

Federal Fiscal Year of project: 2005

TODAY'S DATE: 4/15/2006

Please select which reporting period.

MIDYEAR REPORT?:

ANNUAL REPORT?:

QUARTERLY REPORT?:

PROJECT TITLE: Evaluating the performance of vegetated treat

REPORT DATES: FROM: 1 Oct 2006

TO: 30 Mar 2006

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OVERALL PROJECT ACCOMPLISHMENTS

Since the establishment of the project to evaluate vegetated treatment systems (VTS's), stakeholders meetings have been held, in December 2004, January 2005, February 2005, August 2005, and November 2005. Representatives of the following groups have attended one or more of the stakeholder meeting: SDSU, SD Farm Bureau, SD Cattlemen's Association, DENR, SD Dept of Ag, Moody County Conservation District, and NRCS. A consulting engineer with a private consulting firm in SD that does many animal waste system designs has also asked to be included in the stakeholders meetings.

The first graduate student has produced some preliminary results using the simulation models developed or modified at Iowa State University.

A web site has been established to foster communication among investigators, stakeholders, and the public.

The two pre-existing sites (Miner and McCook) were monitored during 2005. The three remaining sites are in various stages of design and construction and we expect that all will be

operational in 2006. The Meade Co site is complete and monitoring will commence in the very near future. Construction of the Haakon and Roberts County sites will take place in 2006.

A multi-state add-on project has already been funded by USDA NRCS Conservation Innovation Grant program via the Iowa Cattlemen's Association and a state Conservation Commission grant. We expect that two additional VTS sites will be established at CAFO's in SD in 2006 and monitoring at those locations will begin shortly thereafter.

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OBJECTIVES/TASKS ACCOMPLISHMENTS

OBJECTIVE 1: CHARACTERIZE AND ESTABLISH THE PILOT AFOs THAT WILL BE USED TO TEST THE EFFECTIVENESS OF VTAS AS AN ALTERNATIVE ANIMAL WASTE MANAGEMENT SYSTEM BMP.

TASK 1. CHARACTERIZE AND ESTABLISH FIVE VTA SITES.

The pre-existing sites in McCook and Miner Counties in SE SD were monitored during the summer of 2005.

The Roberts Co site (NE SD) has changed locations and cooperators because of change of plans by the original cooperator. The new location (and cooperator) is a suitable site. The site design has been completed by NRCS and construction will take place early this summer.

The Meade Co (W SD) site is nearing the end of the construction phase. The contractor has completed activities and the site is operational in that it will contain runoff. The site will contain runoff but will not be completed (vegetation, etc.) until early summer of 2006. Monitoring will commence early this summer.

The fifth and final site has been identified and will be located in Haakon County. The design of the Haakon site (by SDSU) is nearing completion and it is expected that construction will take place in early summer of 2006. The Miner SCD has procured grant funds from the SD Conservation Commission to be used as cost-share for construction of the Haakon site.

Work planned for next six months: Monitoring at the Meade site will commence in 2006. Construction will commence at the Roberts site. The Haakon site design will be finalized and construction will take place.

This task is behind schedule, based on the two sites remaining to be built.

OBJECTIVE 2: MEASURE THE SURFACE WATER QUALITY IMPACTS OF VTA'S AT THE SITES

TASK 2: CHARACTERIZE WATER, NUTRIENT, SALT, SEDIMENT, AND FECAL COLIFORM BACTERIA FLOWS AT EACH SITE.

No further samples were collected or analyzed during the winter months.

Sampling during 2005 indicated that there were some discharges of water, nutrients, and coliforms from the Miner VTS. The outlet from the sediment basin to the VTA has been modified for the 2006 growing season to try to reduce or eliminate any further VTA discharges. Gated pipe was added to the outlet of the sediment basin to spread the water laterally across the VTA. This should reduce or eliminate VTA discharges.

Work planned for next six months: Surface water monitoring will continue at two sites in 2006 and will commence at the remaining three sites. Runoff sample analysis will continue. Mass flow rates will be analyzed and summarized. We expect that initial soil samples will be collected at the Roberts, Meade, and Haakon Co sites.

This task is on schedule.

OBJECTIVE 3: COMPARE THE PERFORMANCE AND FINANCIAL FEASIBILITY OF EACH VTA TO A WASTEWATER BASIN AT THE SAME SITE.

