CONSERVATION INNOVATION GRANTS
FINAL QUARTERLY REPORT
LIVESTOCK RESERVOIR WETLAND SUB-IRRIGATION SYSTEM (LRWSIS)
APRIL 2, 2007-SEPTEMBER 30, 2007

Grantee Name	Lenawee Conservation District
Project Title:	Design and Implementation of a Closed Recycling Water Management System to Provide an Alternative Use of Milkhouse Wastewater and Storm Water Runoff and Silage Leachate
Period Covered by Report	April 2, 2007-September 30, 2007
Project End Date	9/30/2007

SUMMARIZE THE WORK PERFORMED DURING THE PROJECT PERIOD COVERED BY THIS REPORT:

THIRD SEASON OF CROP PRODUCTION UNDER SYSTEM

- Planted floating islands of cattails to improve wetland system.
- Planted corn on the west sub-irrigated field and planted soybeans on the east side of the sub-irrigation system.
- Set up Nitrogen application plots.
- Worked with Michigan State University on Corn Silage Plots and Soybean Plots.
- Started Sub-irrigation of Corn on June 27, 2007.
- Started Sub-irrigation of Soybeans on August 2007.
- Began Third Season of Nutrient Sampling Program, which will be sampled twice per month. Water samples are sent to Heidelberg College.
- Started Project with the USGS, which is funded by the Michigan Soybean .Promotion Committee, to water sample for Pathogens. Water samples are sent to the USGS lab in Lansing, Michigan.
- Hosted several mini-tours for interested farmers from Ohio and Michigan.
- Started outline for farmer fact sheet about the system dealing with design, installation, management and cost of implementing a system on other farms. This will be completed by March 2008 for publication.
- Harvested corn and soybeans plot that are in the sub-irrigation system.
- Analyzed nutrient and Pathogen Data (see attached graphs)
- Developed Center for Excellence results meeting information for corn production under a sub-irrigation system.

DESCRIBE SIGNIFICANT RESULTS, ACCOMPLISHMENTS AND LESSONS LEARNED. COMPARE ACTUAL ACCOMPLISHMENTS TO THE PROJECT GOALS IN YOUR PROPOSAL.

MANAGE THE SYSTEM

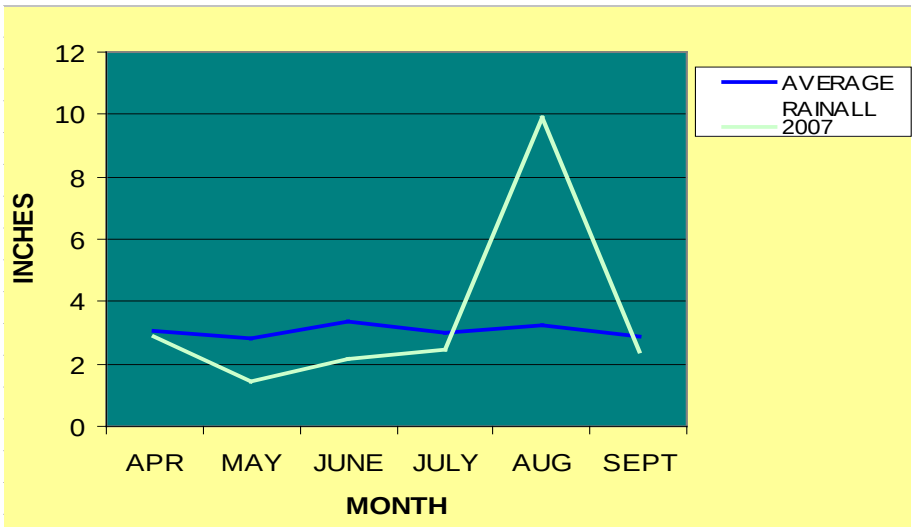
Goals of the Project:

- Separate waste water from runoff, milking center wastes and leachate from manure on a 400 cow dairy herd.
- Manage 2.2 million gallons of black water in a closed sub-irrigation system to get rid of all the black water produced in a year.
- Manage the sub-irrigation system to improve crop production to offset installation costs of the system.
- Develop a water quality data base to determine if the system has a negative impact on surface and ground water.
- Produce educational programs to local and regional farmers about the project.

In the 2007 growing season was once again a different year. Due to pump failure on the west side of the field we didn't get started on sub-irrigation of the corn until the end of June. We had below normal rainfall from April through the middle of July and it was extremely dry through the end of July. In August we had way above normal rainfall to deal with. There were several days when the sub-irrigation system was shut off due to the lack of demand of water by the crop.

