
Manure On The Move

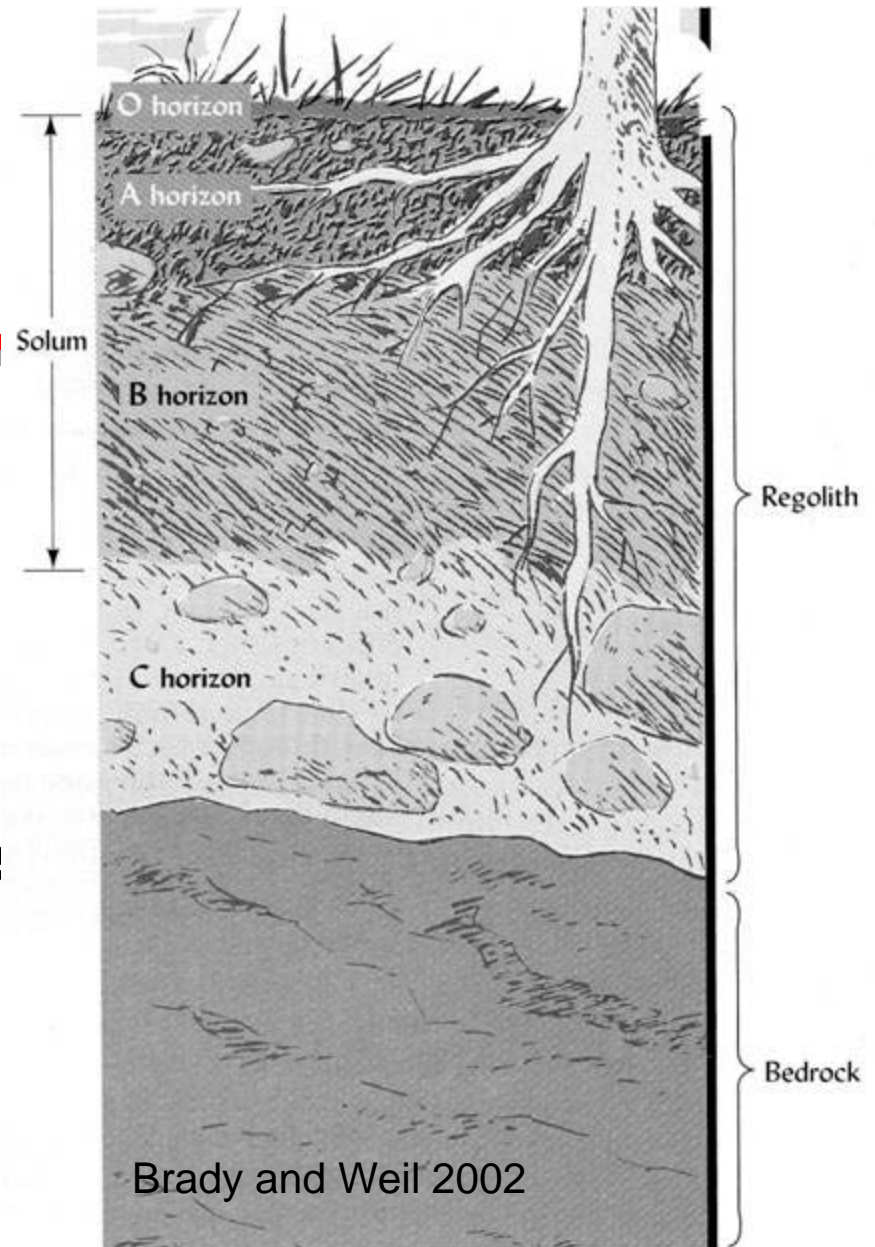
Bill Bland

UWEX and UW-Madison

Soil Science

Rootzone

- Soils retain water against gravity => ET
- Air-filled porosity => gas exchange
- Requires range of pore size
- Hope drainage water does no harm

