

Manure

farming & healthy fish habitat

A complete nutrient management plan will ensure crop nutrient needs are met over the long-term and will protect the aquatic environment.



A resource on the land . . .

Over 35,000 livestock farms produce manure in Ontario. This resource may be used profitably in the production of many crops to:

- ✓ improve crop yields,
- ✓ add organic matter to improve the soil's water and nutrient holding capacity,
- ✓ enhance soil porosity for better aeration and drainage,
- ✓ reduce runoff and soil erosion potential through improved soil structure,
- ✓ encourage growth of beneficial soil organisms.

The nutrient value of manure may vary greatly and should be determined on a regular basis by chemical analysis. Careful management of manure nutrients can significantly reduce fertilizer costs, putting money in the farmer's pocket.

When manure is not properly handled it can result in a spill, polluting surface water and groundwater. Problems may occur during any of the steps of manure management including: collection, transfer, storage and application. If a manure spill reaches a stream it can create serious problems for aquatic life as well as for people and livestock.

Most manure spills are due to:

- ▶ manure tanker overflowing during loading,
- ▶ overflowing failed or leaking manure storage,
- ▶ manure irrigation pipes leaking or being disconnected,
- ▶ over-application with manure irrigation systems,
- ▶ improper transportation

Most spills occur during manure application. To prevent manure from contaminating watercourses, it is important to consider the following:

- ✓ pre-cultivate when soil is dry and tiles running,
- ✓ apply at low to moderate rates when the land is dry,
- ✓ apply at rates that meet the nutrient needs of both crop and soil,
- ✓ use leak-proof irrigation connections and shut-off equipment,
- ✗ do not apply on soil that is wet or frozen, or when rainfall is forecast,
- ✗ avoid locations close to watercourses or floodplains, or that are flood-prone,
- ✗ avoid sloped areas where runoff to watercourses could occur.



The Livestock Manure Pollution Prevention Pilot Project was established to develop approaches to protect aquatic habitat and water quality and prevent fish kills by reducing manure spills and runoff from livestock operations.

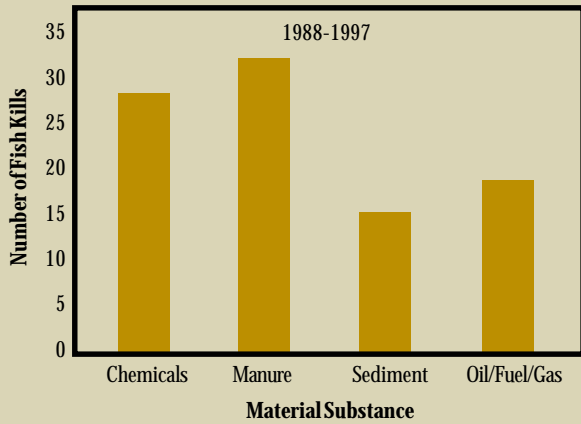
The Working Group includes representatives from the agricultural community, government and academia.



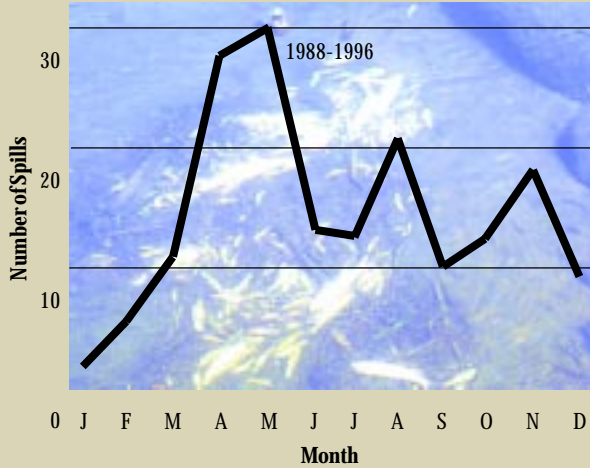
The challenge: keep manure on the land...

Since 1988, Ontario's Ministry of Environment and Energy has maintained a spills data base which includes a record of reported manure spills and related fish kills. The Livestock Manure Pollution Prevention Pilot Project Working Group has analysed the data to identify concerns and develop solutions to prevent spills. The Working Group members agree that improved manure management is crucial to a healthy economy and environment.

The leading causes of reported fish kills in Ontario.