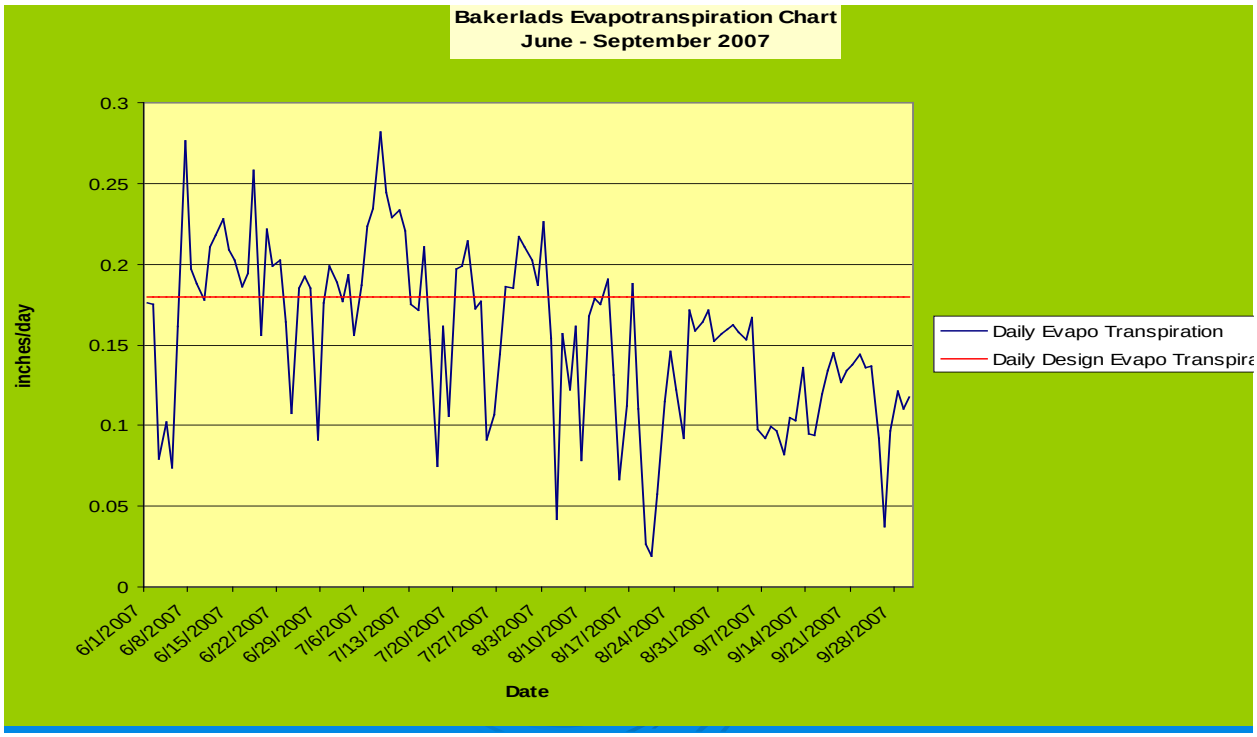
- We should have started sub-irrigation in early June as indicated by the 2007 rainfall and the evapo-transpiration of the crop. This would have helped the crop agronomically and would have allowed us to get rid of all the water for the year.
- Sub-irrigation did very little for the crop from late July through August due to the excess amount of rainfall.
- In our design of the system we didn't factor in the excess subsurface water that is added to the closed system from excess rainfall.
- We need to have an extra pump that can be used at any of the pump sites which might fail during the operations of this system. This system has 5 pumping plants which include: Pulling one of the pumps that is not in service is difficult and time consuming. Having an extra pump that is rotated into a non-functioning pump site is recommended. Servicing the pumps annually is critical for long term maintenance.
    1. Pump to get milk house and runoff to the storage pond.
    2. Pump for sub-irrigating treated water to the crop fields.
    3. Two re-circulating pumps at the edge of the field to keep the closed system functioning.
    4. Pump to drain the last three feet of the waste storage pond to the wetland area.

