

# Research Briefs: Controlling Runoff from Beef Feedlots using Vegetative Treatment Systems

By Robert Burns, Lara Moody, John Lawrence, Matt Helmers, Iowa State University

## Research Purpose

The objective of this project is to evaluate, through field monitoring, the performance of vegetative treatment systems (VTSS) on six NPDES permitted Iowa beef feedlots ranging in size from 1200-5500 head. These are the first NPDES permitted VTSS on CAFOs in the U.S. Vegetative treatment systems include a settling basin releasing to a vegetative infiltration basin combined with a vegetative treatment area or a settling basin releasing to a vegetative treatment area. A three year evaluation of these systems includes a feasibility assessment of vegetative treatment systems in Iowa as an alternative to traditional containment to control feedlot runoff, and an assessment of the Iowa State University developed models as a method to design and model these systems.

## Activities

The feasibility assessment is being made using data collected to quantify contaminant concentrations and annual mass flow from treatment areas receiving settled feedlot runoff. Each of the sites is equipped with automated sampling and monitoring equipment. Sampling occurs on an event basis and includes flow measurement to calculate mass of ammonium, nitrate, total kjeldahl nitrogen, biochemical oxygen demand, chemical oxygen demand, total solids, total phosphorus, orthophosphate, chloride, pH, and fecal coliforms. Site specific data are compared to predicted values generated through the design models on an annual and event basis. Further comparisons are made between site specific system release data and predicted performance of theoretical traditional containment.

## What We Have Learned

We have learned a great deal about the design requirements and management of VTSS in the last two years. Our experience with these systems has taught us several lessons about designing and operating vegetative treatment systems. A few of the keys issues

are settling basin performance, active producer management, a focus on both hydraulic and nutrient loading rates, uniformity of water distribution over the treatment area, and the importance of site selection. Perhaps the most important item we have learned is that vegetative systems are not suitable at all locations. To achieve the desired control results from vegetative systems, certain siting and operator requirements must be satisfied. These include meeting recommendations on hydraulic conductivities of the soil throughout the soil profile, an operator who will actively manage the vegetative treatment system, and having a soil profile that has available capacity to store the moisture from typically storm sizes in the region.

## Why is This Important?

Open feedlots in Iowa with greater than 1000 animals are now required to implement additional feedlot rainfall runoff control beyond the previous requirement which was an effluent settling structure. Traditional containment systems and VTSS are two options for increased control. Results from this study will be used by regulatory authorities to determine whether VTSS can be used on NPDES permitted CAFO beef feedlots.

## For More Information

Read the following articles or visit our project website <http://www.abe.iastate.edu/wastemgmt/beef-at-systems.html>

I. Khanijo, R. Burns, L. Moody, M. Helmers, J. Lawrence, C. Pederson, D. Anderson. Vegetated Treatment System Models: Modeled vs. Measured Performance. 2007. *Proceedings: International Symposium on Air Quality and Waste Management for Agriculture*. September 16-19, 2007.

L. Moody, N. Heithoff, R. Burns, C. Pederson, I. Khanijo. Settling Basin Design and Performance for Runoff Control from Beef Feedlots. 2007. *Proceedings: International Symposium on Air Quality and Waste Management for Agriculture*. September 16-19, 2007.

Moody, L. B., C. H. Pederson, R. T. Burns, I. Khanijo. 2006. Vegetative Treatment Systems for Open Feedlot Runoff: Project Design and Monitoring Methods for Five Beef Feedlots. *ASABE Paper #064145*. St. Joseph, MI: ASABE.