

**Minutes of the SERA-IEG 17 Annual Meeting held in Fayetteville, Arkansas.  
June 11 to 13 2007**

**Watershed Phosphorus Management: Changing the Paradigm**

**Location:** Center for Continuing Education, University of Arkansas, Fayetteville  
Arkansas

Monday June 11<sup>th</sup>

The SERA 17 group was welcomed to Arkansas by Andrew Sharpley from the University of Arkansas (UA). Mark Cochran, Associate Vice President for Agriculture – Research at UA gave a short overview of agriculture in the state.

Local Watershed Management Issues

1. Arkansas concentrated animal feeding operations (CAFOs) and nutrient management planning regulations - Crystal Phelps, Arkansas Natural Resources Commission.

Most CAFOs are broiler operations. All animal feeding operations are required to register with the state. Nutrient management planners are required to undergo certification before they can write plans. The state recently started inspecting producer's farms to verify that nutrient plans are being followed. The plan is to inspect around 5 percent annually. This year 13 violations were reported for late registrants, 2 for over-application of litter and 1 for a complaint regarding a setback.

2. Managing Phosphorus in a Changing Landscape - Marty Matlock, Biosystems and Agricultural Engineering Department at UA

Before we can manage phosphorus at watershed scale we need to be able to determine scientifically-defensible critical phosphorus concentrations (based either on reference streams, or the impact of different concentrations on observable stressors such as algal growth rates). In parts of northwest Arkansas many rural counties are rapidly urbanizing and the ability of the landscape to deal with excess phosphorus decreasing. While the rate of urbanization is still relatively low (80 percent of what will be built up by 2050 is not built yet) there is a need to promote the development of green infrastructure – open spaces, green streets (with bioswales) etc.

3. Watershed Management from a Drinking Water Perspective – Bob Morgan, Beaver Water District [www.bwdh2o.org](http://www.bwdh2o.org)

The Beaver Water District's plants are tasked with producing up to 100 million gallons per day (MGD) of high quality drinking water at an economic price

(\$0.0016 per gallon). Beaver Water District provides water to more than 250,000 people and industries, or more than 9 percent of Arkansas' population including the cities of Fayetteville, Springdale, Rogers and Bentonville. In addition to producing water the Water District has a water quality monitoring program (in collaboration with the USGS). Phosphorus can be from either point or non-point sources. Phosphorus from point sources is typically of low mass in a highly soluble and constant form. Non-point sources of phosphorus can be greater than from point sources, and can include both soluble and insoluble.

### Watershed Management in Action – Field Trip

The group loaded into two buses and visited several sites in the area including:

1. A decentralized wastewater treatment facility at Bethel Heights. This plant was established as a less expensive option for a rapidly growing community
2. Beaver Water District Watershed Drinking Protection Plan, Plant Operation and overview of water treatment residuals research
3. Rogers Blossom Way Project to see an urban stream restoration project and greenway development
4. Rogers Water Utilities for a background on biosolids handling and use and research on blending water treatment residuals and biosolids for land-application
5. Litter hauling program managed by BMPs Inc., to encourage the development of alternative markets for poultry litter produced by the broiler industry in Arkansas. With funding from several 319 grants litter is now marketed to farmers up to 150 miles away. The grant subsidizes transport costs of up to \$9 per ton. Depending on the distance the litter is transported farmers pay up to \$30 per ton (for litter with a nutrient value of around \$50).

The day was concluded with dinner and an evening social sponsored by the Arkansas Poultry Federation.

### Tuesday June 12<sup>th</sup>

The second day of this meeting was divided into several sessions looking at several different global perspectives on phosphorus and issues related to phosphorus. Examples included the Chesapeake Bay, the Canadian prairies, rural England and Australia. This session was followed by a review of some of the challenges related to setting phosphorus nutrient criteria limits for surface waters.

During the afternoon sessions a panel discussion was conducted on industry solutions and academic research needs. The day was concluded with breakout

sessions with the different SERA 17 workgroups. An evening social was sponsored by Conner and Winters, LLP.

### **Phosphorus Sources: Extending the Paradigm**

#### The US Paradigm: Lessons from the Chesapeake Bay. Tom Simpson, University of Maryland

Dr. Simpson gave an overview of the history of the Chesapeake watershed partnership. The partnership was initiated following the 1997 suggestion that an outbreak of the dinoflagellate *Pfiesteria piscicida* was linked to runoff from agriculture in the Bay. The state of Maryland passed a Water Quality Improvement Act in 1998. This Act mandated the development of nutrient management plans by some agricultural producers and the addition of phytase in poultry feed to reduce the amount of soluble phosphorus in litter. Similar legislation was passed by Delaware and Virginia in 1999.

