

Keeping Land-applied Manure in the Root Zone

Part 2: Tile-drained Land

MICHIGAN STATE
UNIVERSITY
EXTENSION

Management strategies that keep applied manure in the root zone will make the nutrients available for the next crop, improve soil quality, and prevent manure nutrient and contaminant loss to the environment. The idea of keeping manure in the root zone is quite simple, but in practice it can be quite challenging as weather, soil and site-specific field conditions vary. **The challenge for a livestock producer is to apply the manure in a way that is labor-efficient, cost-effective and environmentally responsible. When liquid manure is spread on tile-drained land, it can move to the tile lines through wormholes, root channels, cracks in the soil and other macropores.** High application rates and highly flowable liquids such as milking center waste water generally cause more problems than thicker slurries with a high solids

content. Spreading on tile-drained land requires special efforts to prevent manure loss through subsurface drains.

The single most important tool in preventing manure nutrient and contaminant loss to the environment is your knowledge of your fields. When manure is applied on tile-drained land, the tile outlets should be monitored before, during, and after spreading. **The best land application plans are custom designed on a field-by-field basis.** These plans are developed within the context of established best management practices and fine-tuned for each field by using a process of *application*, careful *observation* and *evaluation* of the results. Apply manure, observe what happens, and evaluate the effectiveness of capturing manure in the root zone, where it will be a benefit to your cropping system rather than a hazard to society.

Evaluate the Risk of a Tile Line Discharge

- The first step in creating a field-by-field land application plan is to evaluate each field. Any field where subsurface tile drains discharge into ditches that flow to surface water should be monitored carefully before and after land application.
- Although a discharge could happen in any field, farmers report that problems are more likely with high application rates and highly flowable liquids such as milking center waste water.
- High application rates increase the probability of a discharge.
- No-till fields often have more wormholes and root channels than more conventionally tilled fields. An abundance of such large pores increases the likelihood of manure loss through tile lines.
- Clay soils (soil management groups 0, 1, 1.5 and 2.5) tend to shrink and crack. Soil cracks may provide a direct route to subsurface drains.



- Slurry injection is not a sure solution. Manure has been found in tile lines within minutes of injection with sweep injectors.

GAAMPs Helpful in Preventing a Tile Line Discharge

You can download a printable copy of the generally accepted agricultural management practices (GAAMPs) with a more detailed explanation from <http://www.michigan.gov/mda>.

- Application rates should be based on the ability of the soil to accept and store water and the ability of plants to utilize nutrients.
- Manure should be uniformly applied and the amount applied should be known.
- Liquid manures should be applied in a manner that will not result in ponding or runoff to adjacent property, drainage ditches or surface water.
- Records should be kept of manure analysis, soil test reports and rates of manure application for individual fields.

Actions to Prevent a Tile Line Discharge

- Excessive application rates increase the chance of runoff and a tile line discharge. Calibrate manure spreaders and verify that the calibrated rate is the rate that is actually applied to the field. *Use observation and evaluation to determine the appropriate application rate for your fields. On some fields, the right rate may be considerably less than the allowable rate based on manure nutrient content.*
- Use soil and water conservation practices such as crop residue management and grassed waterways to prevent local ponding and overland flow. Local ponding can funnel wastewater to tile lines through macropores.
- Use surface tillage to disrupt the continuity of wormholes, macropores and root channels and reduce the risk of manure reaching tile lines.
- Avoid applying manure to tile-drained fields when the tiles are flowing.
- Manure with high solids content is less likely to move off site. Separate lot runoff, milking center waste water and other water sources from the herd manure stream and handle them separately.



Surface tillage is one method to reduce the risk of manure reaching tile lines.

- **Apply, observe and monitor tile outlets, evaluate the results, and make adjustments as needed to develop a site-specific land application plan.** Match the manure application rate with soil infiltration rates and water-holding capacity.
- Make more frequent, lower rate applications rather than a single heavy application.
- Should a discharge occur, have a plan for dealing with manure that may reach tile lines, such as blocking outlets or blocking the flow once it reaches the ditch.
- Surface applications with rapid incorporation may be the best choice on land with subsurface drainage. Conservation tillage before spreading will create a rough, permeable surface. Injection may actually increase problems by placing the manure closer to the tile lines.
- Decrease the manure application rate, and avoid spreading in the rain or when rain is in the forecast.
- Read, understand and adopt the *GAAMPs Manure Management*. These will help build the foundation of your site-specific manure land-application plan.
- Permitted farms will find specific setbacks, monitoring and record-keeping requirements within their permits.

In the event of a manure release to surface waters, call the Pollution Emergency Alerting System, 1-800-292-4706.

Funding for making these available from CSREES Great Lakes Regional Water Program.