Enabling Grass-Roots, Intensive, Runoff Water Monitoring Projects: The North Dakota Discovery Farms

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Science for a changing world

Abstract

Like many states, North Dakota has focused much of its ecosystem improvement efforts on decreasing the negative risks associated with livestock manure runoff. Regulations have been imposed and significant cost share dollars have been made available for producers to better manage livestock facility runoff. North Dakota producers, regulators, academics and conservation managers all agreed that regulations and recommended best management practices are primarily based on assumptions. By building a grass-roots team of affected individuals, North Dakota implemented a statewide intensive runoff water monitoring project to test these assumptions. The project is modeled after the Wisconsin Discovery Farms and recruited three livestock operations willing to allow monitoring of edge of beef feedlot runoff and tile drainage impacts at the sub-watershed scale. The producers will be the primary source of innovation to address any issues discovered through monitoring. The project is a combined effort of the producers, NDSU, USGS and the North Dakota Department of Health.

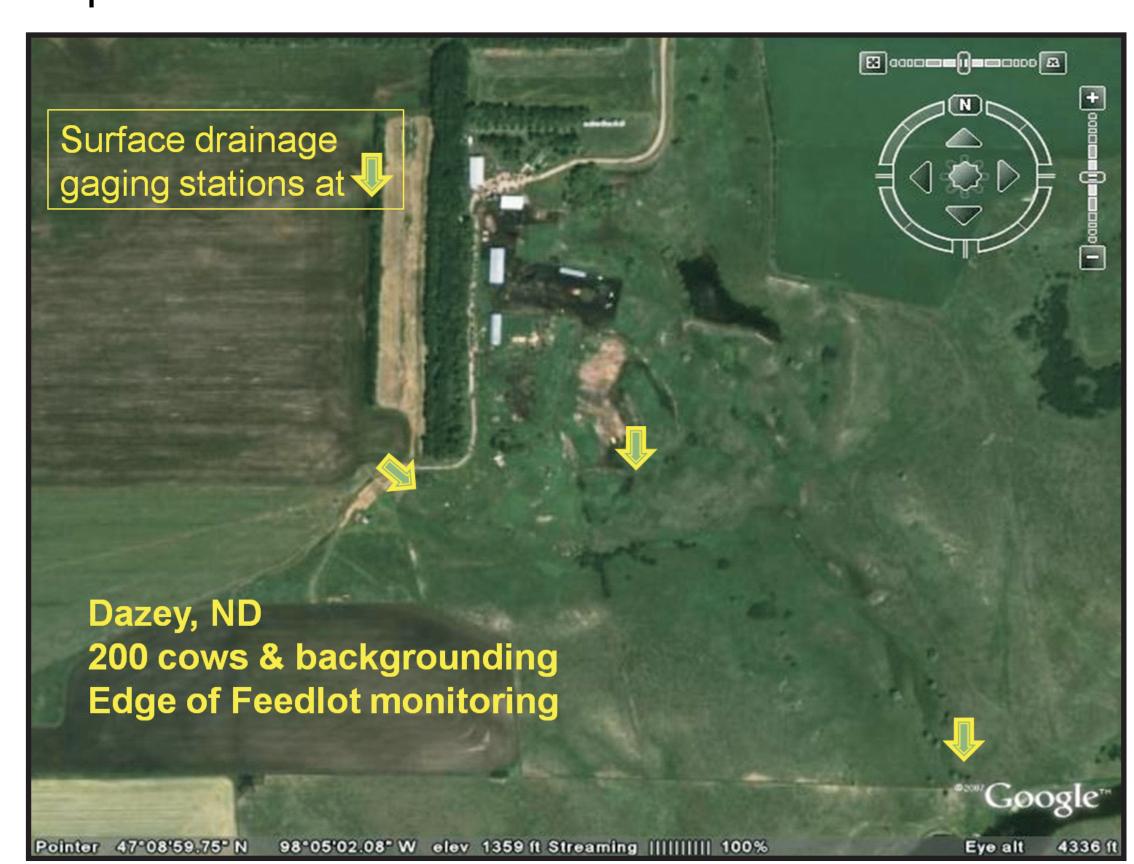


Figure 1. Aerial photo of feedlot and field surface runoff monitoring stations at location 1.