TASK 3: COMPARE PERFORMANCE OF VTA SYSTEMS TO SIMULATED PERFORMANCE OF BASINS AT ALL SITES.

Progress: Preliminary model runs have been made. Preliminary data are presented here.

The VTS model is used to simulate discharge of water, nutrients, and solids (among other things) from the VTA, based on input soil, feedlot, and VTS parameters and weather data.

Discharge of solids and water are sensitive to change of input parameters such as soil bulk density and sand and clay content but not sensitive to parameters such as available water content and hydraulic conductivity (Fig. 1). Thus, soil sampling to obtain accurate estimates of parameters such as bulk density and sand and clay content would result in the greatest increase of simulation accuracy.

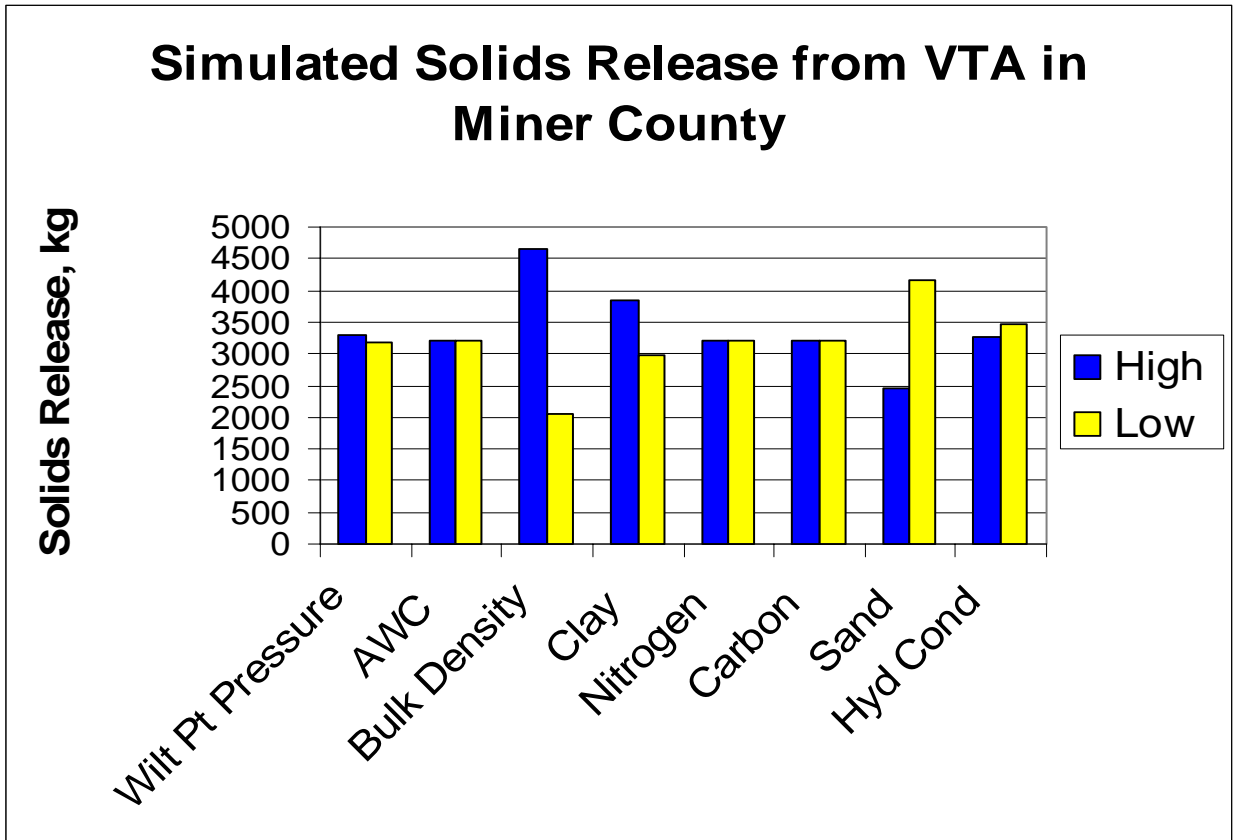


Figure 1. Sensitivity of simulated solids released from the Miner County VTS as related to soil parameters. If both bars of a pair are nearly the same length, the simulated solids release is not sensitive to change of that parameter.