Today many nutrient management plans have been developed in the MD, DE and VA. Follow-up of the implementation of nutrients plans has been varied. For example, in MD about 500 farms are “inspected” annually with the emphasis being on checking paperwork rather than checking on implementation. In DE plans are reviewed but no farm inspections are routinely conducted. In VA no plans are required for litter that is moved off-farm.

New challenges that are facing the Bay are:

- The development of a new phosphorus index that can be used in trading, TMDLs etc.
- The role that “legacy” phosphorus is playing in possibly delaying improvements in water quality
- What impact will the feeding distillers-grains from new ethanol plants have on the watershed phosphorus budget?

#### The Canadian Paradigm: Lessons from the Canadian Prairies. Don Flaten, University of Manitoba

The Canadian Prairie landscape is very flat, “disconnected”, cold and dry environment. Very little erosion occurs. Most phosphorus losses are related to snowmelt runoff that contains relatively high concentrations of dissolved phosphorus – resulting from the freeze-thawing of surface residues. Soil test phosphorus and water phosphorus numbers correlate well and there is a poor relationship with phosphorus risk indices (for examples, from MN) as erosion is not a driving factor in phosphorus losses.

BMPs such vegetative buffers have not been found to be very effective, especially for dealing with the highly soluble phosphorus losses from snowmelt.

Buffers work better in controlling phosphorus losses from rainfall, where there is less soluble phosphorus. Phosphorus losses from no-till systems have been observed to be greatly than in conventionally cultivated systems.

Phosphorus loading and sources are the main issues of concern in the Canadian prairies, where farmers are encouraged to avoid the build-up of soil phosphorus.

The EU Paradigm: Lessons from Rural England. Paul Withers, ADAS , Salisbury UK

In 2000 the European Union Water Framework directive was released. Among the objectives of the directive were to give farmers payments for good agricultural and environmental practices and to establish a program of measures to reduce non-point source pollution, especially sediment and phosphorus. In 1993 it was estimated that up to 43 percent of non-point source phosphorus pollution was coming from agriculture. Studies have shown that between 20 and 60 percent of phosphorus is in the particulate form – less in larger watersheds due to dilution effects. Sediments act as phosphorus sinks. Dissolved reactive phosphorus is correlated with urban populations and point sources rather than agriculture. Today only 28 percent non-point source phosphorus pollution is estimated to come from agricultural sources.

The Australian Paradigm: Lessons from Down Under. Cameron Gourley, Primary Industries Research Victoria, Australia

There are increasing pressures on water quality in Australia. Many dairies are intensifying, resulting in increased phosphorus concentrations on dairies while it is decreasing on cropland. There is an increasing emphasis on whole farm nutrient planning and soil fertility recommendations. On-farm studies have found that between 10 to 20 percent of manure is recovered on dairies, with between 8 and 45 percent being deposited on non-productive areas of the farm and 40 to 85 percent on pasture. In Australia a nutrient loss tool has been developed. This tool is similar to the phosphorus risk index.

There are few economic drivers for farmers to improve environmental stewardship in Australia. Self-regulatory and voluntary approaches are preferred and have initiated several industry / state partnerships.

### **Phosphorus Criteria in Aquatic Systems**

Developing Nutrient Criteria: the EPA Paradigm. Mike Bira, EPA Region VI, Nutrient Regional Coordinator

In the US point sources of pollution are permitted through the NPDES permit system. The development of nutrient criteria for non-point sources is challenging. Most nutrient criteria are narrative rather than numeric. Individual states are

currently responsible for developing criteria many are based on protecting water users or anti-degradation policies to limit additional pollution. In the future nutrient criteria will be numeric rather than narrative.

#### Oklahoma Nutrient Criteria Development. Phillip Moershel, Oklahoma Water Resources Board

Oklahoma has been working for 48 years to develop numeric nutrient criteria. To date none have been agreed on. Several nutrient limited watersheds have been identified. Different approaches to setting criteria have been suggested. Measurements of the concentrations of phosphorus that favor algal growth suggest that 10ug P/L (the breakpoint at which cyanobacteria become dominant) as a possible limit. Other work has found that the 75<sup>th</sup> percentile values for reference waters were often close to the 25<sup>th</sup> percentile values of data for all waters (i.e., both reference waters and “degraded” waters) in a region. Some EPA guidance suggests the 75th and 25th percentile values for reference waters and all waters, respectively, could be used to set nutrient standards.

