

Ohio Lake Erie Phosphorus Task Force Meeting Minutes
September 10, 2007
Riffe Center, Columbus, OH

Meeting Objective: *To explore the use of a phosphorus risk index to determine the phosphorus concentrations in soils and the potential for loading to surface waters, summarize current research on phosphorus in soils, and provide updates on other programs addressing phosphorus in Lake Erie.*

Chair Gail Hesse provided an overview of why the Task Force was created and a summary of the topics covered at the three previous meetings. The first meeting focused on the status of Lake Erie as related to nutrient loadings. The second meeting focused on the status of tributaries to the lake and the identification of potential sources of phosphorus. The third meeting began to address the agricultural sources and assessment tools available to measure various forms of phosphorus and risk factors associated with too much or not enough phosphorus application. The minutes of all previous meetings, presentations, references and other information are available on the web site at www.epa.state.oh.us/dsw/index.html. The full presentations given at this meeting are also found on the Phosphorus Task Force web page. Only the highlights are presented in these minutes.

Mike Monnin, State Conservation Engineer with NRCS, gave a presentation on Phosphorus Management in Comprehensive Nutrient Management Plans (CNMP). Any farms that want to apply for assistance under EQUIP must have an approved CNMP. Phosphorus application and control is largely governed by two standards: 633 and 590.

Standard 633 states that manure should not be applied to fields that are frequently flooded during the time when flooding is expected, unless incorporated immediately. For liquid manure applications, about 18,000 gal/acre is considered safe. Tile outlets must be monitored during application. Application rates must be adjusted to the most limiting factor, one of which is the N or P risk assessment for the field.

Standard 590 states that no manufactured phosphorus fertilizer should be applied above 40ppm Bray P1 or equivalent test unless recommended by industry standards or land grant universities for specialty crops.

In general, livestock farms applying manure are probably doing a better job of testing than those farms that just apply commercial fertilizers.

The purpose of a Phosphorus Risk Assessment is to assess the risk of P movement from fields. Two methods are used: soil test or Phosphorus index. The soil test method is the most sustainable, while the P index generally permits

higher P application rates over the short term while buying time for other options for disposal/use of manure.

Soil test results represent 25 acres and are current for 3 to 5 years. They utilize Bray-Kurtz P1 or adjusted Mehlich 3 methods. The scale depicting risk is as follows:

< 40ppm Bray P1	low
40 – 100 ppm	moderate
100 – 150 ppm	high
> 150 ppm	very high

Different management options are recommended at each level.

The P index is not an absolute measure and is calculated using 9 factors: 1) erosion; 2) connectivity to water; 3) runoff potential; 4) Bray 1 soil test results; 5) amount of fertilizer applied; 6) method of fertilizer application; 7) amount of manure applied; 8) method of manure application; and 9) filter strip management. Fertilizer is weighted more than manure because it is more soluble.

In general, the P index is a planning tool that calculates risk assessment by combining the effects of multiple factors. It is best used when soil test results are at the limit. **[Need to add something about management based risk scale for P index]** Using the P index is time-consuming, field by field intensive, only used on 1 -2 % of fields and additional research is still needed to verify the components of the P index.

Application of additional phosphorus on any farm with Bray P1 > 150ppm is not allowed and other options are recommended, such as changing crop rotation, cover crops, removal of crop residue, etc. There are some localized hot spots, but areas with > 150ppm Bray are found infrequently. Similar application standards are used in Indiana and Michigan, but not sure about the rest of the Lake Erie basin.

Libbey Dayton from OSU then gave a presentation on the Utility of the P Index Framework. The P Index was initially developed to identify fields vulnerable to P loss. As described previously, the P index equals transport factors (runoff, erosion, connectivity to water) times the source factors (STP, Applied P and application method). If the transport factors and source factors do not add up to an acceptable P risk score, then P loading must be adjusted using BMPs.

Libbey ran through several examples of how adjusting any of the components can alter the P index value. Using the Pennsylvania P Index approach, she showed how varying certain factors could result in achieving the desired P index value. One way to reduce the STP is by the use of sorbents, such as aluminum or iron oxide. These are best on and easiest to apply to filter strips. It is more difficult to apply them to open fields with tile drainage. One project OSU is working on is the use of byproducts from water treatment plants for use as sorbents in fields.

