter macrominerals are generally required at the level of grams per kilogram per day in diet
- Trace elements (microminerals) needed at one hundredth to one thousandth of that level (note g versus mg on table)
- Inadequate amounts of macrominerals leads to range of conditions including hypocalcaemia (milk fever) and hypomagnesaemia (grass tetany)
- Need correct balance of macrominerals, particularly parturition and lactation & when feeding grain (need to add Ca to grain based diet)

<https://www.sciencedirect.com/science/article/pii/S0377840105003202>

Table 1.1: Recommended minimum element concentrations in pasture dry matter for grazing cattle and sheep¹

	Cattle	Sheep
Macrominerals	g/kg	g/kg
Calcium	3.5	3.0
Phosphorus	3.0	2.0
Sodium	1.5	1.0
Chlorine	2.0	1.0
Potassium	5.0	4.5
Sulfur	1.5	2.0
Magnesium	1.5	1.0
Trace elements	mg/kg	mg/kg
Iron	40	40
Zinc	25	20
Manganese	25	25
Copper ²	5 to 12	5
Cobalt	0.10	0.10
Iodine	0.50	0.50
Molybdenum	0.10	0.10
Selenium	0.05	0.05

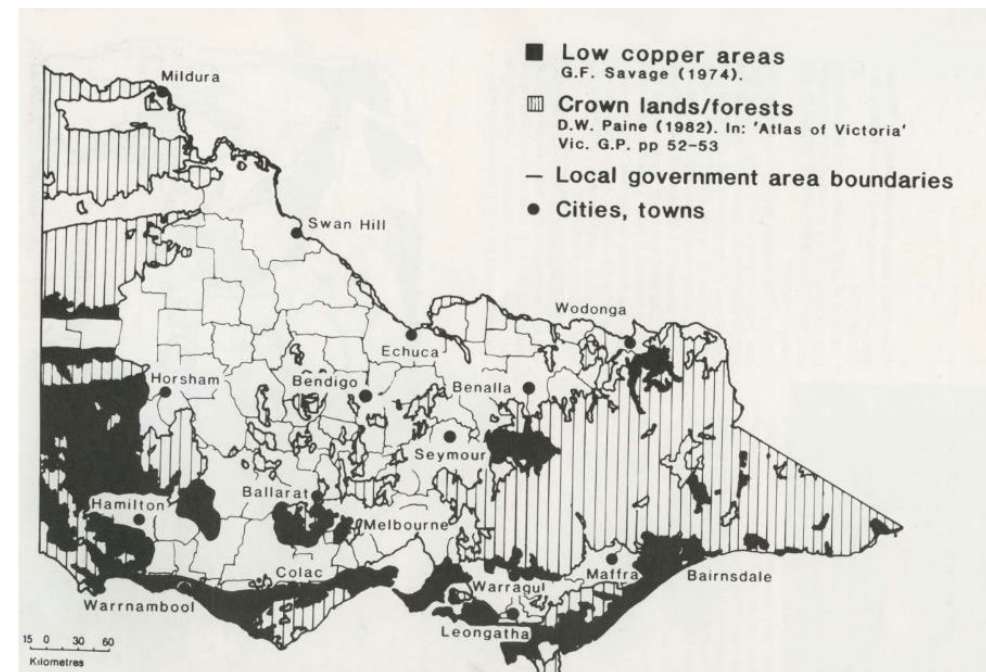
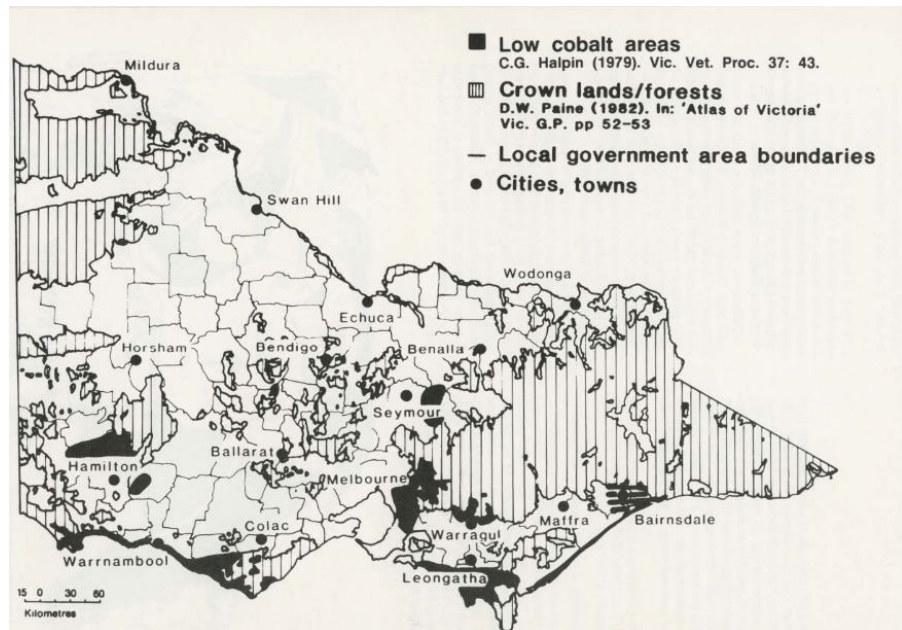
¹ Based on data presented by the ARC (1980), Grace (1983), NRC (1978), Underwood (1981) these amounts represent the average requirements for growth, pregnancy or lactation, in grazing livestock.