#### Developing Nutrient Criteria: the Consultants Paradigm. Kent Thornton, FTN Associates

Nutrient criteria should be set based on their impact on water quality in similar waterbodies. In this presentation a case-study from lakes in Mississippi was presented. The Mississippi fish index (modified from the Tennessee Valley Authority) came up with limits of 80 and 150 ug P / L for reservoirs and ox-bow lakes (respectively).

### **Industry Solutions and Academic Research Needs**

This panel discussion included representatives from the City of Rogers, BMPs Inc. and a local dairy farmer. Much of the discussion focused on ensuring that current and future regulations should be based on sound science with an understanding that long-term solutions needed to be both cost-effective and sustainable.

#### Wednesday June 13<sup>th</sup>

On the final morning of the meeting John Gilley (University of Nebraska) gave a short memorial presentation on the life of Eghall Bahman who sadly passed away in 2005. This presentation was followed by a round-up from the workgroups.

## Work Group Reports

### 1. Phosphorus Management and Policy Workgroup: Greg Mullins, NMSU

This group currently has three papers in draft form and several that will be drafted on the near future.

Current drafts:

- Phosphorus Threshold levels (Sam Feagley)
- Phosphorus management with multi-state watersheds (Deanna Osmond)
- Soil Sampling Methods (Peter Vadas)

To be drafted:

- Phosphorus in Manures: Is it hazardous? (Brad Joern and Phillip Moore)
- Farm-gate Nitrogen and Phosphorus Balances (Quirine Ketterings)
- Performance Based Nutrient Management Plans (Josh McGrath)
- Agronomic and Environmental Phosphorus tests (Antonio Mallarino and Quirine Ketterings)

Two new topics were suggested on Bioenergy crops and Nutrient Trading.

### 2. BMP Factsheet Workgroup: Forbes Walker

The group currently has 4 factsheets (Snowmelt, Nutrient Planning, Phosphorus Sources and Biosolids) in draft form. These will be reviewed and edited soon.

New fact-sheets will be developed in the coming year on:

- Pasture renovation (Philip Moore)
- Phosphorus leaching (Deanna Osmond and Don Graetz)
- Feedlot management
- Feeding Distillers Grains to Beef and Dairy Cattle

### 3. Phosphorus Modeling Workgroup: Nathan Nelson

Work planned for this year will include adding soil test phosphorus as an input in the SWAT model. The group will initiate a cooperative research effort to review and potentially revise the equations used to partition inorganic P between the stable, active, and labile pools. It is expected that this research effort will improve the ability of the model to predict P loss on diverse soils with a wider range of initial soil test P concentrations.

### 4. Soil and Manure Testing Workgroup: John Kovar

The main topic of discussion during the Testing Workgroup meeting was the revised version of the Methods Manual. The revised manual has 22 chapters.

Chapters addressing bioactive P in manures and soils and P speciation via <sup>31</sup>P NMR spectroscopy have been added. A chapter addressing QA/QC and a chapter focusing on P determination methods are yet to be added. A draft of the entire manual will be sent to the SERA-17 list for review in early August.

There was also some discussion of a manure sample exchange at some point in the future. The analyses would focus on differences in P fractions in manures from animals fed distillers grains.

Finally, it was decided that the Testing Workgroup should move to inactive status, until such time that issues with new methods or analytical techniques need to be resolved.

#### 5. Aquatics and Transport: Brian Haggard

The newly combined Transport and Aquatics Workgroup is planning to write reviews on three topics:

- Tracing Phosphorus Loss Using Rare Earth Elements and Phosphate Oxygen Isotopes
- Methods Analysis of Sediment EPCo Determination
- Short Term Nutrient Injection Protocols

### **Business Meeting**

April Leytem proposed Quirine Ketterings (Cornell University) as the future chair of SERA 17. This motion was seconded and her nomination accepted by a show of hands.

Next year's meeting is to be held in Annapolis, Maryland on the Chesapeake Bay. Josh McGarth (University of Maryland) and Rory Maguire (Virginia Tech) have agreed to host and co-ordinate the meeting.

The 2007 SERA 17 meeting was adjourned at 9.30 am