Agricultural Drainage Management Systems Task Force

Sept 26-28, 2007
Des Moines, Iowa

Introductions

Jim Fouss opened the meeting, and Mark Jensen, NRCS, welcomed the group to Iowa. All participants introduced themselves. (List of participants included on p. 8.)

ADMC Comments

Leonard Binstock noted that it has now been one year since the Conservation Innovation Grant for drainage water management had been awarded to the Agricultural Drainage Management Coalition, and nine months since he became Executive Director. The Coalition is very active, and Jeanne Hanson now works in the office as well. The web site is getting thousands of hits.

NRCS Comments

Mike Sullivan provided updates from NRCS. There have been several personnel changes, including a new Director of Engineering. Sheryl Kunickis has become Program Manager for NRI and CEAP, and they expect to have another Agricultural Research Coordinator.

Mark Jensen gave a presentation on "Iowa's Support for Controlled Drainage". He noted that the practice is available in CSP and EQIP, but they have noted the following issues:

- *Impact on soil quality, especially microbiology, earthworms, and other macro-invertebrates.* A lot of money has been spent getting soils to be aerobic. Will any of that be undone by making the soil anaerobic part of the year?
- *Overall nutrient balance*: What happens to the N? Is it flushed out in the spring? Leached into the aquifer? Used by the plants?
- *When does flow occur*? The Science Advisory Board report focuses on spring flush. In Iowa, there is not much tile flow in the winter. Could drainage water management exacerbate the problem?

He also examined the drivers for drainage water management, which include (1)Economics, including crop yields (if we see that), potential for wetland mitigation (studies needed to see if saturated fields could provide some of the biological functions of a wetland), and potentially fee hunting; (2) regulatory, and (3) society as a whole. We need to talk about least-cost ways to achieve the goal of nutrient loss reduction from the 88,600 farms in Iowa.

Doug Toews, National Water Management Engineer, discussed current happenings in Washington DC, particularly the Farm Bill. He highlighted some of the proposed changes from the 2002 Farm Bill including the Comprehensive Stewardship Incentives program that combines EQIP, WHP, and CSP. He also discussed a new rule signed by the Corps of Engineers and other agencies that specifically exempts drainage ditches from permitting. In response to many questions from Task Force members, he agreed to email the rule to the ADMS email group (drainman).

Pat Willey presented a draft of the Drainage Water Management practice standard (554), which should be finalized in a few months. Questions raised concerned the timing criteria, which specifies that "the system should be in controlled drainage mode within 30 days after the final field operation until 30 days before the next season's field operations begin, except during

system maintenance or to provide trafficability when field operations are necessary." This is considered to make it fairly flexible. Manure is not addressed. Questions about the non-perforated pipe and anti-seep collar are not addressed in this standard, but instead will be addressed in the structure standard.

Hydrologic effects of drainage water management; Where does the water go ?

Wayne Skaggs discussed the critical question of "where does the rest of the water go?". In most cases, he believes that the primary seepage route is vertical. Horizontal seepage is possible, to ditches or just regional water table lateral flow – but it conditions are such that large volumes can move horizontally, drainage is probably not needed. He presented DRAINMOD results with three values for hydraulic conductivity of the restricting layer, and discussed the predicted ET, surface runoff, seepage, and drain flow. As Kv (vertical conductivity of restricting layer) increases, drainage decreases and seepage increases, and the % reduction in nitrate loss increases.

N Stabilizing Products

John Hassell, Manager, Research and Agronomic Development for Agrotain International, presented background and current status of stabilized nitrogen technology.

State Reports – Status of Activities and Funding

- *Indiana:* Jane Frankenberger introduced Nathan Utt, a new graduate student working on the CIG project. Three sites that have previously been reported on are functioning well, and a fourth at Francesville has been installed. Submergence of the outlets at one site continues to be a problem. She also discussed with the County Surveyor (responsible for ditches in Indiana) the question of water control structures in the ditch right-of-way. He said the structures could be there but if they interfered with dredging equipment they would need to be removed.
- *Illinois*: Richard Cooke gave an overview of the Illinois projects and status.
- *Iowa*: Matt Helmers provided an update on the Iowa projects.
- *Minnesota*: Mark Dittrich described the various sites in Minnesota, and handed out the brochure used.
- *Ohio*: Norm Fausey reported on recent Ohio activities at the demonstration sites.