2007 Rainfall Bakerlads Farms



Date	Average	2007
7-Apr	3.08	2.9
7-May	2.82	1.45
7-Jun	3.35	2.18
7-Jul	3.03	2.48
7-Aug	3.23	9.91
7-Sep	2.88	2.39
Total inches	12.49	16.96

As can be seen by the rainfall data there was 4.47 inches of increased rainfall during the planting and growing season. These 4.47 inches of rainfall can be equated to 28,966 cubic feet (216,662 gallons) of runoff from the 86,400 feet of runoff area not to mention an additional 4.47 inches of rainfall on top of the existing waste storage facility. The increased rainfall has a dual effect on the system: Increased waste water to manage and less water needed by the crop during the growing season as represented by the daily evapo-transpiration of the crop. Having enough acres to manage the waste water within the system is necessary to compensate for increased rainfall and less demand by the crop per acre.



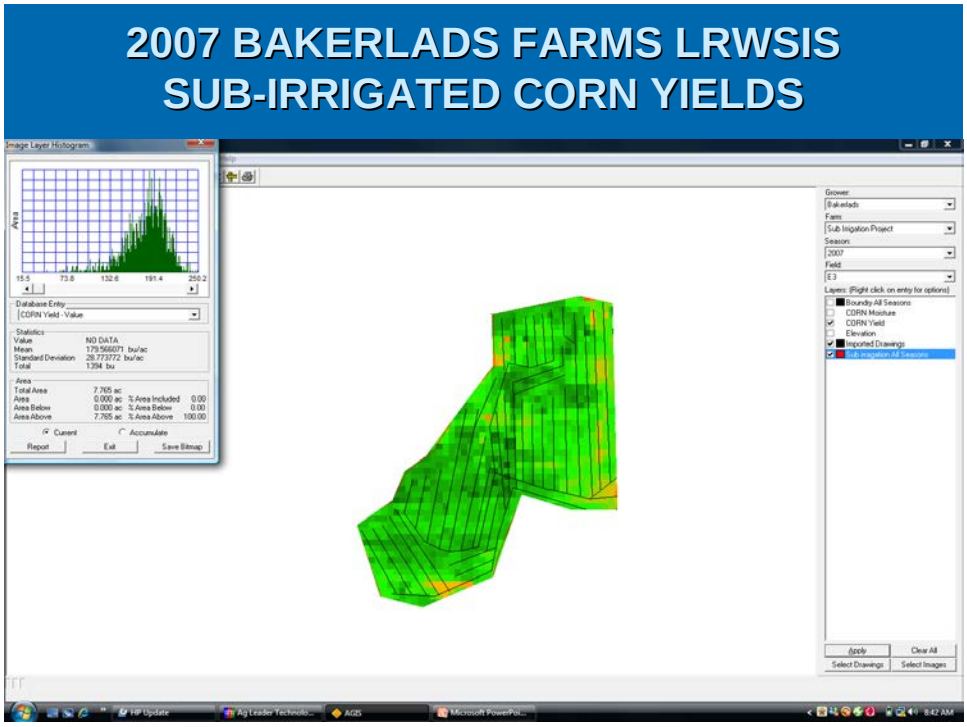
2007 WATER USAGE

The system was designed to store water for a nine month storage period which is estimated at 1.8 million gallons of milk house water and runoff. We estimate the annual waste water production is 2.4 million gallons to manage on 18-20 acres of sub-irrigated land in a closed system. That would mean on we would need to daily distribute 24,000 gallons per day or have pump output of a minimum of 16.7 gallons per minute 24 hours per day for 100 days of growing season. The key is to effectively distribute the water through the system where it can be agronomically used most effectively by the largest amount of acres that will allow within the 18-20 acres.

When we are filling the system early in the growing season we are pumping 35 gallons per minute for approximately 2-3 days until the system fills the tile lines and starts to saturate the soil and move up into the desired water table elevation. The system is then shut down to have an output equal to the daily evapo-transpiration of the crop. Sometimes the system is shutdown depending on the rainfall and daily mean temperature of the system.

During the growing season of 2007 we missed approximately 29 days of June to provide water to the crop which is about 5.22 inches of evapo-transpiration. We received 2.18 inches of rainfall. Assuming this rain was efficient we could have provided 3.04 additional inches of rainfall for this time period. This equates to about 82,080 gallons per acre or 820,000 gallons of water usage for this time period. We missed a critical period here because it was extremely wet period during August when we did not use much water.

