NSW Grassland Society

Soil assessment for pasture production that considers both physical & chemical factors in the topsoil & subsoil

Dr David McKenzie
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Overview of the Presentation

- Conventional soil testing for pasture production has major limitations.
- Graziers need a comprehensive soil assessment package that takes into account:
  - the depth of rooting of pasture plants,
  - soil physical factors,
  - able to cope with highly variable landscapes.
- An example is presented that overcomes many of the problems with traditional approaches to soil testing.
- Ben Watts will discuss practical benefits of the proposed new system.

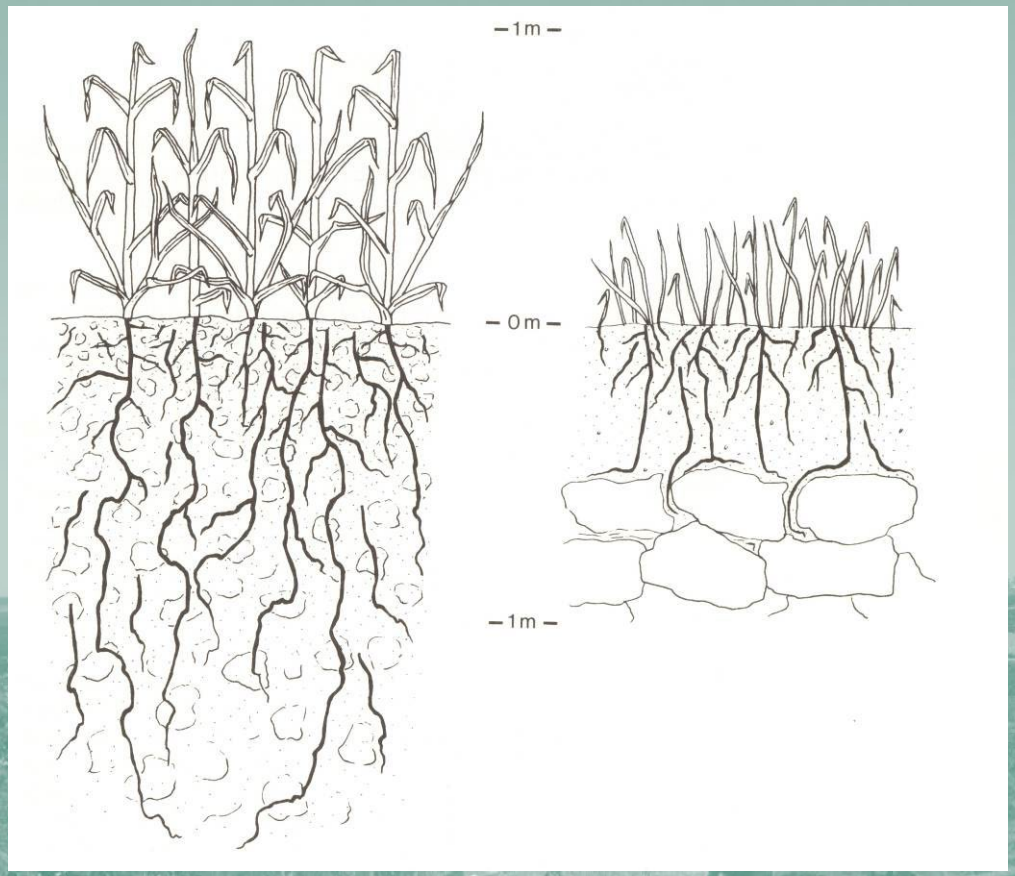
Soil testing: Current practice

- A focus on the upper 10 cm of soil (even though the roots of most pasture species go far deeper).
- Bulking of soil samples rather than keeping them separate.
- Emphasis on soil chemical factors rather than soil physical conditions.
- Poor storage and display of the data.

An Alternative Approach

- Pit inspections to a depth of 1.4 metres.
- Pit positions based on:
  - landholder observations of pasture performance,
  - geology maps, air photos and EM maps,
  - topographic information.
- Use of rapid "visual-tactile" methods to assess soil physical condition.
- Backed up by laboratory analysis (*Incitec-Pivot*) of the chemical fertility of selected soil samples.
- Production of "key soil factor" maps for the topsoil and subsoil (*no bulking of soil samples*).