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Introduction

North Dakota has a well developed set of regulatory policies addressing runoff from animal feeding operations (AFOs). However, most of the regulatory policies were developed using broad assumptions from a limited amount of environmental data. The North Dakota Discovery Farms Program was initiated to collect data from working agricultural operations to measure the quality of runoff water from agricultural lands and livestock feeding areas as well as document the effectiveness of producer-driven solutions to any identified water quality impacts.

Figure 2. Aerial photo of feedlot and field surface runoff monitoring stations at location 2.

ND Discovery Farms Goals

- Encourage responsible livestock development while protecting our natural resources.
- Ensure a coordinated approach of regulatory practices and policies.
- Document and quantify environmental impacts of farming practices.
- Provide unbiased, reliable information on the relationship between agricultural production and natural resource management.
- Provide enhanced communication between farmers, researchers, educators, the general public and regulatory agencies.
- Establish a network of working farms to evaluate existing and new/innovative agricultural land use practices.
- Provide a platform for agricultural systems research.

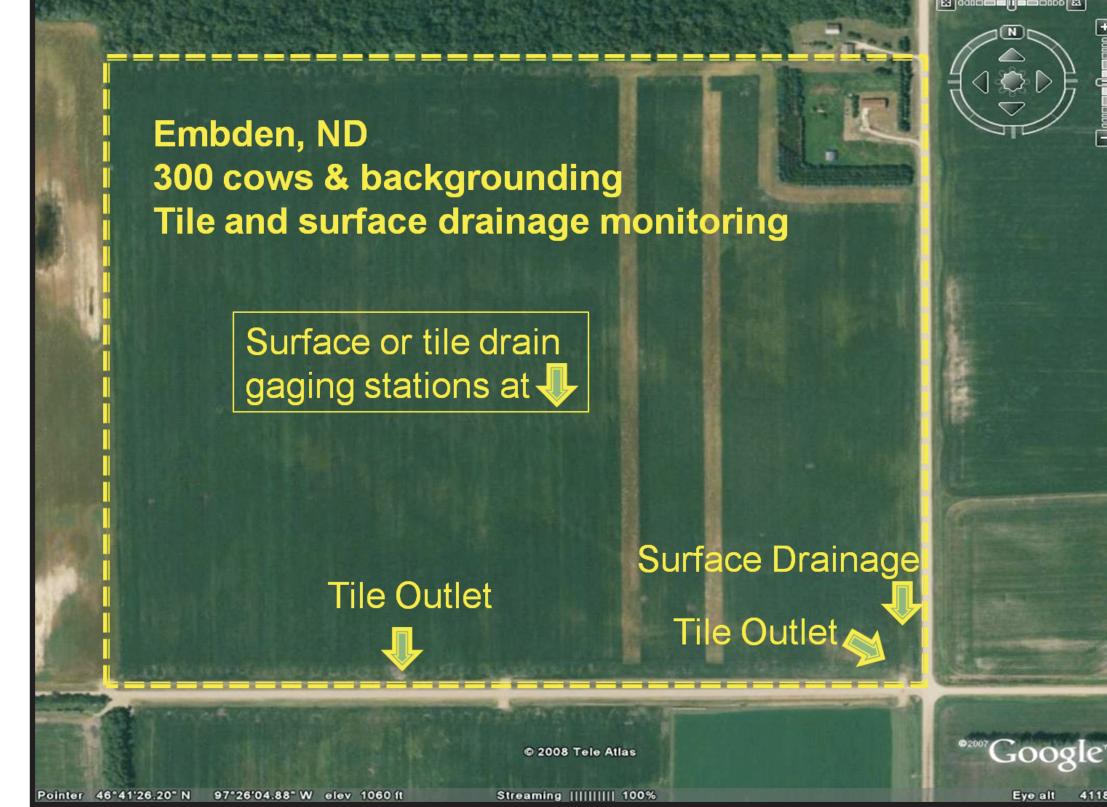


Figure 3. Aerial photo of field surface runoff and tile drainage monitoring stations at location 3.

Project Implementation

Following a model developed in Wisconsin, a steering committee consisting of producers, commodity groups, researchers, technical service providers, regulators, and other state agency personnel met in mid-2007 to decide what issue to focus on and select the core farms. The environmental impact of runoff from small to medium animal feeding operations was chosen as the focus of the project. Volunteer farms were identified through EPA 319 watershed projects that represented a broad geographic area with possible water-quality impact.

Each cooperator is expected to be involved in the project a minimum of five years. If a waterquality impact is identified, the producer is the person who will decide what action to take and monitoring will continue.