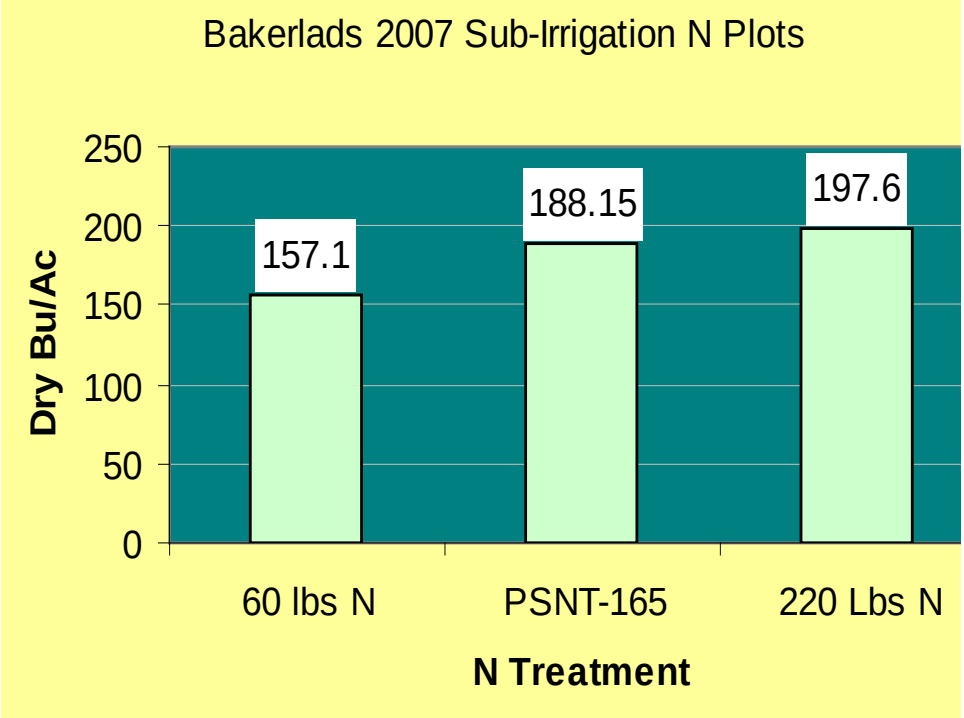
VALUE ADDED: INCREASED CROP YIELD



2005-2007 Corn Yields
Bakerlads Farms LRWSIS

Year	2005	2006	2007
Sub-Irrigated Corn	189.5	188.16	180
Non-Irrigated Corn	171.4	172	145.9
Yield Difference	18.1	16.16	34.1

The 2007 crop year is the first year out of the three that the increased yields represented what past research reveals for a ten year period on sub-irrigation of corn. In 2005 and 2006 we had outstanding corn yields across Southeast Michigan and Northwest Ohio. Although we did not obtain the highest corn yield in the three year period the yield difference was 34.1 dry bushel acre.

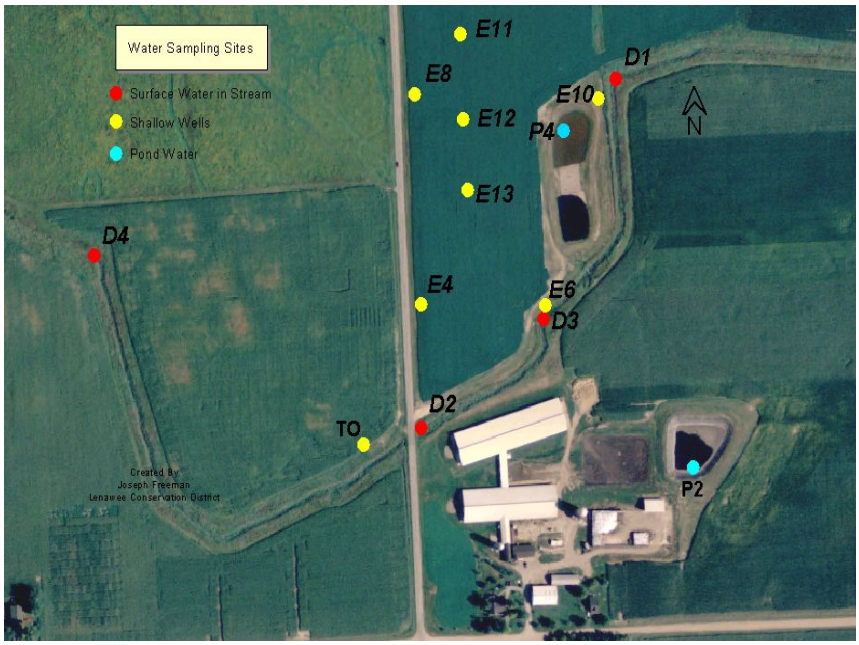


As part of trying to overcome the costs from the installation of the sub-irrigation system our input costs were reduced by the reduction of fertilizer costs for the crop. Efficiency of actual Nitrogen applied is .38 lbsN/bushel, 0.88lbs N/bushel, 1.11 lbs N/bushel