The P index is good for finding the areas where there is high STP and high potential for transport. Testing and validation of P index is needed to ensure the success of P-based nutrient management at the farm and watershed scale. To increase the utility of the P index, BMPs to reduce P index scores need to be developed and validated. By considering P source and transport factors as well as management systems, a robust P index framework can provide flexibility in reducing the risk of agricultural P transport. We need to find whatever is needed to reach P balance.

The discussion following the presentations focused on what factors/components could be accounting for the increase in dissolved phosphorus. These included:

- crop tillage methods
- crop rotation pattern change
- fertilization application changes
- tillage practice trends (no/low till vs. turnover)
- decline in no-till corn but increase in soy beans
- soil stratification of phosphorus (due to conservation tillage)
- buffer (filter) strips may still be doing a good job of catching sediment, but they may have reached maximum P concentrations
- most filter strips have been added in the last 8 to 10 years
- we may never know what is causing the increase in dissolved phosphorus, so we may need to focus on removing it before it gets to the lake (i.e. divert high phosphorus waters to wetlands where algae can be grown from the P and harvested for biofuels)
- what are the management options we can consider without knowing exactly where the dissolved phosphorus is coming from
- where are the hot spots
- work on advancing GPS precision farming being done in NW Ohio
- follow up on AGNPS model in Auglaize County

Rick Wilson then provided an overview of pertinent research on phosphorus management in agricultural watershed. Check the actual presentation for the list of researchers working in this area. For more than two decades BMPs have been installed across the country and yet NPS pollution remains an acute national problem and agriculture has been strongly implicated. In some cases, researchers point directly to the ineffectiveness of BMPs, particularly the application of sediment control practices to reduce soluble chemical transport in runoff. Effective control of polluted runoff is greatly hampered by: 1) Incomplete understanding of fundamental processes affecting the movement of water in the landscape as well as the origin, fate and transport of dissolved and suspended solids; 2) Incomplete understanding of social, economic and institutional processes for developing management strategies; 3) Inadequate technology for assessing environmental and water quality risks; and 4) Insufficient resources for implementing BMPs and management plans in affected land and water bodies.

The rest of his presentation draws mainly from Lesson 34 – Agricultural Phosphorus Management: Protecting Production and Water Quality by Andrew Sharpley, USDA-ARS. The entire lesson has been posted on the P Task Force Web Page. These are some of the major points in Rick's presentation:

- Most applied phosphorus accumulates at the soil surface.
- The phosphorus cycle from source to sink has changed considerably since the 1940s. This has affected the import and export of phosphorus on a national level as well as pathways, processes and nutrient budgets.
- It appears that the 6 inch depth is a major cutoff for stratification rather than 8 inches.
- The sources of excess phosphorus on livestock farms where manure is applied are pretty much related to the excess of phosphorus in animal feed.
- Once fertilizer application stops, P levels go down quickly.
- Sand appears to have a higher concentration of P than clay, but the volume of runoff from clay is greater than the runoff from sand.
- There are three options for measuring/managing P for AFOs: agronomic soil test, environmental soil test P thresholds, and P index.
- The Agronomic P does not measure environmental P. It is done to determine the amount of P needed for crop production.
- The P in the top two inches is measured to determine the environmental impact.
- 90% of the P utilized for algal production comes from 10% of the land over a short time period.
- BMPs minimize P loss at the source, reducing loads to the water body
- Leaching implies transport off site while percolation implies infiltration into the soil.
- The key issues are the critical importance of the soil test depth, manure and nutrient surplus budgets, agronomic vs. environmental thresholds, and the utility of the P-index.

Discussion

If it looks like the top 2 inches of soil is critical, what would it take at the state level to require testing be done on separate soil depths rather than a homogenized sample of the top 8 inches?