What is the rooting depth of pasture?



Batey (1988)

- **Grasses?**
- **Lucerne?**
- **Chicory?**

What is “visual-tactile” soil assessment?

Pit inspections

- Compaction severity
- Texture
- Colour, mottling
- Water holding capacity

Spade inspections

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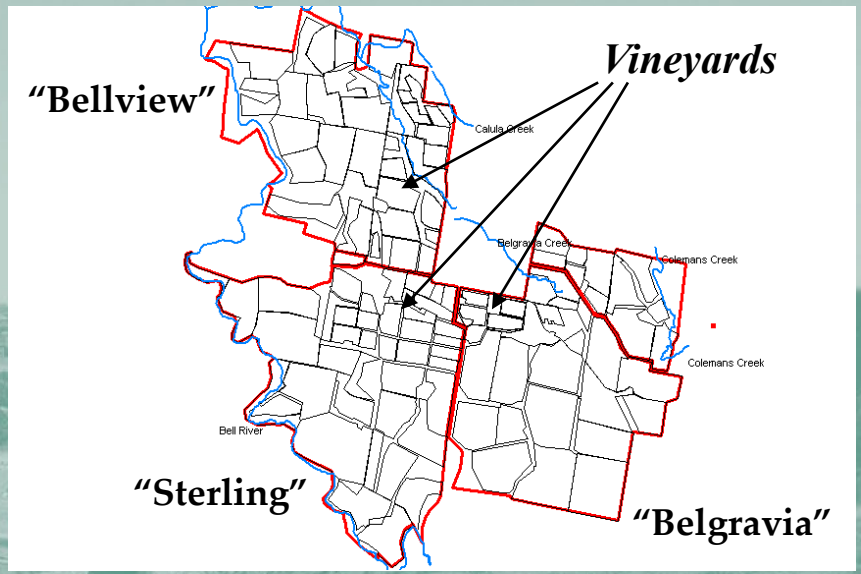
The “Belgravia” pasture project



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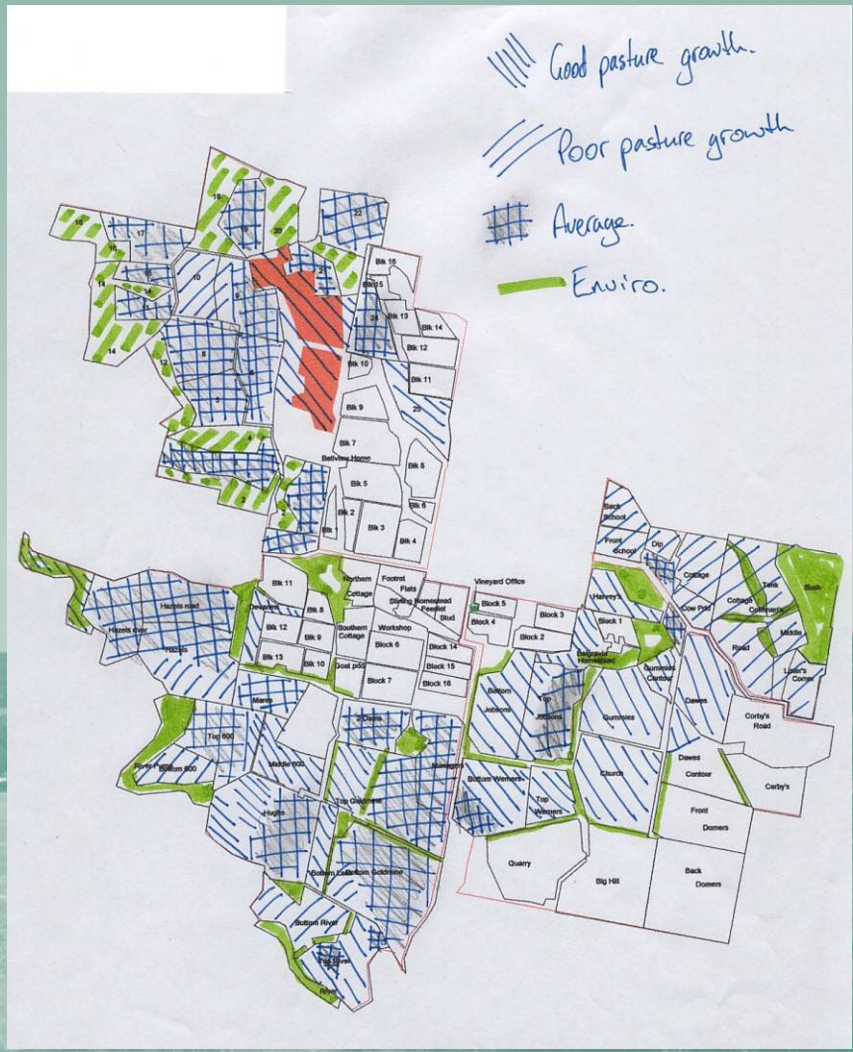
“Belgravia” – productivity zones