Thursday

At 8 a.m., the group boarded a bus to Adair, Iowa, to visit AgriDrain, and appreciated tours of the plant led by Charlie Schafer and others. Task Force members were particularly interested in a prototype valve-type water level control structure which is currently under development. The group enjoyed a visit to a big rock on the way home, and the wonderful hospitality of the Iowa hosts. (For those who weren't at the meeting, be sure to ask about the rock.)

Potential Nitrogen Reductions from Drainage Water Management

Dan Jaynes presented a GIS-based estimate of the potential for drainage water management to reduce nitrogen flowing into the Gulf of Mexico. They estimated impact by taking the estimates for N loss reduction for DWM from the RZWQM model calibrated for a soil in IA and a corn-soybean rotation. They applied the calibrated model to 48 locations across the Midwest using the 30 yr weather data for each site and statewide average crop planting and harvest dates and physiology. They then estimated the land base this practice would be suitable for by using STATSGO data and the NLCD land cover database to estimate drained soils with slopes less than 0.5% and planted to row crops. They used the 2002 NASS data to estimate how much of

the row crop cover used in the NLCD was actually corn and soybean. They then multiplied the model results for the benefit of DWM with the estimates of suitable drained land under continuous corn or corn-soybean rotation to come up with the mass of N removed from surface waters via DWM for each county in the Midwest. They then estimated the fraction of the Midwest states contained in the Upper MS and OH-TN river basins so they could put the N reduction numbers for DWM into perspective. They found that DWM could reduce N by 52,000 metric tons from 7.2 million ac, compared to annual losses of N of 349,000, 335,000, and 813,000 metric tons for the Upper MS, OH-TN, and entire MS basins respectively.
They tried some simple costs computations as well:

- For 7.2 million ac proposed for DWM @ 1 structure/14 ac and $600/structure installed = $309 million
- Plus management payment = $2000 max/farmer/yr = $29 million/yr
- Gives total cost = $44 million/yr
- Or ~ $0.85/kg-N (assuming 500 ac/farmer and 20 yr structure lifetime).

Results indicate that this is a cost effective approach when compared to other options. Discussion followed. Some people felt this represented an average or expected reduction, rather than the potential reduction.

A state perspective on structural practices for nitrate reduction: Gaps and research needs

Dean Lemke, Iowa Department of Agriculture, described innovative programs in Iowa. He identified seven potential practices that could be implemented in statewide hypoxia strategy:

- Improved fertility management
- Riparian buffers
- Row crop land retirement (probably linear relationship)
- Perennials for ethanol
- Not discovered practices (we can always put our hope in this)
- N sink wetlands
- Drainage management

He then described Iowa's model for targeting the most effective N sink wetlands.

EPA Science Advisory Board Draft Report

Dan Jaynes presented an overview of the Agricultural Drainage section of the SAB Hypoxia Report. The report identifies potential impacts on TN and TP of various drainage management practices.

CIG Project data collection and reporting

Diana Starr of AgriDrain described the data management system for the CIG project, and showed computer screens of the web-based software providing access to the satellite data. The CIG groups in each state have access to the data, and they can provide access capabilities to producers or others.

Charlie Schafer presented the following list of desired manually-collected data for each field.

- Field topo on 6" contours
- Drainage system design
- Top and bottom of structure as benchmarks
- Weir heights and dates of change
- In-field water table in 6" contours

- Nitrate concentrations
- Surface runoff per observed event (Discussion pointed out that this is very difficult. Note: Matt has placed plate over bottom of well. Jim Fouss puts a sensor without a well. Need to discuss.
- Surface runoff per observed event (The suggested method is that the producer looks to see qualitatively if runoff occurs more often on managed plot. It is impossible to measure surface runoff for an entire field. Another suggestion was to have small plots that would at least evaluate whether or not there was surface runoff, which Skaggs et al. have done on one project.
- Tillage method
- Crop
- Fertilizer type, rate, and application date
- Planting date, population, and row spacing
- Harvest date
- Yield on 6" contours
- Site-specific checklist for each paired system

Other issues:
- Economics
- Website (Currently at AgriDrain but will be on ADMC website)
    - Google Earth – Probably make videos that allow people to see the field, but not exactly where it is.
- Field days – Field days will take place at each site, which necessitates making locations public
- Cost share

The CIG Team will have conference calls once per month, which may take 10 minutes or an hour, depending on things to discuss. Quarterly report needed by October 15.