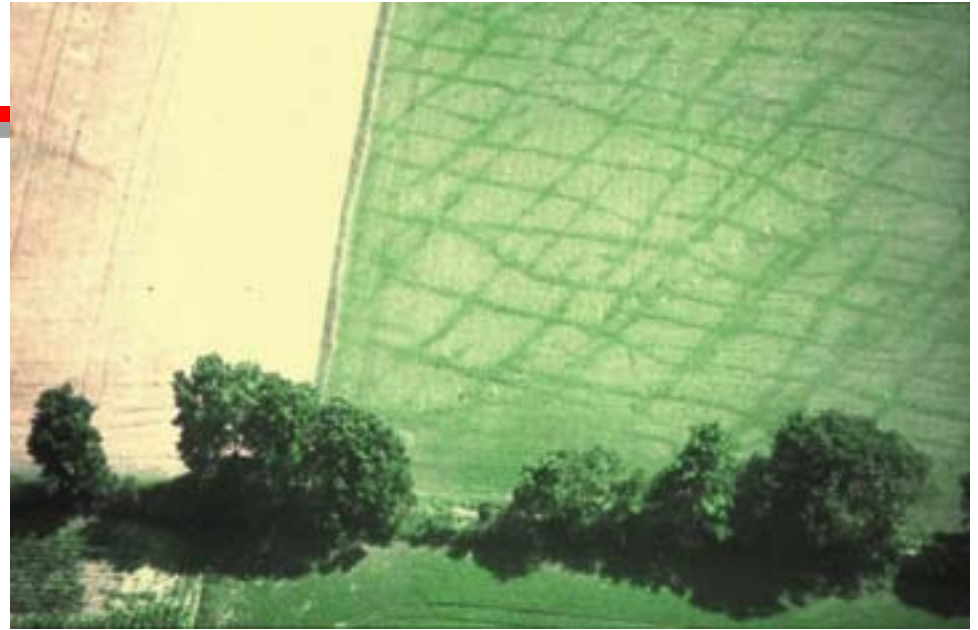
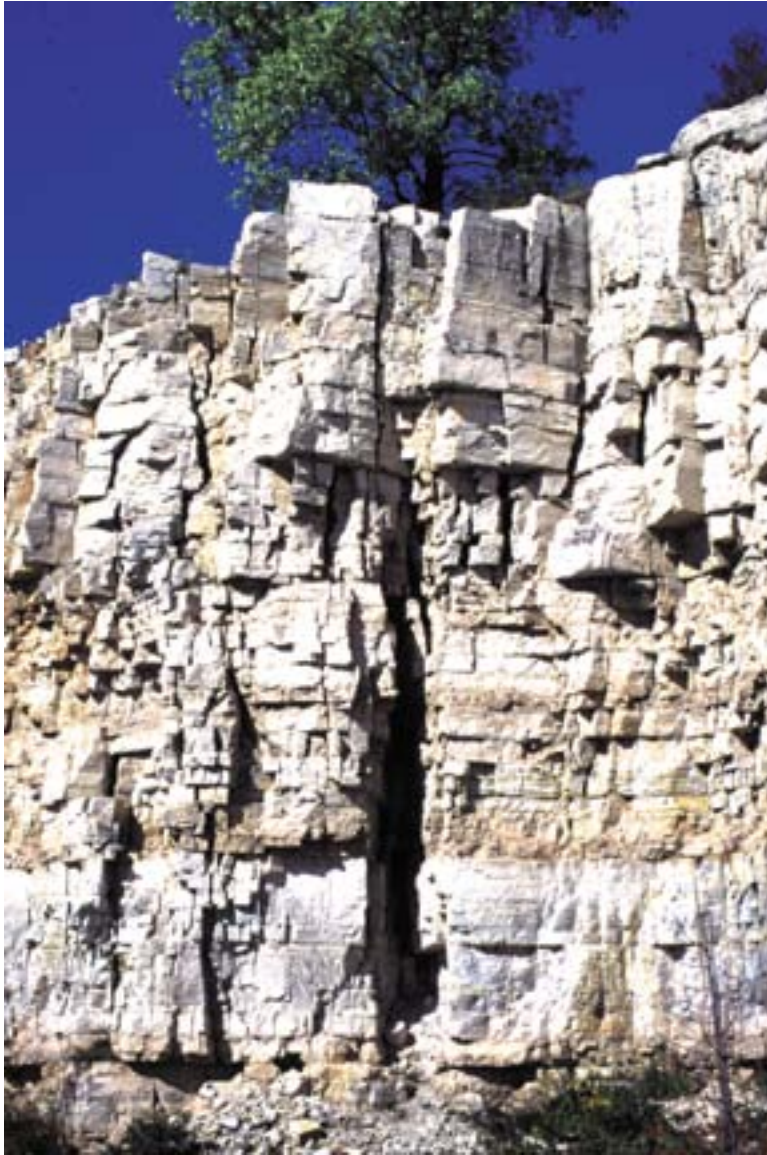


Manure Discharges

- Drainage tiles to surface waters
 - Pore structure does not allow adequate drainage
- Fractured bedrock
 - Subsoil and aquifer materials allow rapid movement of drainage waters to wells
- Surface runoff