The increased yield from 188.15 to 197.6 is 9.45 dry bushel per acre. With corn prices at $3.00 bushel the break even amount on the increased amount of fertilizer off 55 lbs of actual N is .43 per lb of anhydrous or $860.00 per ton. Every farmer needs to take a look at their expenses and the price return to determine is it worth the investment. In the case of the sub-irrigation much of the risk is removed due to no lack of water to produce the crop.

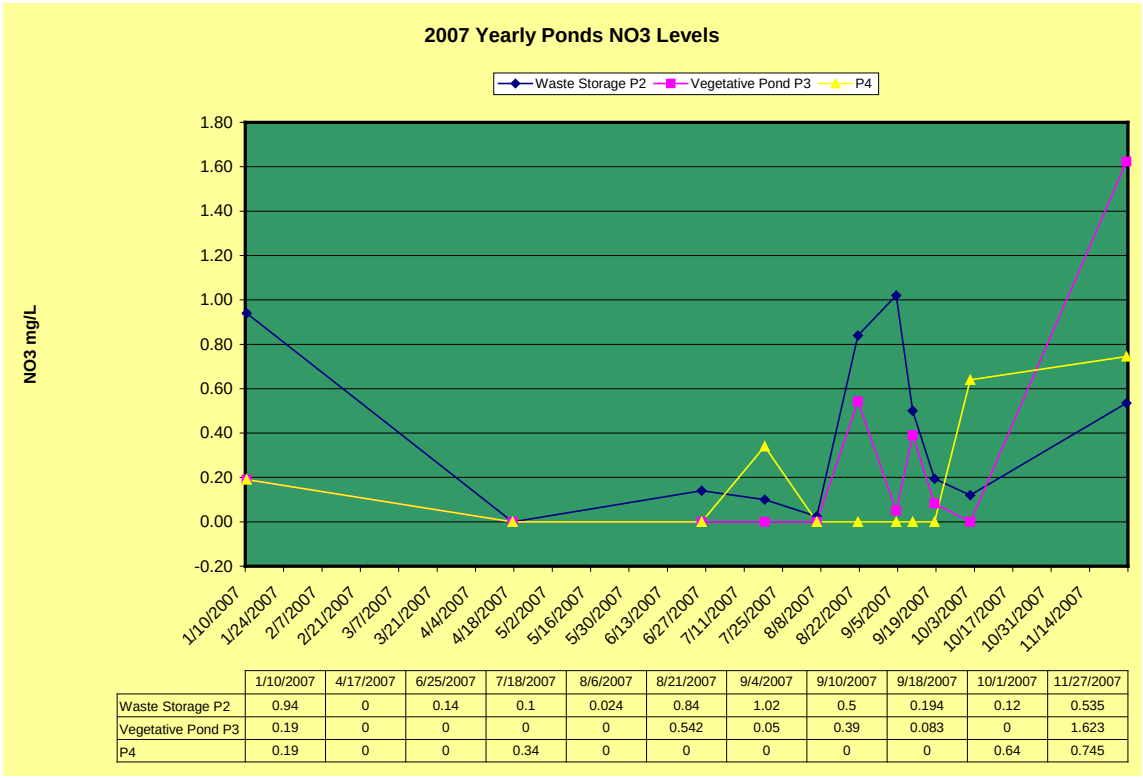
LRWSIS
BAKERLADS FARMS

Water Quality Data



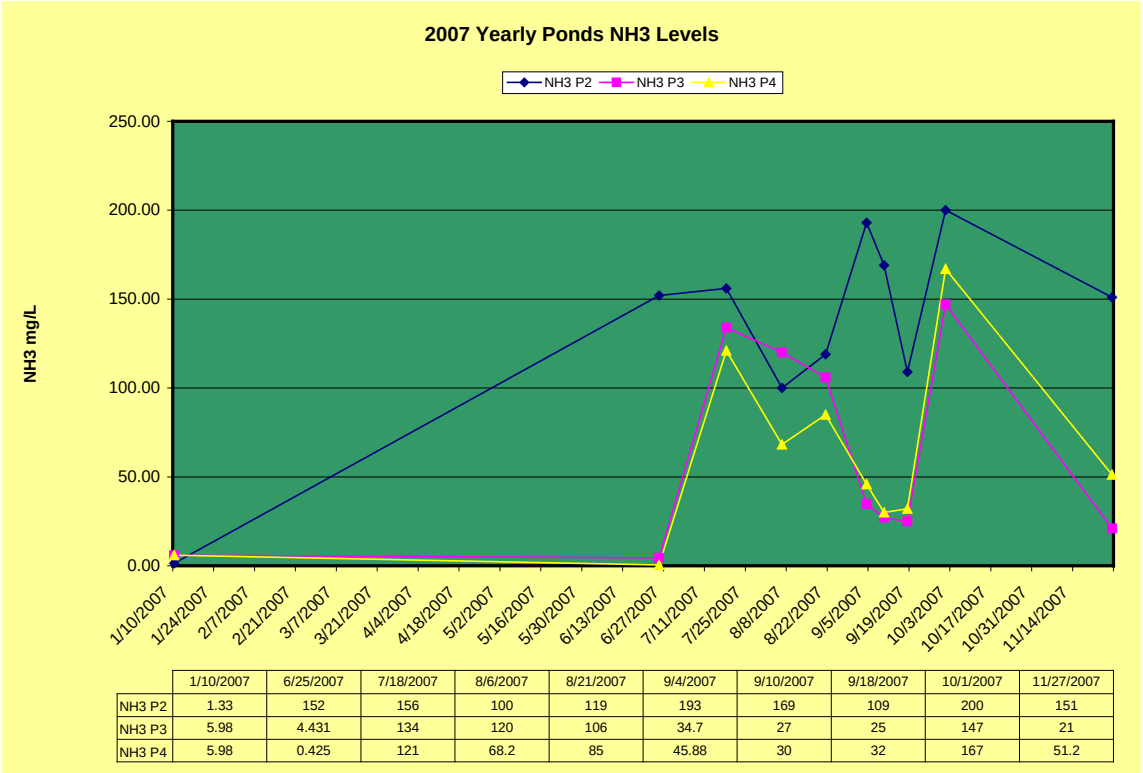
Water samples have been taken for the past four years dealing with Nutrient levels at the waste storage facility to what is in the stream prior to entering the farm and leaving the farm. We have been very concerned about any negative