

Manure Management and Water Quality: Nutrients, Pathogens and Regulations

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My Agenda

- Relate intensification trends in livestock production to manure management
- Show links between manure management and water quality: nutrients and pathogens.
- Present scenarios for mitigating environmental impacts from manure
- Review DNR permits and regulations for CAFOs

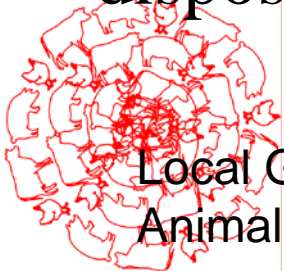


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Consequences of Livestock Production Intensification

- Nutrient surpluses created on livestock farms
- Increased separation of crop and livestock production
- Decline in acreage of on-farm cropland available for land spreading manure
- More livestock operations closer to urbanizing areas
- Increased costs and labor for manure storage and disposal



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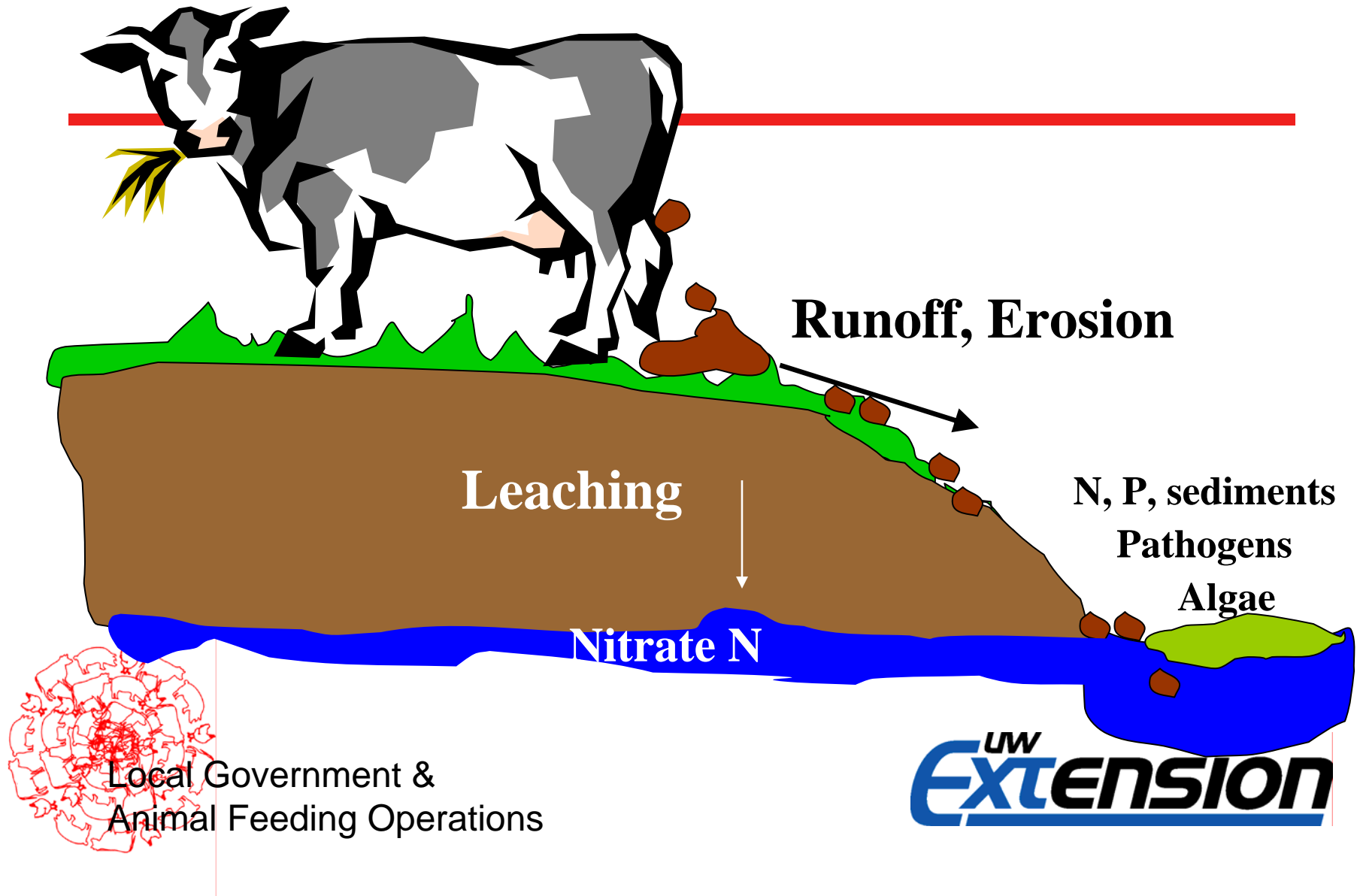
What is the connection between livestock production and non-point pollution of surface and ground waters?