Friday

Susan Heathcote from the Iowa Environmental Council discussed her perspective on drainage management and the roles of the environmental community.

***"Q&A About Drainage Water Management in the Midwest"* Publication**

Jim Fouss announced that the extension publications "Questions and Answers About Drainage Water Management in the Midwest" (www.ces.purdue.edu/extmedia/WQ/WQ-44.pdf) won a Blue Ribbon in the American Society of Agricultural and Biological Engineers Education Aids Competition. Jane Frankenberger said that few copies of the publication remain from the original 8000, which have been distributed around the Midwest. A rough inventory was made of desired additional copies, and the following list was made. The original printing was paid for by the CSREES regional water quality program, but other sources would be greatly appreciated for funding the second printing. Please contact her at frankenb@purdue.edu with needs and ideas for funding.

Requests for Q&A pub (Funding not assured)

Univ. of Minnesota	*2000*	*Springfield Plastics*	*1000*
Ohio (estimate)	*2500*	*NRCS*	*2500*
Louisiana (Fouss)	*500*	*FRATCO*	*1000*

Iowa State	*500*	*NRCS – Indiana*	*500*
ADMC	*1000*	*IDDA*	*100*
ADS/Hancor	*400*	*Iowa Dept of Agriculture*	*100*
Prinsco	*500*		

Open discussion

The group discussed what it would take to have more tile systems installed on the contour. Needs include

- education of contractors on how to design and install such systems (role of the universities), and also
- incentives to offset the added costs of such a system as opposed to a least-cost, grid system.

For NRCS to provide such incentive, they need to have a practice standard. There was some discussion on whether 606 or 554 could be used to cost-share on the differential. Although they address the general practice, they would need criteria for actually making cost-share decisions. The group felt that such a standard is a strong need, and NRCS staff were encouraged to begin work on one.

How to develop a drainage water management plan – Don Pitts

In Feb 2007, NRCS in Illinois used special EQIP water management project funds to develop DWM conservation plans. 80 landowners signed up in 30 days; 32 were selected to receive contracts. The funds could have been used for implementation, but since no plans were available the funds were used for planning only. The objective of the project was to develop a set of DWM plans that would be available when funding opportunities arise. The focus was on retro-fit of an existing conventional drainage system, not design of a new drainage system. NRCS Practice Standard 554 was used as the basis. The conservation plan can be developed by the local NRCS field office staff, a private sector technical service provider, or by a drainage contractor. About 40 people were trained in these

Components of a DWM Plan

1. Farm and field information
2. Objectives of the landowner
    - Should be one of purposes in 554. Some produces recognize the benefits of minimizing off-site water quality impacts, but this is rarely the primary reason. Production benefits are the primary reason most are interested. They must include Purpose 1, also usually Purpose 2.
3. Field map with field boundaries
4. Soil map.
    - Web Soil Survey or a GIS site at UIUC
5. Tile map, including tile material, diameters, and location (Landowners had to bring this information for cost share)
6. Delineation of the area within the field drained by the tile system.
    - Considered to be one half of the lateral tile spacing recommended for the soil type as the outer boundary. For most “patterned” or intensive systems, the entire field is drained. For random system, typically only part of field is included. The recommended spacing is considered to be the widest part of the recommended range.
7. Topographic map on a maximum of 120 ft grid and 6-inch elevation increments.
8. Impacted Area

- An overlay map that includes field boundaries, tile locations, contour map. This is to determine the zone of influence or impacted area. In Illinois they defined this as 2-foot contour. Ratio of cost of structure to the impacted area is used in prioritizing implementation.