- 8 inches is used because that is the standard agricultural application (agronomic).
- Unless you are plowing (moldboard) it doesn't make sense to measure P in the entire 8 inches.
- Additional testing would cost \$6/25 acres.
- Most of the root mass in no-till crops is at the surface
- The 8 inch horizon is the agronomic standard while the 2 inch horizon represents the environmental impact

- At what point does the solubility increase?
- Soluble P in soil pores is different than soluble P in water
- How do concentrations in runoff from a site compare to soil pore P?
- Need a water body threshold
- Every soil has a breakpoint.
- A concentration of 20 ppb of phosphorus in a waterbody is usually the difference between mesotrophy and eutrophy.
- Ultimately, we need to set a phosphorus target in the lake and move back up onto the land to see how to meet the target in the lake. Keep in mind that the lake's ability to assimilate phosphorus has decreased since the advent of dreissinids (zebra and quagga mussels).
- How does the 1mg/l TP limit for discharge from wastewater treatment plants larger than 1MGD relate to open lake TP concentrations?
- Is there a way to get folks to volunteer to bring in the top 2 inches of soil for analysis in addition to the top 8 inches? The samples could be collected at the same time.
- Heidelberg is conducting a pilot project in the Sandusky River Basin under the Great Lakes Protection Fund's Measures and Metrics Initiative to sample both the 2 and 8 inch horizons and develop a soil test metric for dissolved phosphorus.
- There are no long term studies to measure what is coming out of the tiles.
- The only place we see high P in tiles is where new tiles have been installed.
- We don't have the studies for dissolved phosphorus in subsurface drainage tiles that we do for nitrate.

For soil stratification, what do we know, what don't we know, and what do we still need to know?

How much further do we want to take the examination of agricultural practices as a source of dissolved phosphorus to Lake Erie?

What is going on in other areas that may have characteristics similar to the Lake Erie basin? Saginaw Bay, Green Bay, Lake Champlain are all having problems with excessive algae and are surrounded by agricultural land use. Florida, Minnesota, Wisconsin have adopted restriction on phosphorus in fertilizer. Vermont, Washington and Quebec have adopted bans on phosphorus in dishwashing detergents. Why are other areas looking at phosphorus reductions? What type of management practices are they following? Some areas like Green Bay are very similar to Lake Erie as far as land use in the basin and physical characteristics similar to the western basin.

Julie Letterhos provided an update on the Lake Erie Lakewide Management Plan (LaMP) program that is required under the Great Lakes Water Quality Agreement. The LaMP has been in development since 1994 and has been attempting to move toward implementation the past several years. The LaMP

has evolved as a framework toward management rather than a plan. Nutrients are and have nearly always been the most significant issue in the lake in regard to pollutants. For the next two years, the LaMP will be focusing on nutrient management issues. A Science Task Group will be pulling together all the current science on nutrients in the lake. Based on that, a binational nutrient management strategy will be drafted by June 2008. We are working to get LaMP partner agencies to commit to aligning policy, regulatory, program and resource issues to achieve nutrient management objectives for Lake Erie.

Julie Weatherington-Rice suggested that the P Task Force may want to consider sponsoring a session or field trip at the Ohio Academy of Sciences Conference to be held at the University of Toledo on April 11, 12 and 13. This may be an opportunity to raise awareness of the nutrient issues. It seemed that most members felt it was too early to be holding such a session.

Next Steps

- Presentation on the status of the Rock Creek project.
- Potential to develop other nutrient targets for the lake. Currently there are only targets for TP.
- What can we find out about similar areas around the Great Lakes or elsewhere
- More discussion on what type of soil tests to use
- Recalculate loadings to the lake
- Joe Nestor
- 1978 IJC Phosphorus Task Force Report, 4 ppm hypolimnion concentration, 3 modules focused on eliminating harmful algal blooms

Attendance: Julie Weatherington-Rice – OFFWG; Dave Baker, John Crumrine, Jack Kramer, Pete Richards – NCWQR; Gerry Matisoff – CWRU; Chris Riddle – OLEO; Rick Wilson, Julie Letterhos, Gail Hesse – Ohio EPA; Norm Fausey – ARS; Robert Mullen, Elizabeth Dayton, Nick Basta, Larry Brown – OSU; Todd Hesterman; Kevin Elder – ODOA; Paul Bertram – USEPA-GLNPO; Seth Hothem – NEORS; Chris Kasselmann – ODNR; Dan Button – USGS; Jeff Reutter – Ohio Sea Grant; Steve Davis, Mike Monnin, Tom Sewell, Bob Hendershot, Julie Zehner – NRCS