Pasture productivity estimates from the farm manager



Pit inspections

65 pits over 1,600 hectares

Pit positions were measured using a hand-held GPS

Soil conditions evident in the field




Soil with limitations

Fertile soil

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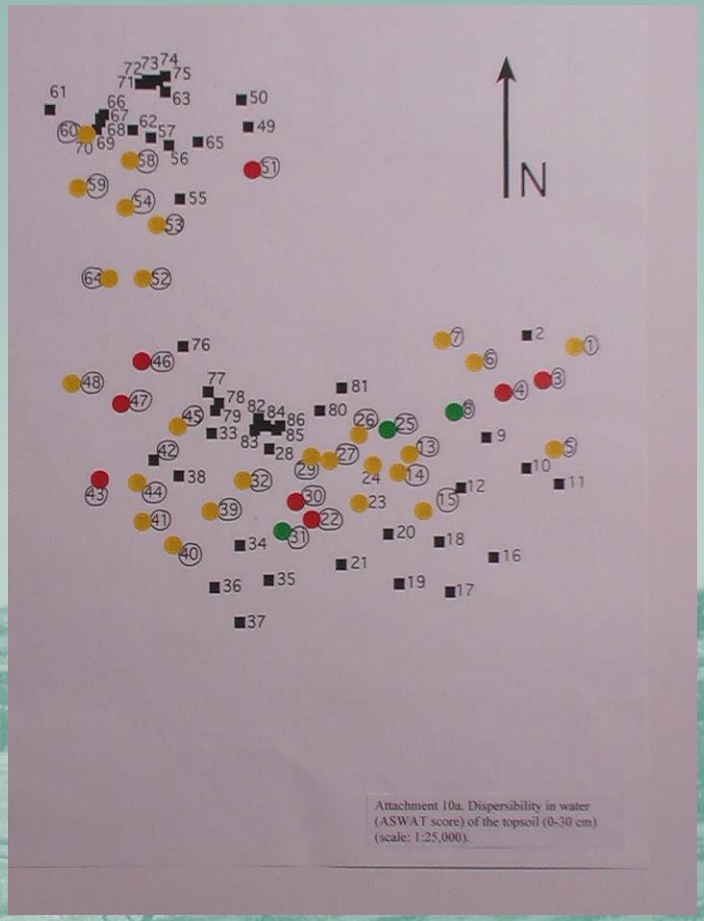
Comprehensive soil assessment:
Topsoil & Subsoil

- **pH (acidity, alkalinity)**
- **Dispersion**
  (related to exchangeable sodium percentage, Ca/Mg ratio)
- **Salinity (EC)**
- **Compaction severity**
- **Soil structural resilience**
- **Organic carbon**
- **Water holding capacity / stoniness**
- **Nutrients**