9. Operation and maintenance component
    - Follows 554. This is a statement that defines the purposes and critical dates and target. Includes timing and target water table elevation. (Elevations are given in relation to the soil surface at the control structure.) During fallow season must be held (usually 6 inches from surface) but up to farmer for the growing season. Often include a diagram.
    - Also a statement that "the water level control structure should be operated and maintained based on the manufacturer's recommendations."
    - Consideration: Adding water level observation wells is helpful in mgmt (but it is a hard sell.)
10. A summary sheet that includes pipe diameters for each control structure and the area impacted by each structure
11. Signature page
12. A District Conservationist checklist

After plans have been developed, systems will be prioritized for funding based on the ratio of impacted land to cost of structure. (Cost of structure based on size of pipe.) This has not yet been done because plans have not been completed. The DC will need to go through each component with the landowner before payment can be made. This will help DC and landowner be very comfortable with system.) A template for a DWM plan is available on the Illinois Drainage Guide (managed by Richard Cooke. Template at http://www.wq.uiuc.edu/dg/Related.htm)

Questions and Discussion:

- The payment for the plan alone is $30/acre of field. This includes the cost of doing the topographic map.
- All fields selected have one owner only, and do not impact another landowner.
- Only a few DCs went to training, in counties where there will be the most systems (about 12 counties). 'They will need to become familiar with the practice as they sign off on plans with the landowner.

Seasonal Operational Management Strategies

Several experts shared their thoughts on operational management strategies.

- Don Pitts' general philosophy is not to let the water go until you really need to. Anecdotal observations were that after water table was raised for some time, it seemed to be less sensitive especially on corn.
- Jim Fouss recommends never having completely free drainage. He uses "deep controlled drainage".
    - Comment: In Illinois, farmers have been concerned about potential sediment buildup in the pipe. Completely lowering the weir is perceived to flush it out better. The discussion was not conclusive. Some people have been concerned about the effect on soil structure if the system is wet all the time.
- Wayne Skaggs: The outlet is not kept as high in NC (12-18 inches) because of wheat. Fields are never even, so there is not one depth to water table. One farmer manages for 90% of the field recognizing that there may be losses in a few areas.

- Another consideration is that the Hypoxia Task Force has put a special emphasis on "spring flush". (Spring is defined as April-June, but some people think it needs to start earlier, including February and March.) Should the recommended management strategy take that into consideration? This should be considered in future research and reporting of results to help define potential impacts in that period.
- Depth in winter would be different if there were cover crops. (But cover crops are unfortunately too rare in the Midwest.)
- Can the boards be raised immediately after planting? Usually there are other field operations that need to be done after planting (herbicide, etc.) so important to wait until finished. Can usually be raised right after harvest because it is dry.
- For the CIG demonstration project, one recommendation is needed. ADMC will send a survey to each state, and then aggregate or average the results and recommend that to the individual cooperators, so that results can be properly aggregated and compared.

USDA – Agricultural Research Service overview

Mark Walbridge, ARS National Program Leader for Water Availability and Watershed Management, spoke about the ARS mission and structure for research. He described the structure and program areas that drive the water program. (Note that "water availability" now includes water quality.) There were questions about whether water quality continues to be adequately funded given the current priority on bioenergy, and he assured the group that it is. He discussed the following emerging issues and future research directions:

- ARS Watershed research network, as a baseline for future changes in water availability, and a platform for addressing emerging water availability issues
- Drought monitoring and prediction (NIDIS)
- National Water Census (current discussion on how to develop and fund this)
- Water reuse technologies
- Increased water use efficiency
- Water quality issues (Gulf of Mexico, Chesapeake Bay)

Water issues may be prioritized in a major agency initiative in the future.

Next meeting - April 2-4, 2008 at Purdue University.

This will follow the NCR-207 meeting. Eileen Kladivko (kladivko@purdue.edu) will coordinate logistics for the meeting.
Theme for the meeting: What are the hurdles to getting systems designed and implemented? We need representatives from other states to think about developing a program like Illinois to fund planning for systems, which is the first hurdle in getting systems implemented.