Simulations also have been used to show that discharge from the VTA is even more sensitive to the water release rate from the sediment basin. A slower release from the sediment basin results in greater infiltration in the VTA and reduces runoff (discharge) from the VTA. This is important because rate of release from the sediment basin is relatively easy to adjust (lengthen or reduce) by changing sediment basin outlet sizes. For a simulated storm at the Miner County site, simulated water discharged from the VTA was reduced from 31019 to 7432 to 0 ft³ by reducing the outlet pipe size from 8-inch to 5-inch to 4.5-inch (Fig. 2).

Finally, simulations have been run to compare simulated VTS performance to simulated basin performance for the same site and feedlot. For the Miner County site, preliminary results indicate that, for a 23-year period of simulation, total water discharge from a simulated basin was 300,000 ft³ while total water discharge from a simulated VTS was slightly less than 100,000 ft³ (Fig. 3). There were more release events from the VTS (Fig. 4) but the total volume of release was still much greater for the basin than for the VTS.

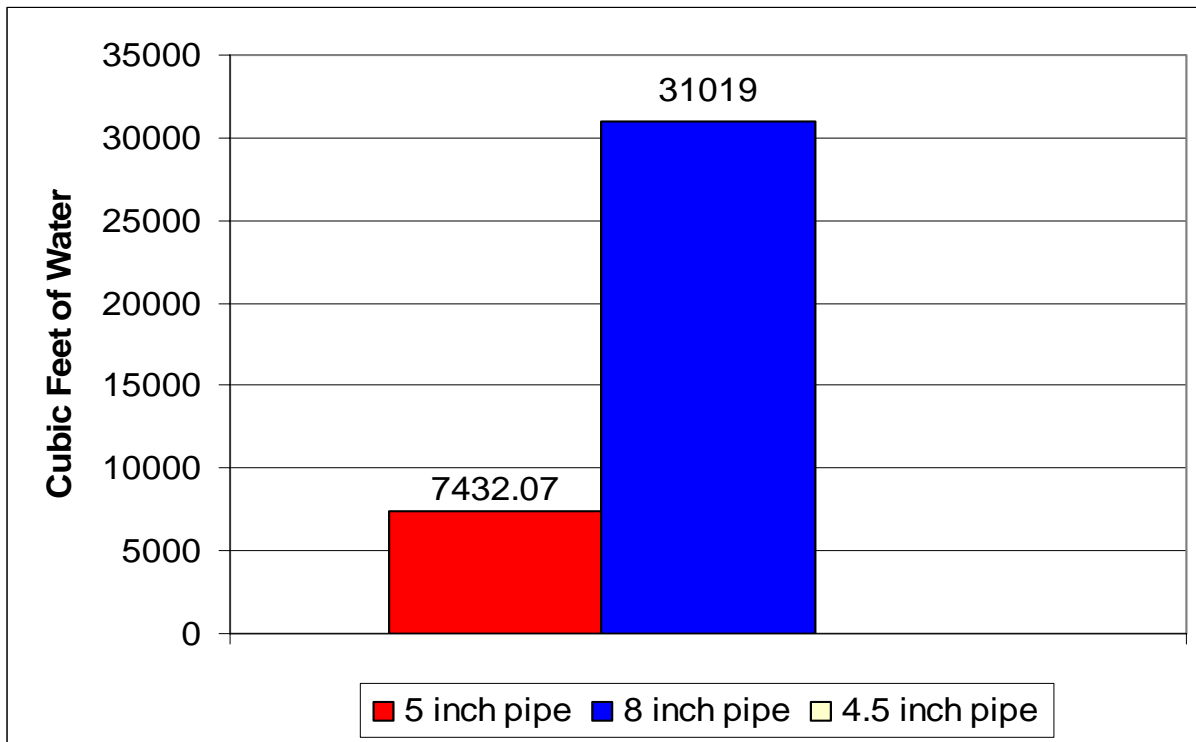


Figure 2. Simulated water discharge from the VTA for three sediment basin outlet pipe sizes.

Work planned for next six months: Model runs will be completed in multiple configurations to explore alternative scenarios and address optimization of VTS's. She will also run the ELG model to compare simulated VTS performance to simulated basin performance. This simulation work will form the basis of Sara's MS thesis. She will be spending even more time with the models and plans to have her thesis completed in August 2006.

This task is on schedule.

OBJECTIVE 4: DEVELOP RECOMMENDATIONS FOR MANAGING PERENNIAL GRASSES USED AS THE VEGETATION COMPONENT OF A VTA BASED AWMS.