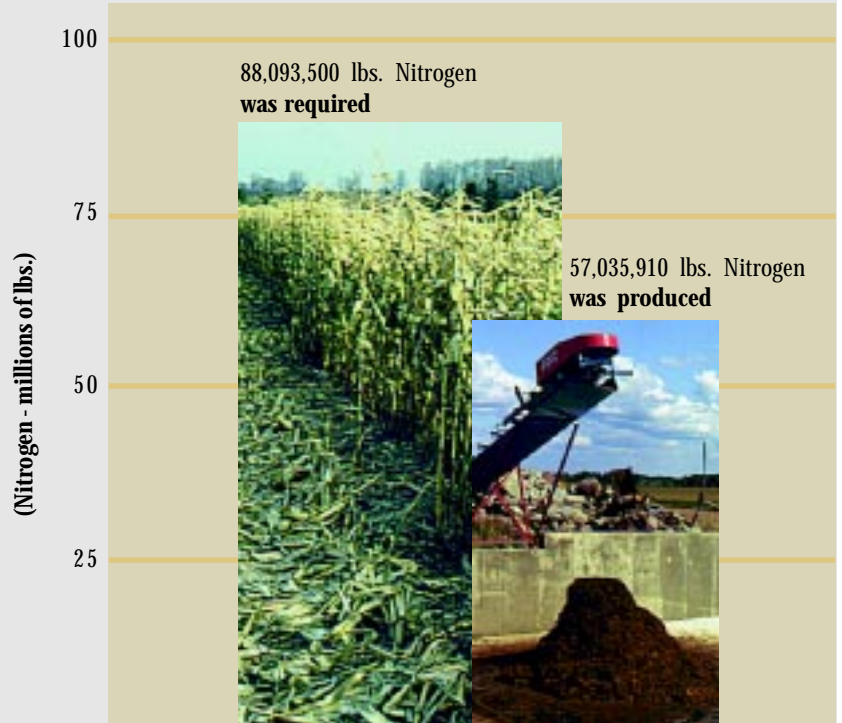
Most reported manure spills occurred during application.



From 1988 to 1996 in Ontario, 207 manure spills were reported. Of these spills, 175 were reported in Southwestern Ontario:

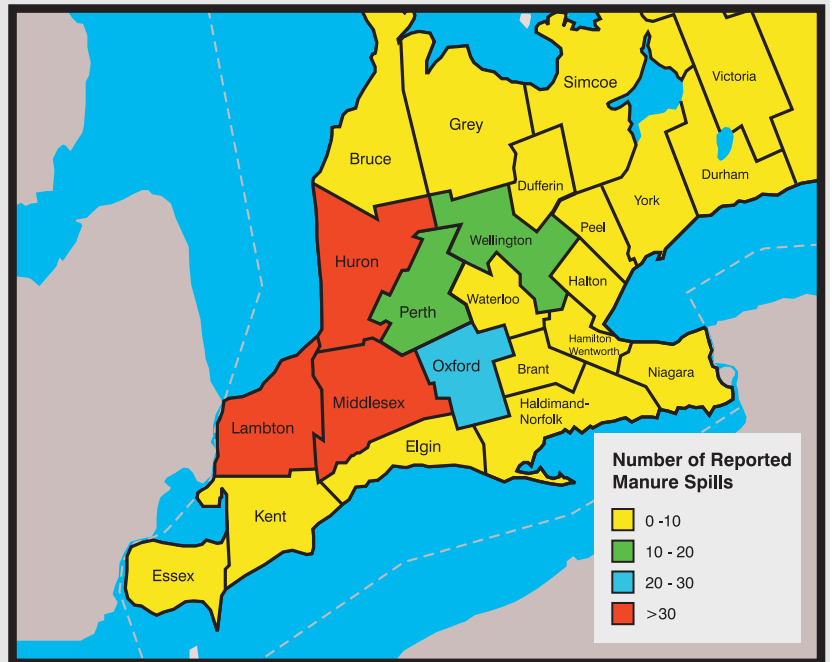
- ▶ 14% resulted in fish kills,
- ▶ all but one were from liquid manure systems,
- ▶ 12% were caused by inadequate storage capacity,
- ▶ over 40% resulted from liquid manure irrigation; the remainder were from equipment and transfer problems,
- ▶ 60% involved tile drains.