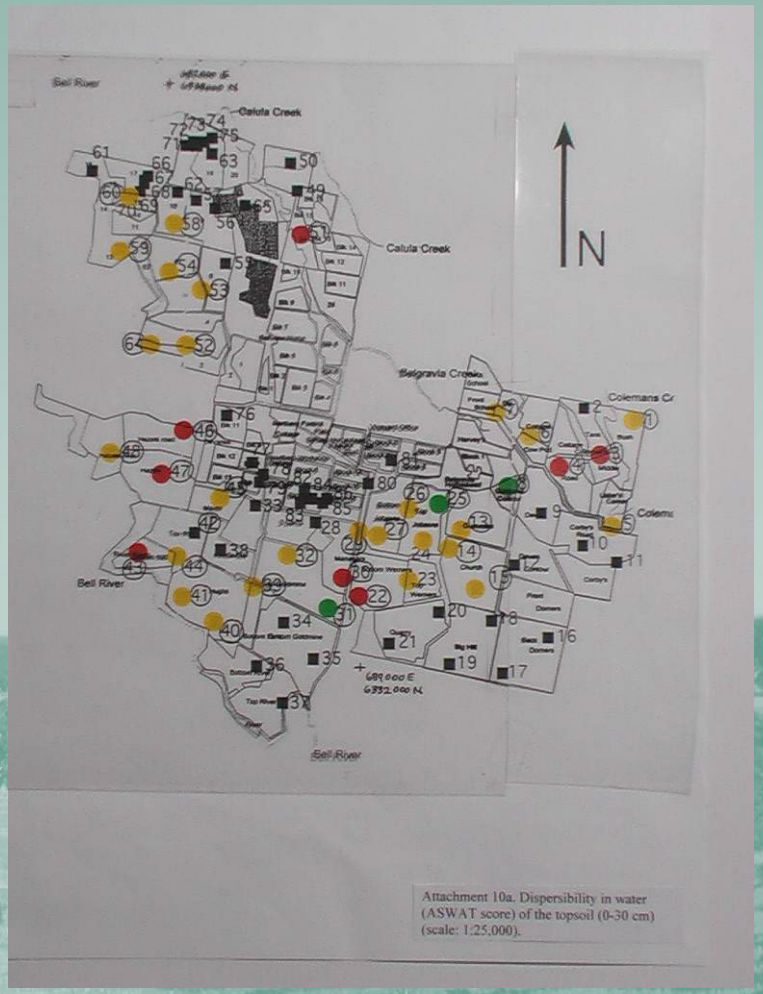
“Key Soil Factor” map

Topsoil dispersibility (0-30 cm)