Figure 4. Gaging station that includes flume, ISCO sampler and data transmission equipment.

Sampling Protocol

- Sampling for: nutrients total and dissolved nitrogen and phosphorus, chloride, total suspended solids, bacteria, conductance, and suspended sediment
- Water-quality samples collected and stored by refrigerated Isco 4700 Automated Samplers until retrieved by USGS personnel
- Water-quality samples collected by setting the sampler threshold to a predetermined "trigger" stage
- As water from a storm event or snowmelt flows through a flume, the sampler begins to collect volumetric amounts at a predetermined rate for the duration of the event.
- Samples prepared by USGS North Dakota Water Science Center Lab and analyzed by the North Dakota Department of Health and USGS lowa Sediment Lab
- Also collecting: stage (height of flow), discharge (amount of flow), air temperature, wind speed, wind direction, precipitation, relative humidity, soil moisture and temperatures for four depths



Figure 5. Runoff during spring 2009 snowmelt exiting H-flume.

Cooperators

- Kim and Denise Amann
- Doyle and Patsy Johannes
- Kent and Sandy Bartholomay
- NDSU Agricultural Experiment Station
- NDSU Extension Service
- USGS North Dakota Water
 Science Center
- ND Department of Health
- ND Water Commission

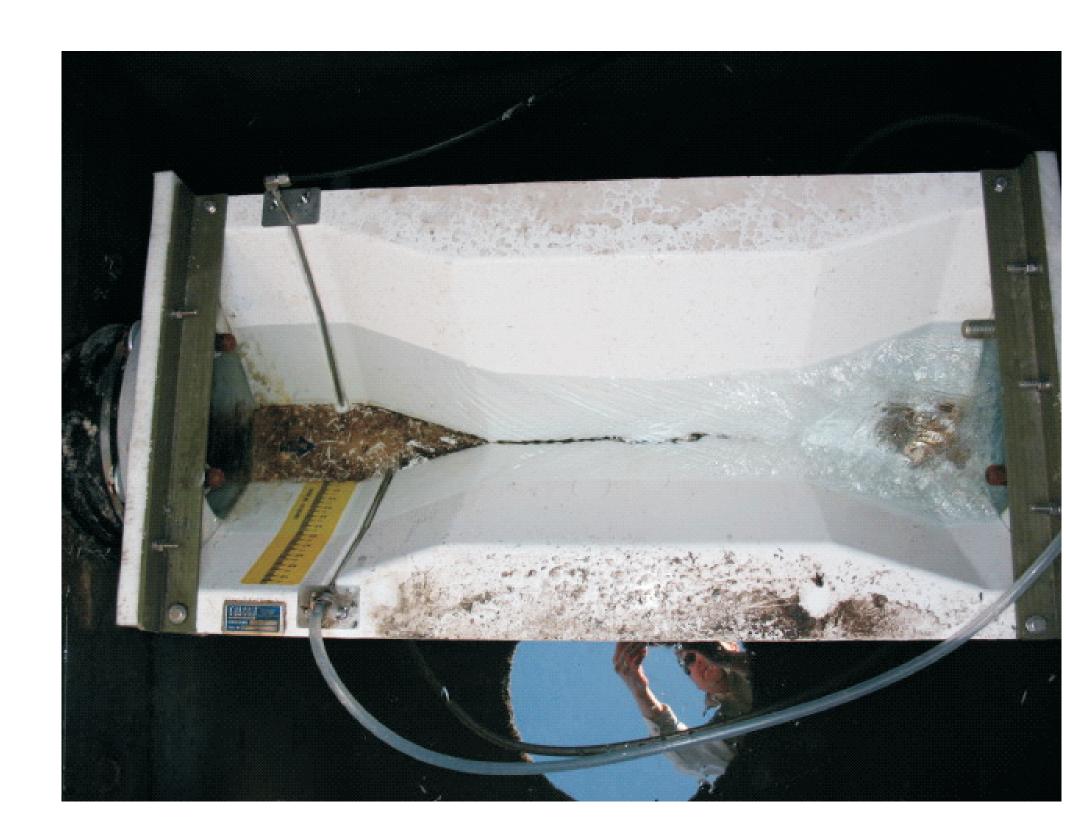


Figure 6. Trapezoidal flume and sampler line installed in-situ in tile drainage line to determine flow and constituent load conditions of tile drainage.

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