TASK 4: COMPLETE ECONOMIC COMPARISONS OF SYSTEMS AT ALL SITES.

No progress to report.

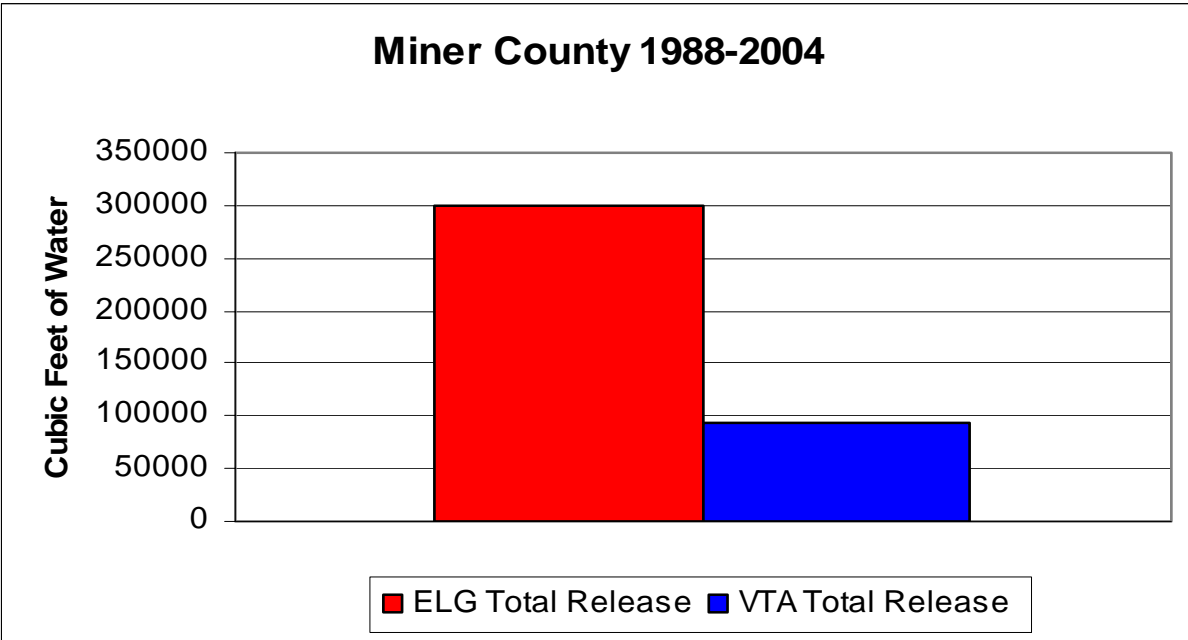


Figure 3. Total volume released from a simulated basin and a simulated VTS at the Miner County site from 1982 through 2004.

Work planned for next six months: Activity addressing this task will commence in summer and fall of 2006, beginning with the identification of the economics graduate student.

This task is on schedule.

TASK 5: INFORMATION TRANSFER (I&E)

Press releases from SDSU announced the establishment of the project and outlined the objectives. Press releases were in both print and audio formats. Two examples of publication of the published press releases are in the Rapid City Journal (<http://www.rapidcityjournal.com/articles/2005/10/06/news/agnews/ag05.txt>) and the TriState Neighbor (http://www.tristateneighbor.com/articles/2005/10/06/tri_state_news/top_stories/news26.txt).

A web site dedicated to this project has been established. It is located at <http://abe.sdstate.edu/vts>. Initial project information is listed and results will be published there as they become available and as they are appropriate. Other information that will be contained at the web site includes announcement and minutes of meetings, contact information for the investigators, overviews of the locations, and links to related information.