The meeting was adjourned at 12 pm.

Notes compiled by Jane Frankenberger, Purdue University
September 2007

Meeting Participants

Name	Agency and Location	Email
1. Jeanne Hansen	ADMC, Owatonna MN	jhanson@admcoalition.com
2. Leonard Binstock	ADMC, Owatonna MN	lbinstock@admcoalition.com
3. Phil Algreen	AgriDrain, Adair IA	algreen@agridrain.com
4. Charlie Schafer	AgriDrain, Adair IA	charlie@agridrain.com
5. Diana Starr	AgriDrain, Adair IA	diana@agridrain.com
6. John Hassell	Agrotain Intl, West Lafayette, IN	jhassell@agrotain.com
7. Dan Jaynes	ARS – Ames, IA	dan.jaynes@ars.usda.gov
8. Jim Fouss	ARS – Baton Rouge LA	jfouss@ars.usda.gov
9. Mark Walbridge	ARS – Beltsville MD	mark.walbridge@ars.usda.gov
10. Norm Fausey	ARS – Columbus OH	fausey.1@osu.edu
11. Pat Dumoulin	Farmer, NCGA Rep	dumoulin@fvi.net
12. Todd Redlin	Francesville Drain Tile	tredlin@fratco.com
13. Chris Overmyer	Francesville Drain Tile	covermyer@fratco.com
14. Michael Hagen	Hancor/ADS	mhagen@hancor.com
15. Dean Lemke	Iowa Dept of Ag & Land Stewardship	Dean.lemke@idals.state.ia.us
16. John Torbert	Iowa Drainage Dist Assoc	jtorbertidda@mchsi.com
17. Susan Heathcote	Iowa Environmental Council	heathcote@iaenvironment.org
18. Dan Rasmussen	Iowa LICA, Independence IA	ialica@indytel.com
19. Duane Sand	Iowa Natural Heritage Foundation	dsand@inhf.org
20. Matt Helmers	Iowa State University	helmers@iastate.edu
21. William Crumpton	Iowa State University	crumpton@iastate.edu
22. Mark Dittrich,	Minn. Dept of Ag	mark.dittrich@state.mn.us
23. Bruce Atherton	NRCS – Ankeny, IA	Bruce.atherton@ia.usda.gov
24. Wayne Skaggs	North Carolina State Univ.	skaggs@eos.ncsu.edu
25. Don Pitts	NRCS – Champaign IL	Don.pitts@il.usda.gov
26. Mark Jensen	NRCS – Des Moines	Mark.jensen@ia.usda.gov
27. Jerry Walker	NRCS – Forth Worth, TX	Jerry.walker@ftw.usda.gov
28. Beth Clarizia	NRCS – Indianapolis	Beth.clarizia@in.usda.gov
29. Mike Sullivan	NRCS – Little Rock, AR	michael.sullivan@wdc.usda.gov
30. Tony Stevenson	NRCS – Little Rock, AR	Todd.stevenson@ar.usda.gov
31. Pat Willey	NRCS - Portland	pat.willey@por.usda.gov
32. Sheryl Kunickis	NRCS – RIAD	Sheryl.kunickis@wdc.usda.gov
33. Douglas Toews	NRCS – Washington DC	Doug.toews@wdc.usda.gov
34. Kent Rodelius	Prinsco Inc.	krodelius@prinsco.com
35. JaneFrankenberger	Purdue University	frankenb@purdue.edu
36. Nathan Utt	Purdue University	nutt@purdue.edu
37. Joseph Britt	Sand County Foundation	jbritt@sandcounty.net
38. Steve Baker	Springfield Plastics	sbaker@spipipe.com
39. Jack Huggins	The Nature Conservancy, Peoria IL	jhuggins@tnc.org
40. Gary Sands	Univ of Minnesota	grsands@umn.edu
41. Craig Schrader	Univ. Minnesota Extension	Schr0118@umn.edu
42. Richard Cooke	University of Illinois	rcooke@uiuc.edu
43. Lon Crosby		Lon_crosby@netins.net