effects that the system may have on surface and ground water around the farms and the sub-irrigation system. Please note the location of different samples:

- D1: Sample at ditch after water flows by west and east sub-irrigation system
- D2: Sampling site at Morey Highway East of West sub-irrigation System
- D4: Sampling site prior to any sub-irrigation site.
- P2: Raw waste water
- P3: Raw waste water in first chamber of constructed wetland
- P4: Treat waste water through Constructed Wetland



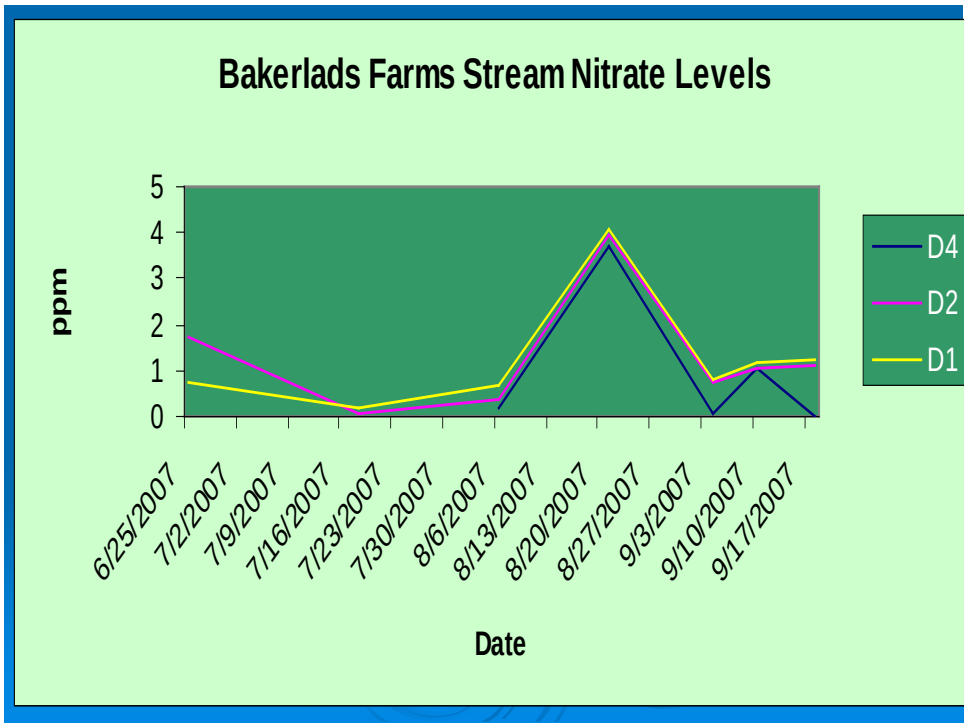
	1/10/2007	4/17/2007	6/25/2007	7/18/2007	8/6/2007	8/21/2007	9/4/2007	9/10/2007	9/18/2007	10/1/2007	11/27/2007
Waste Storage P2	0.94	0	0.14	0.1	0.024	0.84	1.02	0.5	0.194	0.12	0.535
Vegetative Pond P3	0.19	0	0	0	0	0.542	0.05	0.39	0.083	0	1.623
P4	0.19	0	0	0.34	0	0	0	0	0	0.64	0.745

