nutrient stewardship

Drainage Water Management: A Tool that Interacts with the 4Rs

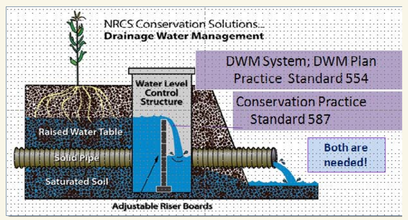
ADMC Agricultural Drainage Management Coalition

Drainage Water Management (DWM):

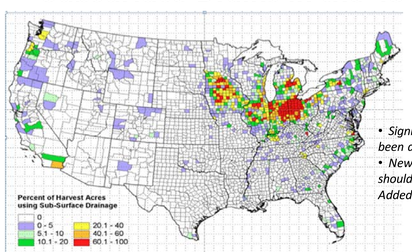
A BMP for Reducing Nutrient Losses

- For soil applied nutrients, placement addresses root-soil dynamics, nutrient movement, and spatial variability management within the field to meet site-specific crop needs and to limit potential losses from the field.
- Right place is an important part of proper nutrient management and must be combined with considerations of right source, rate, and time. Right place can be a moving target that changes depending on the crop grown, the state of its development, the overall fertility of the soil, and the accompanying implemented management practices
- Drainage water management can play a key role in nutrient management by helping to reduce losses of nitrogen and phosphorus from production fields and balancing drainage and water supply needs. This helps keep the nutrients in the right place. Drainage water management can regulate timing of field outflows and improve nutrient use efficiency.

Basic System for Drainage Water Management (DWM)



Subsurface Drains in the 48-States

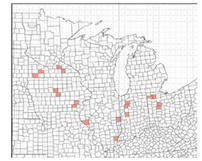


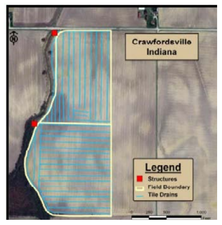
- *Significantly more drainage has been added since this survey.*
- *New installations especially should be designed for DWM. Added cost is only about 10%*

ADMC/NRCS CIG DWM Demo Project

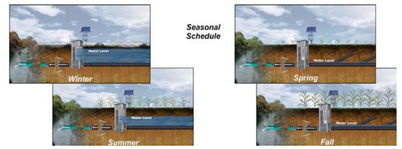
A BMP for Reducing Nutrient Losses
Conservation Innovation Grant 68-3A75-6-116

- The 20 field evaluations in 5 states
- Nutrient reductions,
- Crop yields,
- Profitability,
- Timing of drainage water management,
- Precipitation,
- Drainage outflows

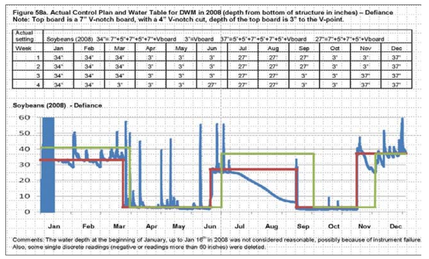




Map of one of the 20 CIG demo sites



Sample Water Table Adjustment Schedule



State Average Summaries

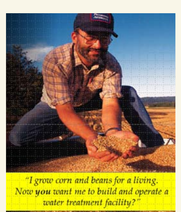
State	Drainage Outflow Reduction (%)	Nitrate Load Reduction (%)	Crop Yield Increase (%)
Ohio	60.9	53.4	4.9
Indiana	7.0	0.1	1.4
Illinois	58.3	68.0	1.3
Iowa	39.4	38.8	0.3
Minnesota	22.3	36.1	-0.5
All	**34.9**	**34.4**	**1.3**

Summary of Individual Field Results

- Up to 90 percent less nitrate leaving in drainage water
- Up to 20 percent increase in yield

What's in it for me?

The best management practices in the world are only effective with the farmer's participation.



- Apply for financial and technical assistance
- Install the practices
- Pay out of pocket expenses
- Sacrifice tillable acres
- Maintain and manage the practices and structures
- Ecosystem services markets?
  - *Cost-share of installation investment*
  - *Management incentives*

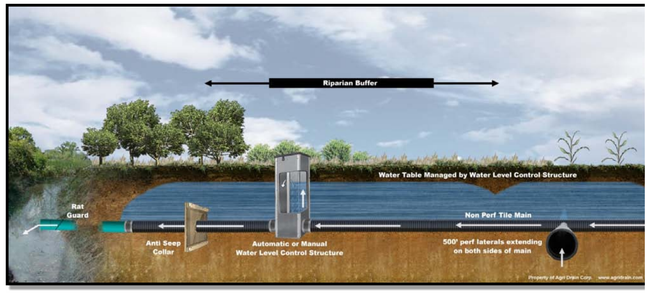
Saturated Buffers

A New Variation of DWM

Existing buffers often have tile lines crossing through them from the adjoining fields, greatly reducing the buffer's effectiveness.

Converting existing buffers to saturated buffers can help make them more effective in managing drainage water flow and in removing nutrients from the water leaving the field.

Installation cost is low and little maintenance is required.



- With saturated buffers, a DWM control structure intercepts the main tile line crossing the buffer, and is used to raise and lower the water table in the buffer.
- Perforated drainage pipe lateral lines are then installed down the length of the buffer and allow the raised water table to saturate the buffer.
- Plants in the buffer help remove the nitrates from the water before it flows into the ditch or stream.
- The saturated buffer also increases the removal of N through denitrification.
- A variation on this design allows the water table to be raised above the surface to from a temporary wetland that can serve as a habitat for water fowl.

Bear Creek---Story City, Iowa

- 60' buffer---grass/shrubs/ silver maple
- Existing 4" tile (50 gpm into buffer)
- 1000' lateral in buffer.
- Estimated 40 acres drained
- Over the first 6 months, this system was able to remove 100% of the nitrate from the water flowing out of the field.
- The buffer could be planted to biomass crops that could be harvested and used as a biofuel or converted to ethanol.

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