² Copper requirements are strongly affected by the concentrations of molybdenum, sulphur and iron.

[http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/trace_elements_pastures_df1/\\$FILE/trace%20elements%20ch1.pdf](http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/trace_elements_pastures_df1/$FILE/trace%20elements%20ch1.pdf)

Trace elements

- Trace element disease particularly associated with certain areas and soil types/climate
- Results in plants having low available levels of the relevant trace element (not always low actual level as there can be interaction between elements)
- Similar issue worldwide – following slide demonstrates Victorian example



From
[http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/trace_elements_pastures_pdf2/\\$FILE/trace%20elements%20ch6.pdf](http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/trace_elements_pastures_pdf2/$FILE/trace%20elements%20ch6.pdf)

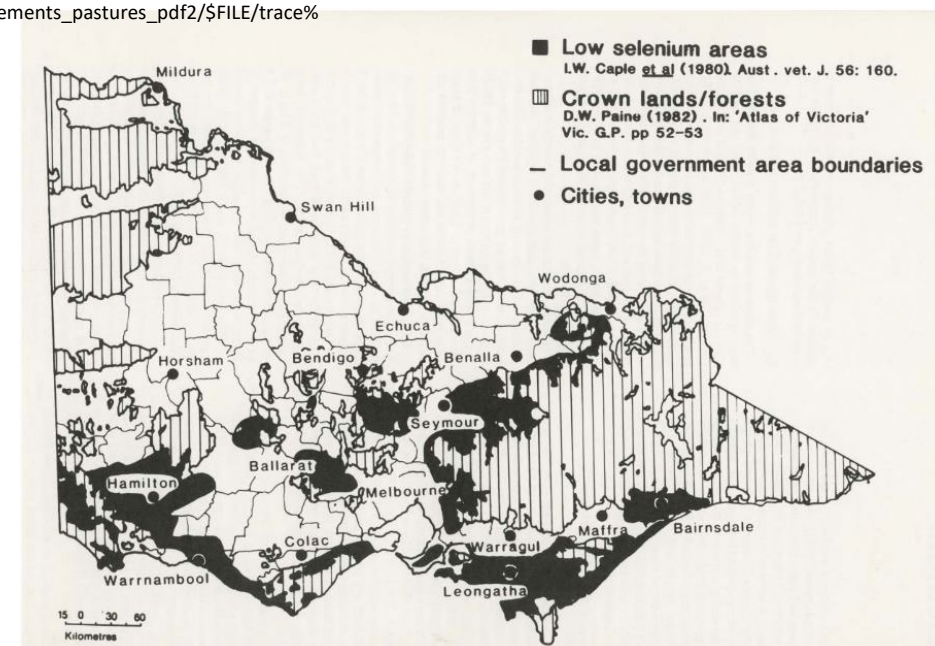
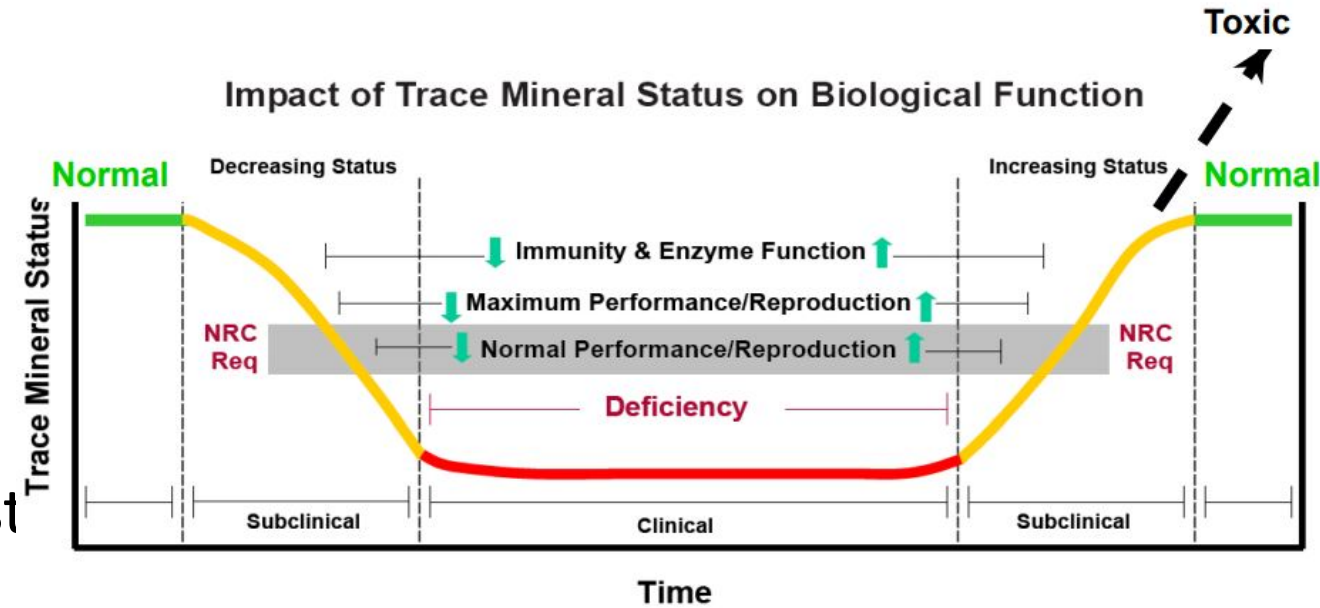