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Non-point Pollution from Livestock Manure



Manure Nutrients: Nitrogen

- **Manure N can leach into ground water : major form of concern is nitrates (NO₃-N)**
- **Health concerns related to methemoglobinemia (“blue baby” syndrome) and possible links to GI cancers**
- **Drinking water standard is currently 10 ppm NO₃-N**
- **N can be dissolved in runoff—link to Gulf of Mexico “dead zone.”**
- **Manure applied to soil surface can be lost as ammonia (NH₃) gas (acid rain) and nitrous oxide (greenhouse gas)**



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Manure Nutrients: Phosphorus

- **Unlike N, P conserved in soils; tends to build up from repeated manure applications**
- **P can move off ag. fields both in dissolved form (runoff) and attached to soil particles (erosion)**
- **Dissolved P concentrations in runoff from manured fields typically 0.1-1 ppm**
- **P concentrations >0.02 ppm cause algal blooms in fresh surface waters**
- **High concs. of P in surface waters linked to human pathogen outbreaks (Pfiesteria in East Coast)**



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Approaches to Minimize Farm Nutrient Contributions to Non-point Pollution

- **Nutrient budgets for inputs, outputs and manure**
- **Change animal diets to lower available N and P contents**
- **Accurate land spreading of manure on fields with nutrient needs**
- **P versus N based manure application rates**
- **Manure handling and storage systems that simplify recovery of manure nutrients and provide greater flexibility for spreading manure on ag. fields**

Move manure off farm or process manure to add value

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Pathogens Associated with Livestock Farms



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Livestock Agriculture as Source of Pathogens to Watersheds

- Major pathogens include bacteria, viruses and protozoa
- Risk depends on BOTH pathogen presence and ability to survive in environment--survival outside water very low
- Ruminant (cattle) manure identified as potential source of Cryptosporidium, Giardia, E. coli O157
- Animals from young stock represent highest potential risk to environment



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Assessment of Pathogen Contamination

Source of pathogen contamination cannot be determined **ACCURATELY** without use of advanced and expensive genetic typing systems.

Therefore, difficult to distinguish relative contributions of pathogens from ag. and non-ag. activities.



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Management Recommendations to Control Pathogens

- **Adopt farm biosecurity practices**
 - use clean water
 - avoid manure transport among farms
- **On-farm water treatment to kill pathogens**
- **Restrict movement of contaminated feces into water courses**
 - prevent runoff from barns, exercise lots
 - separate calf manure from adult manure
- **Use composting or heat treatment to kill pathogens**



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Permits and Regulations



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DNR-related analyses/permits

- Environmental Analysis/Assessment
- WPDES-Wisconsin Pollutant Discharge Elimination System
- Storm Water Construction Site Permit
 - If disturbing > 5 acres
- High-capacity well permit
 - May be public well if serving >25 people



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Environmental Analysis/Assessment

- EA is required before some permits granted, including WPDES; BUT HAS NO REGULATORY BEARING
- Includes assessment of building sitings, nutrient management plan, determination of point source discharge of pollutants
- If found to be point source discharge, can trigger need for Environmental Impact Statement (EIS)



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WPDES permit

- Delegated authority from USEPA (required by Clean Water Act for point source pollution prevention)
- About 100 currently issued and 10 pending
- Never denied for WI CAFOs, but terms of the permit must be negotiated



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Steps in WPDES process

- Livestock facility operator supplies info to DNR for EA and WPDES permit (takes at least 6 months)
- Preliminary Manure Management Plan submitted
- Public Notice given on EA and permit
- Plan and Specification review required before construction starts



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What does a WPDES permit do?

- **Provides public disclosure**
- **Manure storage structure plans checked**
- **Increases likelihood that farm nutrient management plans are sound**
- **At minimum, plans based on NRCS 590 Standard (N-based manure application rates)**



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DNR Authority vs. Local Governments

- DNR has regulatory authority **ONLY** for water quality aspects of the CAFO (WPDES permit)
- DNR recommends that local government officials set their own policies/ordinances **BEFORE** their permit process begins



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