Project Update: Vegetative Treatment Systems for Control of Beef Feedlot Runoff

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Vegetated Treatment Systems for Feedlot Runoff Control

- Beef Feedlot
- Settling Basin (SSB)
- Vegetated Treatment Area (VTA)

Archived presentation is available at http://lpe.unl.edu/archive2.html
SSB to VTA

VTA: Feedlot 0.7:1

Beef Feedlot

Settling Basin

SSB to VIB to VTA

VIB: Feedlot 0.6:1

VTA: Feedlot 0.22:1

Livestock and Poultry Environmental Learning Center Webcast Series

November 16, 2007

Archived presentation is available at http://lpe.unl.edu/archive2.html
### Project Site Information

<table>
<thead>
<tr>
<th>Number of Cattle</th>
<th>VTS Components</th>
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<tr>
<td>On-Site</td>
<td>Research Portion</td>
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<tr>
<td>NW IA 1</td>
<td>1400</td>
</tr>
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<td>NW IA 2</td>
<td>4000</td>
</tr>
<tr>
<td>Central IA 1</td>
<td>1400</td>
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<tr>
<td>Central IA 2</td>
<td>2400</td>
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<tr>
<td>SW IA 1</td>
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<tr>
<td>SW IA 1</td>
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### ISU Models

- Models developed using pilot-scale system data and literature equations & values
  - ELG Model (Traditional Containment)
  - VTA Model
  - VTA-VIB Model

- Vegetative treatment systems required to perform equal to or better than ELG

- Models were used in design of CAFO research sites

### Project Site Status

<table>
<thead>
<tr>
<th>Permit Start Date</th>
<th>Monitoring Start Date</th>
<th>Monitoring End Date</th>
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- Funding for a 3rd year of monitoring at each site to be provided thru a current Iowa Cattlemen’s Association USDA/NRCS CIG grant
- Extended monitoring will better quantify long term system performance

Southwest IA 2: July 1, 2006, July 1, 2007, June 30, 2009

Sample Collection

- Samples collected from each system component
- Flow-based samples collected by ISCO
- Sample representative of highest flow volume collected for analysis
- Samples shipped on ice to commercial lab within 24 hrs of collection

VTS Performance Summary

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<th>2006 (Start of monitoring – Sept.)</th>
<th>2007 (April – Sept.)</th>
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<tbody>
<tr>
<td></td>
<td># of Rainfall Events*</td>
<td>Max. Storm Depth (inches)</td>
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<tr>
<td>SW IA 1</td>
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</table>

*Rainfall events may consist of multiple rainfalls over the release period

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• 2006 VTA releases
  – Settling basins were managed passively
  – All VTA releases associated with settling basin release

• 2007 VTA releases
  – 2 sites actively managed settling basins
  – ~50% of the releases were associated with basin releases

Mass of VTS nutrients released from the VTA are related to:
• Nutrient concentration of effluent
• Volume of effluent discharged

![2006 Settling Basin TS Discharge Concentrations](image)

Concentration assumed by model:
- Concrete lot: 6000 mg/L
- Earthen lot: 4000 mg/L

Archived presentation is available at http://lpe.unl.edu/archive2.html
Central Iowa 1
- Added valve to better control basin discharge
- Hold runoff until VTA achieves non-saturated conditions (when possible)

Northwest Iowa 1
- Added valves to better control basin discharge
- Hold runoff until VTA achieves non-saturated conditions (when possible)

- After reviewing the data, the other sites installed a method to hold water in their basins
- Now all sites have the ability to close basin outlets to manage basin releases

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Additional Research

- Identify critical system performance factors
- Identify ISU model algorithms that don’t accurately predict field performance
- Modify ISU models to more accurately predict field VTS performance

VTA Flow Distribution Mapping

- Working with USDA/ARS, U.S. MARC
- Measure flow depth across VTA length & width
- Create GIS maps for comparing to ECa generated with EMI

Tracking VTA Water Tables

- Shallow wells and water level sensors installed at multiple sites
- Continuously track water table in VTAs at 15 minute intervals

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In-Depth Examination of ELG (Traditional Containment) Model

- ELG model provides baseline performance comparison to VTSs
- ELG model performance under Iowa conditions is uncertain
- Use SPAW to check reasonableness of Iowa ELG model results
  - SPAW is a field and pond hydrology model developed by USDA/ARS

VTS Models

- Converting ISU models to JAVA script
  - Porting models to a more user friendly format
  - Should be available 1st Quarter of 2008
- Updating model algorithms
  - Using field data to modify models to better predict system performance
  - Extended monitoring will provide a better basis for model improvements

Low Cost Monitoring System

- In Iowa, permitted sites must monitor all flow from VTSs
- Need simple, cost effective method to monitor flow
- Have developed and are testing low cost system
  - Further cost reductions by using sheet metal H-flumes

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Things we have learned to date:

- System siting is critical
  - Soil type, depth to water table, adequate area
- Effective solid settling is essential
- Settling basin must have adequate volume to hold runoff during wet weather periods

Questions?

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