Manure On The Move

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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

Brady and Weil 2002
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
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
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 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
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?