



Minnesota  
Pollution  
Control  
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# Effects of Feedlots on Ground Water Quality

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## **Why is the Ground Water Monitoring and Assessment Program (GWMAP) interested in manure-management issues?**

In 1997, staff from the GWMAP and the Feedlot Program of the Minnesota Pollution Control Agency (MPCA) began to discuss information needs related to impacts of manure management on ground water quality. The MPCA regulates feedlots, and regulated parties are conducting water monitoring at 20 sites. However, the MPCA would like to collect additional information on the impacts to ground water from concrete, earthen and geotextile-lined manure-storage facilities as well as from open lots. A variety of methods for collecting and assessing ground water quality will be used (these methods are described below).

## **What is the role of GWMAP staff in manure management?**

GWMAP staff collect water quality information. Our role is to assess the effectiveness of manure management in protecting ground water quality. We install both permanent and temporary monitoring networks around feedlots and manure-storage basins. We sample for a variety of chemicals, such as nitrogen, phosphorus, chloride and sulfate. An

important aspect of our sampling is to assess the comparative risk of manure management. This means we evaluate potential human and ecological impacts from manure management and compare them to impacts from other human activities, such as use of fertilizers and septic systems. To accomplish our objectives, we work closely with Feedlot Program staff to insure that our investigations meet their informational needs.

## **What are the objectives of the studies that GWMAP is conducting to learn more about manure-management issues?**

The objectives of the three studies that GWMAP is involved in are:

**Objective 1: Assess water quality adjacent to older, concrete-lined storage pits, earthen-lined pits and open feedlots.** We will sample five sites from each of these categories. The sites must be older than five years. Initially, sampling will be conducted on coarse-textured soils overlying shallow aquifers, since ground water beneath these soils is sensitive to contamination. At each site, we install temporary wells to define the extent of ground water contamination resulting from leakage through the pits or feedlots.





**Objective 2: Evaluate the effectiveness of different types of new liners in protecting ground water quality.** These are sites where new storage systems are being constructed. Permanent well networks monitor the change in water quality over a period of several years. Storage systems include concrete, earthen and geosynthetic liners.

**Objective 3: Monitor volume and quality of water seepage below cohesive soil-lined manure-storage structures.** The U.S. Geological Survey (USGS) and the MPCA Feedlot Program established one site in 1993 and two sites in 1996, where macrolysimeters collect seepage water. We collect monthly discharge volumes and water quality samples at two-month intervals.

**What work on manure management has GWMAP completed?**

**Objective 1:** Sampling occurred in autumn 1997 at an open feedlot containing 80 dairy cows. A second site — a hog operation with an unpermitted, earthen-lined basin — was sampled in autumn 1998. We collected 22 and 13 samples, respectively, from temporary wells at these two sites. Five additional sites were sampled in the spring of 1999. Four of these sites had clay-lined pits with dairy cattle, and a total of 44 samples were collected from these sites. Sampling also occurred at a dairy and hog operation that had a concrete-lined pit. We collected 10 samples at this site.

**Objective 2:** In 1997, we established a permanent network around an open feedlot with 80 dairy cows. That same year, the owner installed a manure-storage pit with a geosynthetic liner (consisting of bentonite between fabric). We completed quarterly sampling in 1998. A second study began in autumn 1998 at a 300-hog operation with a concrete-lined basin, established in an area with no previous history of animal management. Quarterly sampling is occurring at both sites in 1999.

**Objective 3:** The USGS sampled two of the macrolysimeters in 1997 and 1998. A report is being completed to summarize data from these two years of

sampling. GWMAP assumed responsibility for the macrolysimeters in 1999 and began sampling in January, working in conjunction with county staff.

**When will some information be available?**

GWMAP hopes to complete sampling in 1999 to determine ground water quality beneath several types of manure-storage pits. Data from this study should be available by spring of 2000. A report being completed by the USGS summarizes information from two of the three macrolysimeter sites. Information from long-term studies will not be available for several years. In 2000, we will begin producing annual reports summarizing our activities.

**What are GWMAP's plans for 1999?**

**Objective 1:** We hope to complete sampling at an additional 13 to 18 sites in 1999.

**Objective 2:** We will conduct quarterly sampling at the two sites where we have permanent monitoring networks. Additional sites will be added eventually.

**Objective 3:** Discharge volumes at the three macrolysimeter sites will be measured monthly in 1999. Water quality sampling occurs at two-month intervals.