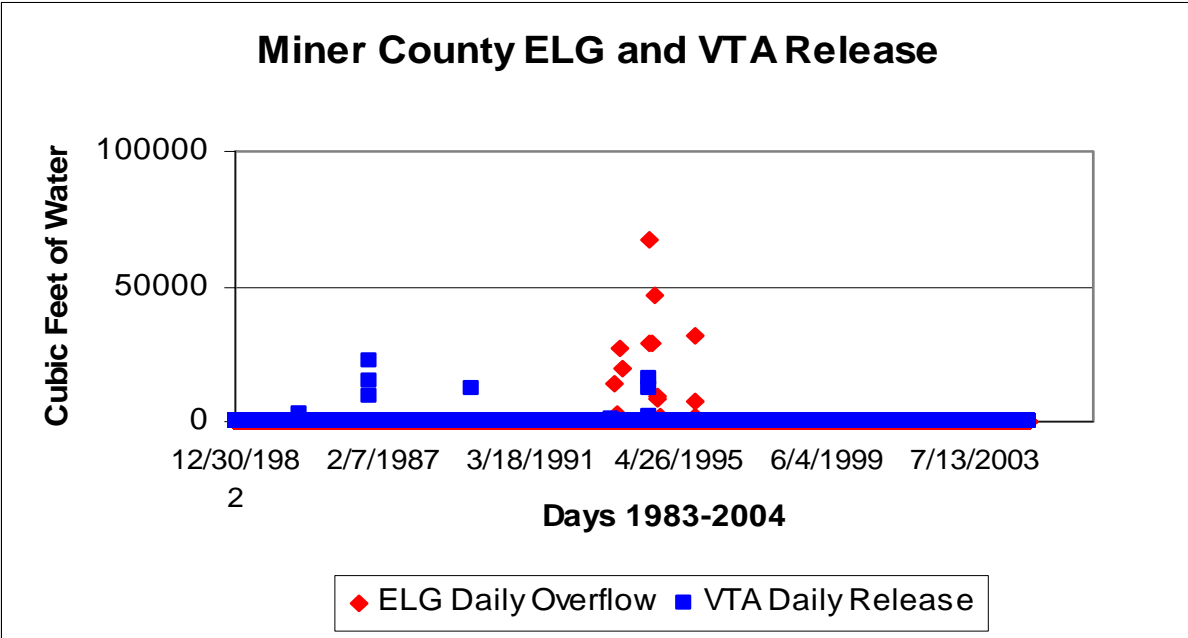


Figure 4. Simulated daily discharge events from basin (ELG model) and VTS for Miner County site.

Work planned for next six months: Film/video presentations of project objectives and the first test sites will be developed. Further planning for print, audio, and video releases will take place with media personnel at SDSU. The web site will be updated as appropriate.

This task is on schedule.

TASK 6: EVALUATE THE EFFECTS OF VEGETATION HARVEST SYSTEMS ON THE ABILITY OF THE VTA TO MAINTAIN FILTERING CAPABILITES AND PRODUCE HIGH QUALITY FORAGE.

This task was appended to the project in August 2005.

No further progress was made on this task during the winter months.

Work planned for the next six months: Samples will be collected and analyzed during the growing season of 2006. Nutrient content of the vegetation will be analyzed to calculate N and P removal from the VTA. Plots at the newly-built sites (Meade, Roberts, Haakon) will be established.

This task is on schedule.

NONPOINT SOURCE 319(h) PROJECT PROGRESS REPORT FORM

Version 1.5

3.3 Milestone table. Evaluating the performance of Vegetated Treatment Areas

Task	Quantity	Groups	2005				2006			
			Mar-May	Jun-Aug	Sep-Nov	Dec-Feb	Mar-May	Jun-Aug	Sep-Nov	Dec-Feb
1. Select and characterize sites	5 sites	1, 2, 3	2			3				
progress			2		3					
2. Characterize flows	612 samples	1, 5		102				255		
progress				30	30					
3. Compare systems via models	10 simulations	1, 4					10			
progress										
4. Economic comparisons	5 site comparisons	1								
progress										
5. I&E Activities	5 field days, 3 theses, 6 papers, 6 presentations, 3 Today's Ag segments	1			2	2	4		3	3
progress					1					
6. Vegetation management	320 pl smpls									
progress	48 sl smpls	1			80				120	
					32					

Groups:

- 1: SDSU faculty and extension
- 2: SD Cattlemen's Association
- 3: NRCS
- 4: Iowa State U ABE
- 5: USDA-ARS, MARC

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CONCLUSIONS

The project generally is on schedule but construction remains for 2006. The dry winter and spring of 2005 impeded runoff sample collection but summer and fall rains during 2005 provided samples for analysis. Sampling and analysis from the two pre-constructed sites indicate that some nutrients are leaving the VTA so modifications have been made to those VTA's. Further sampling and analyses are needed to estimate mass flow rates and thus evaluate the effectiveness of the conceptual VTA. Harvest of smooth brome grass at the Miner site showed increased dry matter for more than one harvest during the growing season. The stakeholder group has provided valuable input to the project in the meetings.

