



Fact Sheet

Livestock Environmental Assurance Program - P.O. Box 182383 - Columbus, OH 43218 - 614-246-8288 - www.ohleap.org

Manure Management Issues, Challenges & Solutions Winter Application • Preferential Flow • Water Quality

Assuring Economic Viability via Environmental Responsibility

Preventing Manure from Reaching Surface water

What is preferential flow? By gravity, water and liquid manure moves downward through the soil profile following a path of least resistance. These pathways include deep cracks and crevices in the soil, old and new plant root channels, earthworm channels, and loamy soil texture. Some of these channels connect directly to subsurface drains and are a direct route to surface water. Melting snow and rain can turn solid manure into liquid manure. Liquid manure is 95 to 98% water, so it flows just like water. Anything that promotes drainage may enhance the flow of liquid manure to subsurface drainage outlets and into surface waters.

Ideal Manure Application Equipment should:

- Apply at low rates.
- Apply at low pressure.
- Apply manure evenly.
- Shallow incorporate manure.
- Be easy to calibrate.
- Spread large volumes of manure.



Top Ten Reasons for Liquid Manure Violations

98 Manure Violation Cases (2000-2003)

- 1) Excess Rain/Saturated Soils
- 2) Over Application or Application Error
- 3) Lack of Manure Storage
- 4) Ponding Manure/Excessive Irrigation
- 5) Tile Lines Flowing or Tile Plug Failure
- 6) Equipment or Storage Failure
- 7) Broken Tile or Shallow Tile
- 8) Dry Cracked Soils
- 9) Snowmelt
- 10) Earthworm Burrows



Need for Calibration of Manure Application Equipment

Farmers reported applying 0.6 inch/acre or 16,300 gallons per acre. Actual rate was 2 times higher than reported rate!



A project of the
Ohio Livestock
Coalition (OLC)



ODNR-Division of Soil & Water Conservation



OSU Extension



Ohio Federation of Soil & Water Conservation Districts



Ohio Department of Agriculture



Ohio Soybean Council
www.soyohio.org
Ohio Soybean Council

Irrigation

- Spreads large volumes of manure.
- Applies manure evenly if operated properly and calibrated.
- Calibration may be difficult.
- No incorporation of manure.
- Capable of excessive application rates.



Tanker with Injector

- Applies medium rates.
- Calibration may be difficult.
- Small loads – many trips.
- Wide knife spacing leads to excessive rates of manure applied to a small area.
- Liquid manure injected under high pressure into the soil has a greater chance of reaching tile lines.



Tanker with Surface Application

- Applies manure evenly if operated properly and calibrated.
- Applies medium rates.
- Calibration may be difficult.
- Small loads – many trips.
- No manure incorporation.
- Compaction may be a problem.



Dragline with Soil Fracturing Aeration Tool

- Spreads large volumes of manure. Applies manure evenly at low rates.
- Shallow manure incorporation.
- Calibration may be difficult.
- Higher cost/gallon of manure applied.



Possible Solutions

Management is the Key!

- Do not apply liquid manure before or after a heavy rain.
- Monitor manure storage and apply manure in a timely manner.
- Do not over apply manure above the Available Water Capacity (AWC) of the top 8 inches of the soil. See NRCS for details on determining the AWC of your soils. Follow your Comprehensive Nutrient Management Plan (CNMP) plan.



Reduce Manure Application Rates

- Reduce manure application rates if wet soil conditions exist to reduce ponding.
- Do not apply more than 1/2 inch or 13,000 gallons liquid manure per acre.
- Soils can absorb multiple smaller applications (1/4 inch or 7,000 gallons/acre) more effectively than large applications.



Inspect Tile Outlets

- Locate all tile lines before manure application.
- Do not apply manure if tile lines are flowing!
- Inspect tile lines regularly during and after application.
- Repair broken tile lines.



Disrupt Macropores & Manage Soil Cover

- Till soil 3 to 5 inches to disrupt macropores such as cracks, root channels, and earthworm burrows.
- Maintain 90% crop residue cover or use cover crops.



Calibrate & Maintain Equipment

- Calibrate equipment before manure applications.
- Keep equipment in good repair and operating condition.



Suggested Setback Distances

- Ditches 100 feet
- Waterways 100 feet
- Broken tile 100 feet
- Residence 300 feet
- Drinking Water 300 feet



Control Structures Versus Tile Stops

- Control structures installed with tile lines allow for management, monitoring and cleanup of manure in tile lines.
- Failure rate on tile stops or tile plugs is about 50%.



Water Quality Data

- Agriculture is the leading source of fish kills in Ohio. In the last 30 years, total fish kill cases from all sources decreased 37% (from 2,330 to 1,473 per decade), but the number of fish kills due to agriculture increased 72% (from 180 to 311 per decade).
- In 31 manure violation cases, ammonia levels were 50 times higher downstream versus upstream (50.70 versus 0.94 mg/L) of a manure spill. Fish start to die at low ammonia levels.
- Liquid manure is 95 to 98% water, so it flows like water. Anything that promotes good drainage may enhance the flow of liquid manure to subsurface (tile) lines and surface water. Do not apply manure if tile lines are flowing!



Water Quality Data at Outlet

Downstream and Upstream of Manure Spills

Water Test	Downstream	Upstream	Cases
BOD ⁵ ¹	627.30 mg/L	3.73 mg/L	18
Ammonia ²	50.70 mg/L	0.94 mg/L	31
Total P ³	42.52 mg/L	10.51 mg/L	22

¹ Five-Day Biological Oxygen Demand, EPA target is less than 10 mg/L.

² EPA Upper Limit is 13 mg/L

³ Total Phosphorous, EPA target is 0.17 mg/L.

Original funding source: US EPA Non-point source management program pursuant to section 319h of the Federal Clean Water Act as amended 1987.

Current funding source: partially funded by a grant from the Ohio Department of Natural Resources, Division of Soil and Water Conservation.

Special project funding source:
Ohio Soybean Council