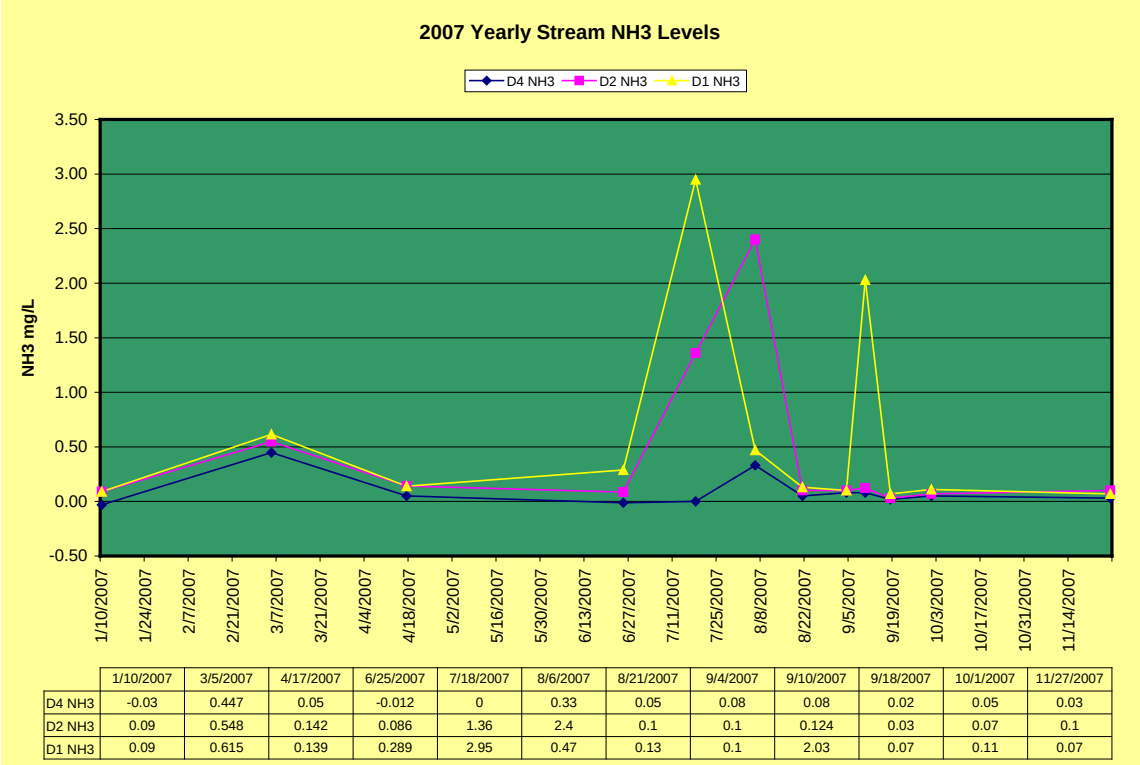
Note no real significant difference in raw water verses treated water in wetland



	1/10/2007	6/25/2007	7/18/2007	8/6/2007	8/21/2007	9/4/2007	9/10/2007	9/18/2007	10/1/2007	11/27/2007
NH3 P2	1.33	152	156	100	119	193	169	109	200	151
NH3 P3	5.98	4.431	134	120	106	34.7	27	25	147	21
NH3 P4	5.98	0.425	121	68.2	85	45.88	30	32	167	51.2