1995 Corn Nitrogen requirements and Total Nitrogen from Livestock Manure in 5 Ontario Counties.



Nitrogen from manure production could satisfy 65% of the nitrogen for corn production, based on data from Oxford, Waterloo, Middlesex, Perth and Huron Counties (OMAFRA, 1995).

...and utilize the nutrients!



County Location and Numbers of Manure Reported Spills, 1988 - 1996

Source: MOEE spills data, 1997.

... where crops can use it!

Aquatic organisms, like all living beings, require clean water, oxygen, food and space to survive. When manure enters a stream or other waterbody, the impacts may include:

- ▶ bacterial contamination,
- ▶ oxygen depletion,
- ▶ nutrient enrichment, promoting excessive plant growth and subsequent disruption of the oxygen regime,
- ▶ poisoning of fish and other aquatic life,
- ▶ the destruction of fish habitat.

A large spill may completely destroy all aquatic life. Over time, frequent smaller spills may have an even greater impact on the stream. These spills change a healthy stream, with a large diversity of aquatic life, into an unhealthy stream dominated by large populations of only a few organisms.

Clean Water

Manure can temporarily make the water in a watercourse toxic to fish, due to its high level of ammonia. Even at low concentrations, ammonia will kill fish and other aquatic organisms. Manure may also harbour bacteria, parasites and viruses that can harm aquatic life and jeopardize the health of downstream water users.

Oxygen

Fish often suffocate when manure enters a watercourse. This occurs because bacteria consume all available oxygen as the manure is broken down. The nutrient-rich manure encourages the growth of aquatic plants, which also deplete the oxygen supply. When algae and plants die and decompose, even more oxygen is used. Streams with low oxygen levels simply cannot support most species of fish and aquatic insects. Although some aquatic vegetation is desirable as fish habitat, too much can hinder the movement of fish and other aquatic life.



Manure is a tremendous resource for the farmer, but if not managed properly will not be utilized by crops such as corn, but instead could result in an algae bloom.



Space

Manure entering a watercourse can degrade water quality and harmfully alter feeding and spawning areas.



Fish species such as bass and trout, along with their food sources such as damsel flies, can be affected by manure spills.



Looking for Solutions

The role of the Working Group is to:

- ▶ enhance communication and partnerships between industry, government and academia,
- ▶ provide a forum to encourage practical ideas about manure management and to promote research,
- ▶ organize pilot projects and demonstration days,
- ▶ produce booklets on best management practices,
- ▶ encourage Ontario farmers to adopt best management practices and strategies to reduce manure spills and resulting fish kills.

Initial funding for the Working Group is provided by Environment Canada. Secretariat services are provided by the Upper Thames River Conservation Authority.

Working Group Partners

Agriculture and Agri-Food Canada
Environment Canada
Ministry of Agriculture, Food and Rural Affairs
Ministry of Environment and Energy
Ministry of Natural Resources
National Agriculture Environment Committee
Ontario Cattlemen's Association
Ontario Federation of Agriculture
Ontario Pork
Ontario Soil and Crop Improvement Association
University of Guelph
Ontario Farm Environmental Coalition

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Current Research and Demonstration Activities:

1. Development of practical, precision manure application technology to minimize contamination of tile drain water and optimize manure nutrient utilization.
Contact: Dr. Greg Wall, Agriculture and Agri-Food Canada, Guelph, (519) 826-2086.
2. The use of low trajectory, hydrant manure application systems to minimize odours and increase application efficiency.
Contact: Don Hilborn, P.Eng., OMAFRA, Woodstock (519) 537-6621.
3. Practicality of plugging tile drains to prevent manure discharge to surface water.
Contact: Ron Fleming, P.Eng., University of Guelph (519) 674-1500.
4. The use of vegetated filter strips to treat barnyard runoff.
Contact: Ann Marie Weselan, Metro Region Conservation (416) 661-6600 ext 323
The use of constructed wetlands to treat barnyard runoff.
Contact: Brad Glasman, P. Eng., Upper Thames River Conservation Authority (519) 451-2800 ext 251
Claude Weil, P.Eng. Alfred College (613) 679-2410.
5. NMANPC97 Nutrient Management computer program planning tool.
Contact: Don Hilborn, P.Eng., OMAFRA, Woodstock (519) 537-6621.

Photo credits: Agriculture and Agri-Food Canada, Ontario Ministry of Natural Resources, The Upper Thames River Conservation Authority.