Phosphorus Task Force-Phase 2 Meeting
September 5, 2012
Vern Riffe Tower 1960

Attendance

Task Force - Larry Antosch, Mike Bailey (for Karl Gebhardt), Anne Cook (for Doug Busdeker), Dan Button, Libby Dayton, Kevin Elder, Gail Hesse, Todd Hesterman, Kevin King, Amy Jo Klei, Greg Labarge, Joe Logan, Terry McClure, Kevin O'Donnell, Jeff Reutter, Pete Richard, Chris Wible, Rick Wilson, Ron Wyss, Jeff Tyson

Observers - Remegio Confesor, Jack Irvin, Jack Kramer, Linda Merchant-Masonbrink, Trinka Mount, Anthony Sasson

Announcements

A handout was distributed with future meeting dates and locations. Participants should note that the meeting locations vary.

Libby Dayton received a USDA CIG (Conservation Innovation Grant) for a 3 year project, possibly renewable for longer.

Jeff Tyson (ODNR -DOW Sandusky Lake Erie Fisheries) is a new Task Force member replacing Roger Knight who retired.

A Nutrient Forum (OEPA, ODNR, and ODA) will be held Nov. 14, 2012.

In 2014, the U.S.EPA Lake Guardian will be in Lake Erie. The P Task Force should consider providing recommendations to the next Lake Erie Millennium meeting which will be Oct. 23-24, 2012 (agenda item for October). Perhaps the Task Force can leverage additional resources to complement this data collection.

ARS scientists along with Purdue University are working on a manuscript on the contributions to the DRP to be published in the coming year.

Check-In on 2012 Algae Season

The bloom in the western basin has recently switched to *Anabaena* sp. This can happen later in the season as nitrogen is used up, and nitrogen-fixers, like *Anabaena sp.*, have the advantage.

The bloom is close to Michigan, centered around Monroe. The bloom is small in extent in the western basin compared to other years.

Drainage Management

Kevin Elder initiated the discussion of this topic with an overview of terminology related to drainage management. He provided a handout of Chapter 10 (Water Table Control) from a document published by the University of Minnesota Extension Service. This chapter provides definitions of the various aspects of a water table control system including:

- Controlled drainage
- Subirrigation
- Subsurface drainage
- Surface drainage
- Water table control, and
- Water table management

These definitions were discussed and the group also included the terms 'water treatment structures' and water control structures'.

> **Water treatment structure** – a structure that uses additives to remove pollutants before going out the tile (i.e., wood chips, ferric, etc.)
>
> **Water control structure**- a structure that changes the depth of the water table in the soil profile (works better in NW Ohio because of flatter slopes.) These structures are expensive and have to be managed.

An overall discussion followed about the reasons for tiling including allowing for planting and tilling without compaction as pore space is needed for plant development. The group discussed differences in design of the tiling system including spacing, grade and depth.

Dr. Kevin King of USDA-ARS followed with a presentation of research related to drainage management. King's PowerPoint presentation was divided into three sections:

1. Current research conducted by Dr. King
2. Synopsis of research conducted by others
3. Research related to treatment of water from drainage outfalls.

King presented his preliminary findings from his research in the Upper Big Walnut watershed in central Ohio and his edge-of-field assessments in the Upper Wabash watershed in Mercer County. He went on to present summarized findings from more than 90 published manuscripts on phosphorus and drainage management. The presentation is posted on the website. (LINK)

King wrapped up his presentation with an overview of strategies for addressing agricultural induced phosphorus transport. King presented findings of phosphorus reduction achieved with the following strategies:

- Upland management (4Rs, interruption of connection to surface)
- Structural hydrologic control (water table management, blind inlets)
- Filtration (end-of-tile and in-stream enhanced bioreactors)
- Edge of field buffers (vegetated and saturated, wetlands)
- Ditch design and management (2 stage, natural, over-wide, dredged vegetated channels)

Discussion

The discussion was wide-ranging throughout King's presentation and afterwards. The following captures many of the key points made by King and Task Force members.