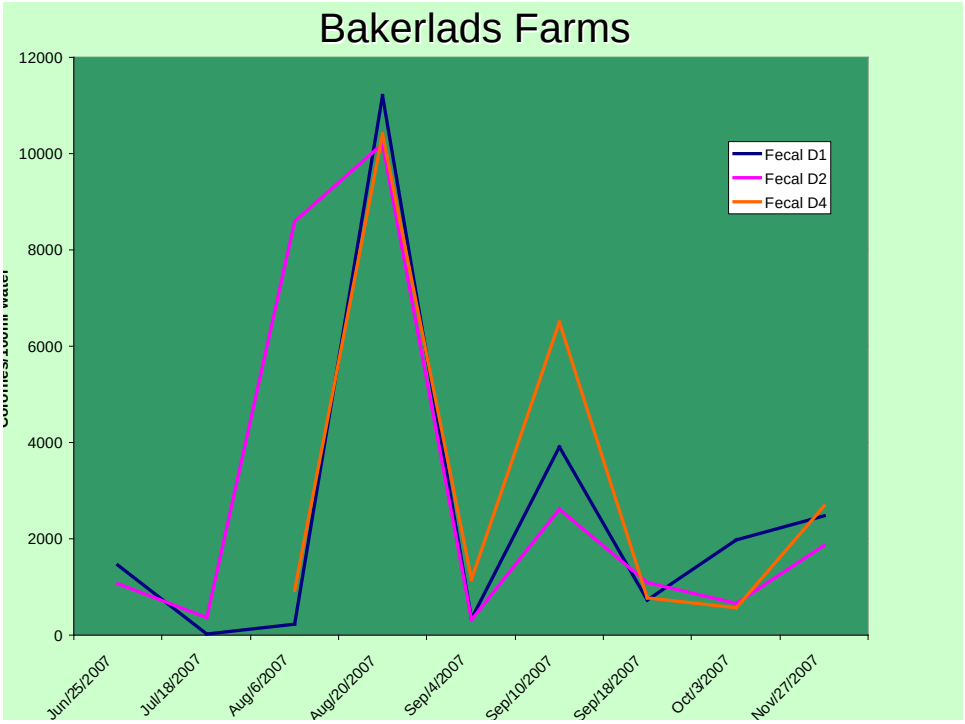
Ammonia levels are somewhat lower from raw water to treated water and water in first chamber of the wetland. This may have a lot to do with time of year and amount of rainfall in the system. In general terms the raw water averages 150 mg/liter compared to the 66.7 mg/liter of treated water





	1/10/2007	3/5/2007	4/17/2007	6/25/2007	7/18/2007	8/6/2007	8/21/2007	9/4/2007	9/10/2007	9/18/2007	10/1/2007	11/27/2007
D4 NH3	-0.03	0.447	0.05	-0.012	0	0.33	0.05	0.08	0.08	0.02	0.05	0.03
D2 NH3	0.09	0.548	0.142	0.086	1.36	2.4	0.1	0.1	0.124	0.03	0.07	0.1
D1 NH3	0.09	0.615	0.139	0.289	2.95	0.47	0.13	0.1	2.03	0.07	0.11	0.07

There appears to be an increase in ammonia in surface water at the Bakerlads Farm as compared to the water sample D4 coming into the farm. Average mg/l at:
D4: .095 mg/liter D2: .43 mg/l D1: .59 mg/liter



This is the first year of looking at pathogens in the surface waters coming into and leaving the Bakerlads farms. The project is in conjunction with the USGS and funded with the Michigan Soybean Promotion Committee. The project looks at fecal coliform, E**. C**oli, and will genotype the material to give us an idea of the type and where the pathogens are coming from. The information will be provided to us later this winter.

Describe the work that you anticipate completing in the next six-month period:

- Grid-sample the soil in sub-irrigated fields at the 0-12 inch level and the 12-30 inch level.
- Make a presentation at the ADA Ohio Northwest Ohio winter program for farmers. February 2008.
- Present 2007 data at the Center for Excellence Crops Day.
- Complete Farmer Fact Sheet about the Sub-Irrigation System. March 2008.
- Continue water quality data sampling with USGS and Soybean Promotion Committee of Pathogens June-October 2008.
- Highlight three years of data from the system at the Center for Excellence Field Day in August 2008.
- Do a Salinity check on the fields cooperating with the National Salinity Expert October 2008.
- Dig some of the lateral tile up and evaluate the tile for any degradation of the tile from using the system.
- Further analyzing water quality data dealing for the three year period.