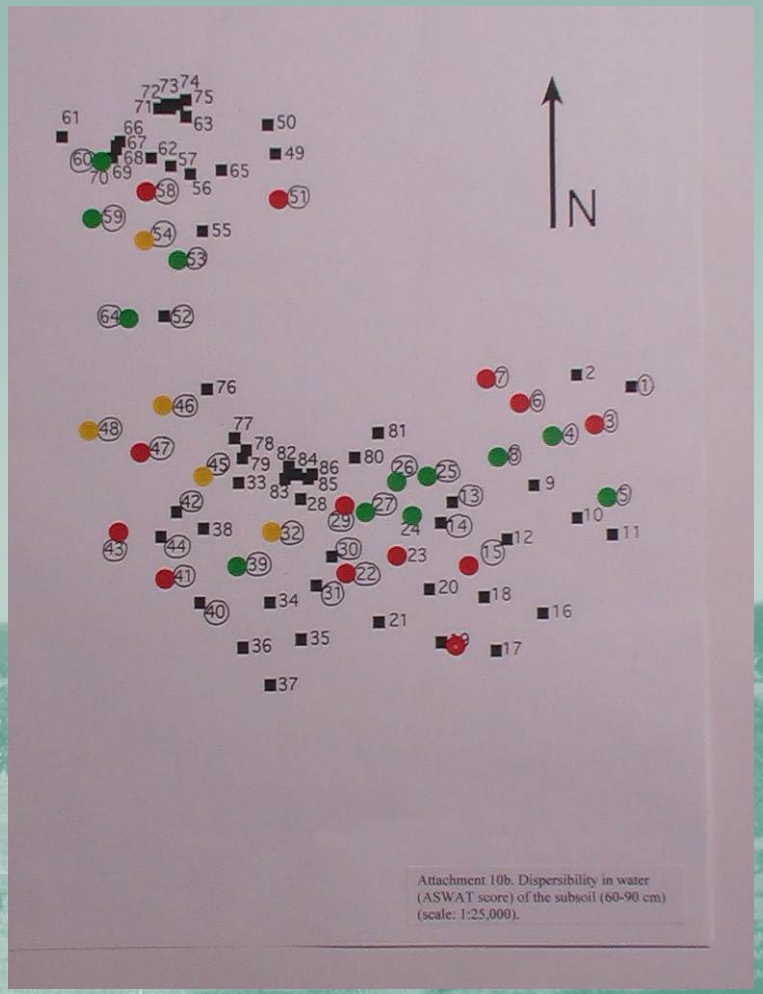
“Key Soil Factor” map

Topsoil dispersibility (with paddock overlay)

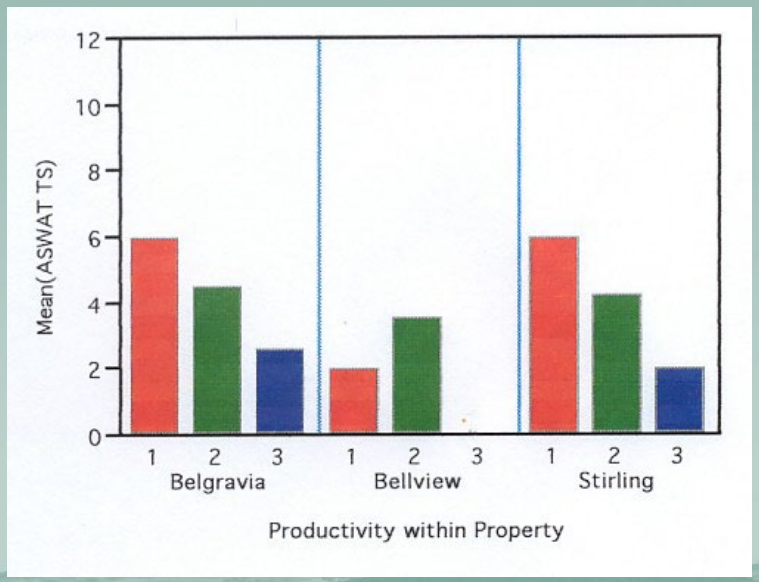


“Key Soil Factor” map

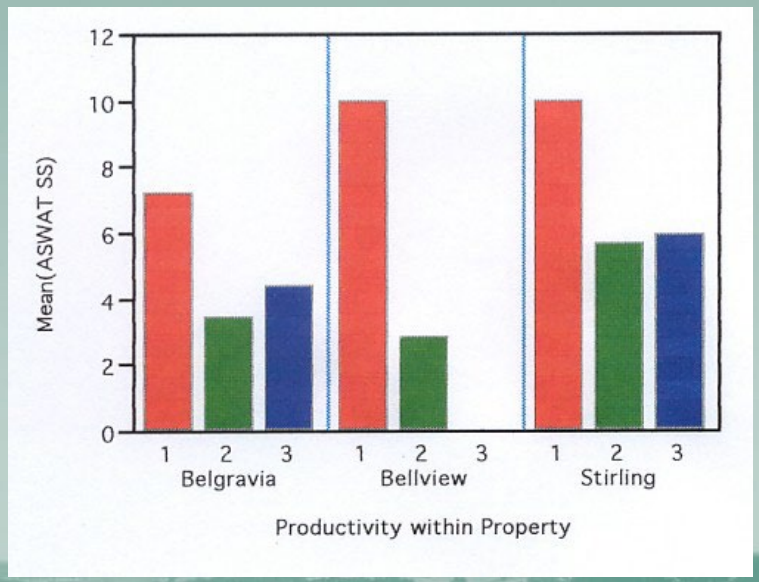
Subsoil dispersibility (60-90 cm)