Western Iowa



Photos: Wisconsin Geological and
Natural History Survey, UWEX

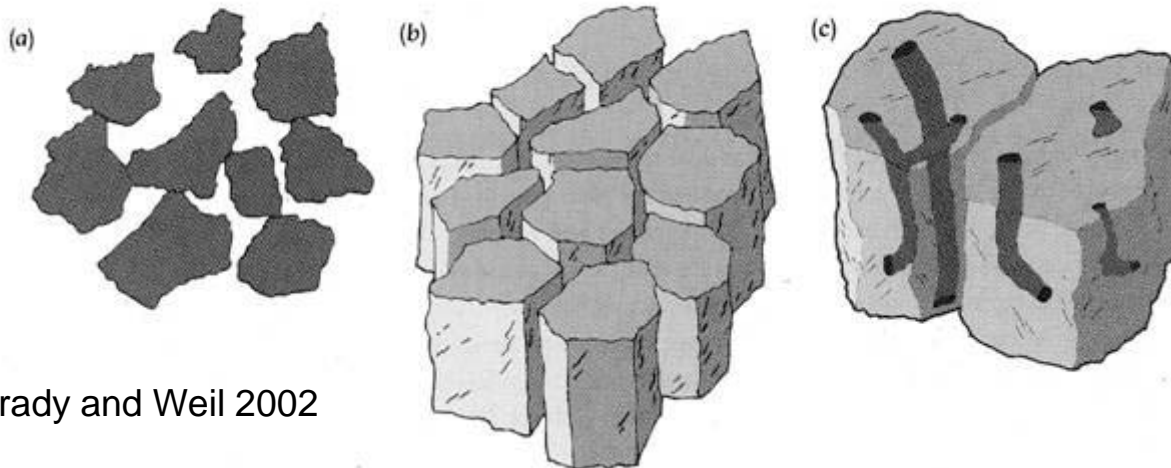
Problems Increasing?



- Brown, smelly water coming out the faucet
 - but also pharmaceuticals, pathogens, P
- More liquid manure!
- More rural non-farm eyes on the lookout?
- Maybe why some waters not improving?

Macropores

- Types: packing, interped, biopores
- Packing yields plant-available water
- Other 2 are freeways for water



Brady and Weil 2002



Biopores from roots,
showing staining from
surface OM, several feet
down, under Miami sil

B. Lepore



J. Postle

Drains: Blowing Smoke



- Blower and smoke generator attached to drain outlet demonstrates macropore connections to surface

Movies by Brian Holmes



Stars Fred Madison



Better dialogue



Mark Cain



Mark Cain

Worms and Drains

- Worms like well-aerated conditions above drains and disrupted soil
- Worms like food supply from manure and effects on structure
- Worms like no-till for cooler, moister, and residue for food

Macropores Drain

- Effective when lots of water around, then open after rapid drainage
- Heavy rain
- Ponded snow melt
- Injection zone? $15,000 \text{ gal/acre} = 0.5''$
 - But concentrated, and pressurized in injection zone

Tile Drains - Ohio Analysis

- 93 cases of manure through drains to surface waters--swine and dairy
- 2/3 no manure management plans; 3/4 of those who did were not following
- Surface vs injected - no pattern
- 0.05"-1.75", avg 0.6", but actual typically 2X reported

Causes - Ohio Analysis

- 75% attributed to mismanagement
 - Means many cases can be avoided?
- Usually combination of factors
 - Before heavy rain and/or wet soil
 - Drains running
 - Excessive application
 - Poor storage management

Fractured Bedrock

- Bedrock with few but large cracks can transport water long distances quickly
 - Door County...long a problem
- Sufficient soil cover generally thought to allow time for transformation

Juneau 2005



- Home wells yielded liquid manure early in 2005, days after spreading and subsequent melt
- Field permitted for manure spreading
- Excavated in May, soil to 16' still smelled of manure





B. Lepore

Preventing Juneau Case?

- Summer application?
- Deeper wells, properly cased and grouted?
- Larger well head protection zone?
- Better ag zoning?



Avoiding Rapid Manure?

- Probably can avoid many cases
- No applications when tiles flowing, heavy rain forecast, soil very wet
- Plugs and control structures on tiles
- Manure storage management
- Tillage??

Summary

- More liquid manure and more eyes seem to be increasing reported incidents of manure to discharge points
- Two settings discussed:
 - Tile drained fields
 - Fractured bedrock
- Greater care in field selection and manure management required?