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

R. J. Wiederholt, Nutrient Management Specialist, North Dakota State University
K. M. Macke-Rowland, USGS Hydrologist, North Dakota United States Geological Survey
W. C. Damschen, USGS Hydrologic Technician, North Dakota United States Geological Survey

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 measuring 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.

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 instigated 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.

ND Discovery Farms Goals
- Encourage responsible livestock development while protecting our natural resources.
- Ensure a coordinated approach of regulatory policies and practices and 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.

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

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 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 Iowa 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

Cooperators
- Kim and Denise Amann
- Doyle and Patsy Johannes
- Kent and Sandy Bartholomay
- NDSU Agricultural Experiment Station
- NDSU Extension Service
- USGS North Dakota Water

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

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

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

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

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