- While there is variability depending on location, tile density has increased particularly in areas with tighter soils. Increased density of tile shows greater DRP losses.
- The cost to re-tile is about $2,500-$4,000/acre. Yield response is dramatic when tiling areas that were not previously drained. For example, 25 bushels/acre without drainage, and 35-40 bushels/acre with drainage. No other technology approaches this payback.
- There are conflicting studies on how tile depth impacts dissolved reactive phosphorus (DRP) mobility.
- The season is more important than type of crops when determining potential DRP runoff concentrations in tile. Studies show that the growing season (April-October) has elevated concentrations of DRP export in tile as compared to the non-growing season.
- Preferential flow must be considered in addition to tile drainage. Macropore flow is a key issue—we need to get back to matrix flow. We need to solve the macropore drainage issue by getting soils more structurally stable so DRP is not lost to the tile through cracks. Clay soil has preferential flow through macropores.
- Studies show losses from clay soils are much greater than from sandy soils.
- No-till increases DRP, and decreases erosion of particulate P; conventional tillage decreases DRP, and increases erosion.
- What would loading look like in un-tiled fields? We don't know.
- Should we stop tiling until we know the answer? We have three options: 1) stop more tiling, 2) deal with macropores, 3) treat tile water. We need to get some recommendations right now.
- We seem too concerned about increasing production, and less concerned about the impact. We are probably making the environment worse by increasing production.
- Society wants inexpensive, sustainable fuel and food. We should be able to manage dual priorities of agricultural production and clean water. This is not a tradeoff between the two.
- There are higher P losses from row crop (especially corn that uses higher P application) rotation acres than in acres managed as pasture and forage (e.g., alfalfa). Less DRP is lost with frequent, lower rates, and longer rotations.

- Inorganic fertilizer has more water soluble P than organic fertilizers. Poultry and swine manure have greater DRP proportions.
- There is a new fertilizer component that makes P more available called "AVAIL." It ties up the elements in soil that typically bind with phosphorus.
- Farmers should incorporate fertilizer and not use more P than needed. Why can't we get an agreement now to make a difference this fall?
- Losses of DRP when Soil Test P is high; applying P after crop harvest increases likelihood of P-transport in tile.
- DRP concentrations are highest after broadcast application. Banding P fertilizer will delay transport (because the more "in-touch" the fertilizer is with the soil, the better.) Minor disruptions of soil with incorporation are possible to do.
- Regarding improved fertilizer placement (i.e., banding or strip tilling P-fertilizer into the soil versus broadcast onto soil surface), Elder says it takes longer, but it saves money.
- Storm related concentrations of DRP are typically an order of magnitude higher than non-storm related discharges.
- Water control structures work best in <1% grade like in NW Ohio. The market is ripe right now for water control structures.
- Surface inlets allow some sediment to settle out. Otherwise they are direct conduits of drainage to tiles and ditches. They will silt in. A study from MN concluded that tile discharge concentration of P is statistically higher in systems where there are surface inlets.
- Bioreactors: These promote denitrification by using wood chips and can be located at the end of a tile. But the amount of denitrification is temperature dependent. There is more denitrification in the summer. Flow rate is the critical factor in these systems
- Buffers: These serve as a setback, but are not effective for removing DRP from concentrated flows.
- Wetlands: These can become oversaturated with P and then discharge P. However, wetlands still retain nitrogen and are effective hydraulic buffers with additional wildlife and ecological benefits.
- Vegetated ditches are like linear wetlands. There is no data for phosphorus removal like there is for sediment and nitrogen. Ditch dredging exposes low nutrient soil and buffering sites.
- Are we going to treat 4.3 million acres the same? Can we break it down into watersheds? We don't have enough data yet.
- Cost sharing can help get a lot of this done. But we can also rely on farmers to be stewards. Since we will get more cracking of soil in our current climate, we need to consider soil health. It takes 6-10 years to change soil structure (less if there are cover crops).

This agenda item consumed the remainder of the day, so the remaining items will move to the October meeting.