Figure 7.2: The location of recorded outbreaks of goitre in lambs (0), kids (r), calves (*) and foals (□) in Victoria (Caple *et al.* 1980).

Importance of trace elements

- Vital for normal function
- Excess amounts = toxicity e.g. if stock graze Se accumulating plants
- Overdosing using trace elements (often in vaccines/drench etc)
- Trace element deficiency most common in winter/spring in high rainfall
- Diagnosis can be visual (enlarged thyroid), but others need blood test or production trials



Water

- The most important overall part of nutrition – an animal will die faster from lack of water than lack of feed (presuming inadequate water in the feed being consumed)
- Livestock meet part of their water consumption via food – depends on DM%
- In winter feed may only be 10% DM, so animals get water needs from grass consumption
- Approximation for animal needs = 10% of bodyweight per day in water volume
e.g. 500kg cow = 50l water (non-lactating)
- Stock need access when at water point – water flow or total volume is critical due to flock/herd social order



Supply of water



Water quality

- Salinity
 - Mixing e.g. bore/dam
- pH
- Toxins e.g. blue green algae

Livestock	No adverse effects on animals expected.	Animals may have initial reluctance to drink or there may be some diarrhoea, but stock should adapt without loss of production.	Loss of production and a decline in animal condition and health would be expected. Stock may tolerate these levels for short periods if introduced gradually.
	EC in $\mu\text{S}/\text{cm}$	EC in $\mu\text{S}/\text{cm}$	EC in $\mu\text{S}/\text{cm}$
Poultry	0 to 3100	3100 to 4700	4700 to 6300
Beef cattle	0 to 6300	6300 to 7800	7800 to 15,600
Dairy cattle	0 to 3900	3900 to 6300	6300 to 10,900
Sheep	0 to 7800	7800 to 15,600	15,600 to 20,300*
Horses	0 to 6300	6300 to 9400	9400 to 10,900
Pigs	0 to 6300	6300 to 9400	9400 to 12,500