Correlation with productivity estimates

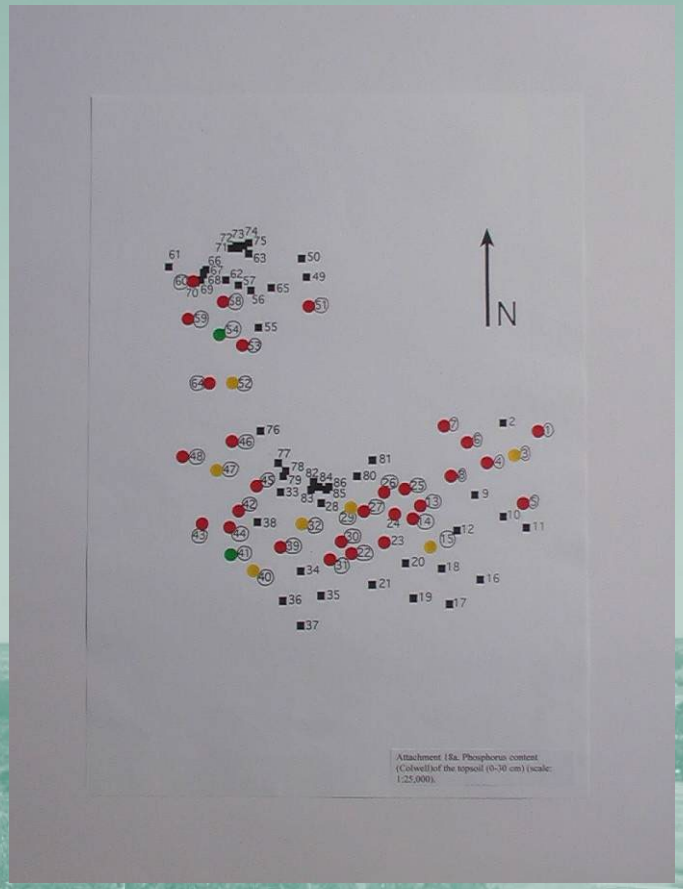


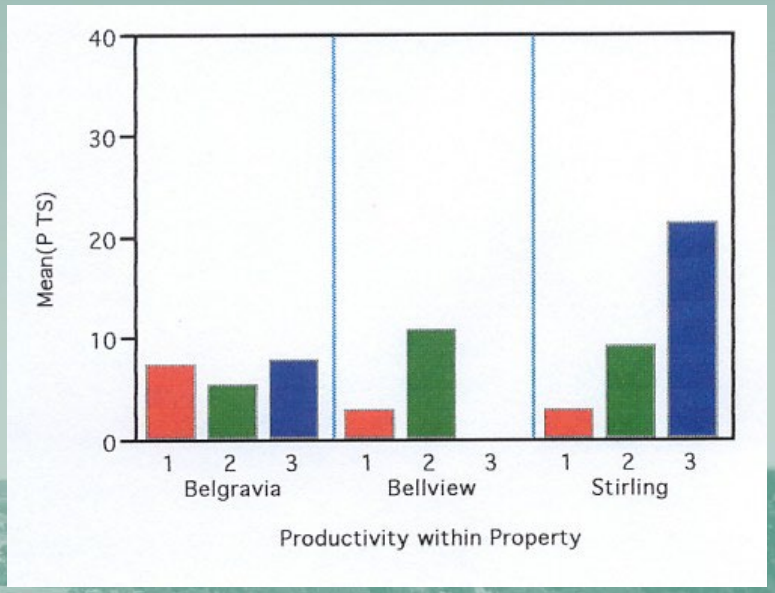
Topsoil dispersibility



Subsoil dispersibility

The “good” soil had limitations





Phosphorus – Topsoil

The “good” soil had limitations

There also were problems with:

- Sulphur
- Potassium

Soil management options

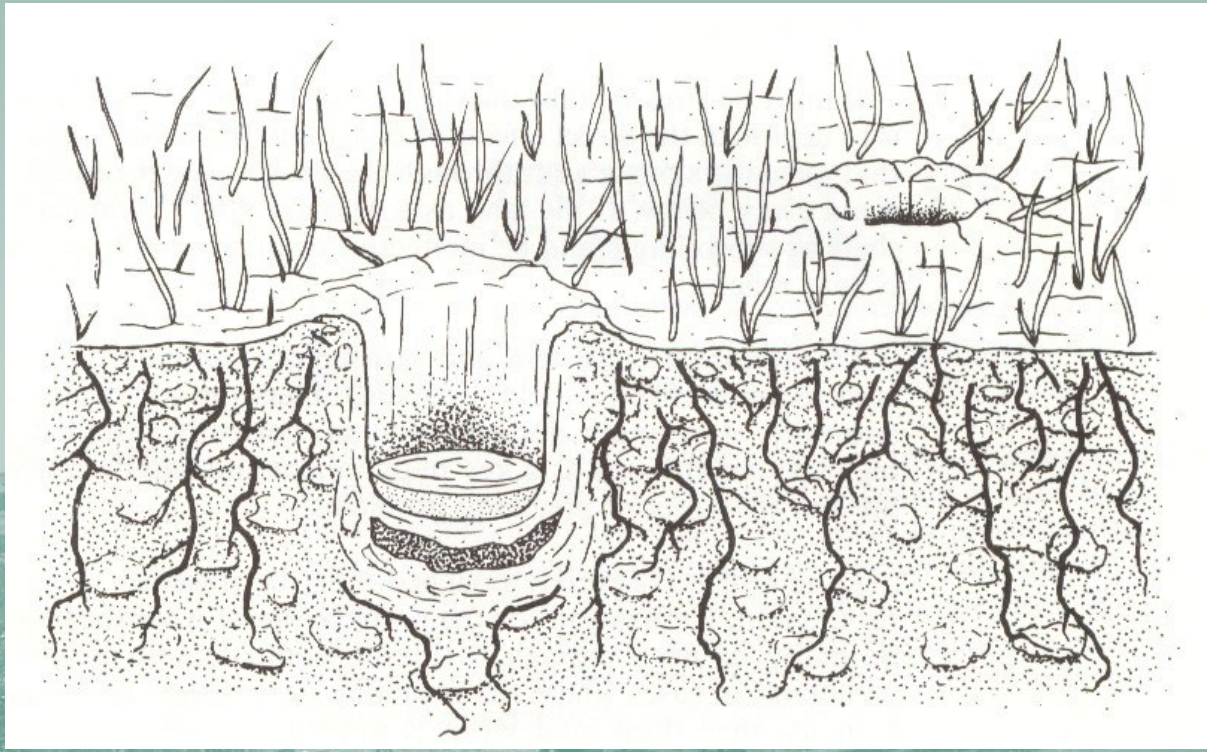
- Gypsum (variable rates rather than blanket application)
- Lime
- Deep tillage
- Nutrients
- Encourage beneficial soil organisms
- Alternative land use in the very stony areas

☞ ***Soil repair maps***

☞ ***Cost of repair maps***

Damage prevention plans

Avoid heavy grazing on soil with a poor shrink-swell potential

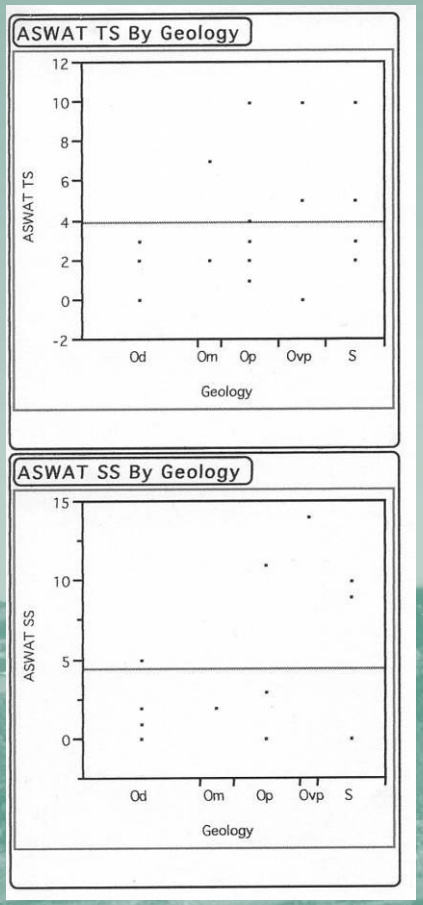


Batey (1988)

Filling in the gaps between soil pits

- EM surveys?
- Radiometrics?
- Airphotos?

There was a moderate correlation between geology and soil dispersibility



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Main points

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