Minutes of the SERA-IEG17 Annual Meeting
Held in Banff on July 26th to 29th, 2005.

Tuesday 26th.
Welcome reception and "Taste of Alberta" reception was held in the evening, where a large array of posters were available for viewing.

Wednesday 27th.
Full day water quality tour that included the eastern slopes of the Rockies, through the Bow River Corridor, to the rain fed and irrigated agricultural lands east of Calgary.

Thursday 28th.
Welcoming remarks by Peter Kleinman (President) and Brent Paterson (Host)
Updates on SERA17 activities over the last year: new Policy and Management subcommittee under Greg Mullins has produced SERA17 position papers; updates to website; progress on BMP factsheets; testing subgroup sample exchange to standardize water soluble P method; this year has the largest poster session.

Morning session theme: Expanding the research continuum: from the lab to the farm.
Session Chair: Peter Kleinman

Extending P research from the lab to the field.
Peter Kleinman, Andrew Sharpley, and Bill Gburek (USDA-ARS, University Park, PA).
Small scale experiments are straight forward, but scaling up is complex. As we move from lab scale to runoff boxes to field scale to farm and watershed scale we may move from quantitative to qualitative determinations. Rain duration is well correlated to water:manure extraction ratio. This ties in to how long it takes for runoff to start and duration of runoff. Landscape position has a large impact on runoff and erosion and changes occur between infiltration and saturation excess, with more runoff at lower landscape positions. Storm flow vs base flow in streams changes relative P concentration. Need to integrate chemistry and hydrology and determine actual losses at appropriate scale.

Dymanic nature of P in snowmelt runoff
Barry Olson, Joanne Little, Sheila Nolan and Janna Casson, Alberta Agriculture.
Melting of snow over frozen ground generates a lot of runoff and little infiltration. It dominates the hydrologic year, but field measurements difficult and uncomfortable. Most P lost in 2 months after seeding, this is due to rainfall – with frozen ground, snow melt generates little sediment, most P loss is dissolved reactive P. In rain generated runoff most P loss is particulate. Manure application bad during thaw periods and winter applications are much worse than spring or fall applications.

Hydrology of catchment area P losses
Phil Haygarth, IGER, UK.
Scaling research results from lab to field to catchment. There are huge variations when you soil test across the landscape, for example 10 to 180 mg Olsen P/kg across a

watershed of approximately 60 ha. Topographic Index shows the propensity of any point to act as a critical source area of runoff. But soil test P accumulates where animals congregate and where manure is spread. It is difficult to see relationships between P inputs and P losses at the catchment scale due to dilution. The speed of the hydrologic response to rainfall has a great impact on P export.

Social dimensions of managing P

Pete Nowak and Perry Cabot, University of Wisconsin.

A few bad farmers can give all a bad name, by 'inappropriate behavior' in a vulnerable area. Behavioral patterns of farmers and their equipment lead to spatial variability in soil test P. For example, liquid manure spreader does not have a homogenous spread and when it is spread in the same pattern the uneven nature compounds to lead to variable soil test P. Where the spreader gate is opened at the same starting point in a field, this can lead to 'hot spots' which can sometimes correspond with critical source areas.

Managing P at multiple scales

Tom Sims, University of Delaware.

The start of P Indices was in 1990-91 as an easy to use field scale tool to identify critical source areas and target BMPs. Over the last 20 years there has been a great increase in P related research and publications. This happened at the same time as great increases in global animal production, the recognition of P surpluses in manure in certain regions and increases in soil test P in areas of animal agriculture. Manure P has increased a lot but fertilizer P sales have stagnated. There is a need to focus on targeted implementation of source and transport BMPs. Also need P availability coefficients as all forms of P are not the same. In the long term we need to focus on farm scale nutrient balance using a number of approaches – nutrition, exporting manure, depopulation etc. Widespread adoption of phytase has helped reduce P import to Delaware by 2 million lbs/yr.

Afternoon session theme: Research updates. Session Chair: Barbara Shackel-Hardman

Reducing fecal P forms through dietary manipulation

Peter Plumstead, Rory Maguire, and John Brake, NC State University.

The sustainability of animal agriculture is at risk due to manure P surpluses. Need to either (a) reduce P in waste, (b) haul waste elsewhere, or (c) be regulated out of business. In broiler breeder experiments, all supplemental P was removed from adult diets and they maintained performance. However, when the temperature was high, phytase was needed to supply enough P to deal with heat stress. A dietary concentration of 0.15% available P was needed under no heat stress, while 0.25% available P was needed with heat stress, yet 0.40% is usually fed. Total fecal P could be reduced by 54%. Water soluble P could be decreased by 40% by reducing available P from 0.37% to 0.09% (no supplemental P) plus phytase. Under the drinker in the breeder pen, there was much more water soluble P than other areas and this was directly related to the moisture content of the manure. Phytase in diets did not increase water soluble P in manures.

Achieving an acceptable N:P ratio in manure

Chi Chang, Agriculture and Agri-Food Canada, Alberta, Canada

Normally when you apply manure at a nitrogen based rate you over apply P relative to crop needs. The N:P ratio is important to meet crop needs with manure in an environmentally sustainable and economic way. Over the period of many years, almost all of the manure P applied will be available to plants. It is possible to alter the N:P ratio in manure through diet manipulation such as using phytase, and reduced phytate corn and soybeans. Undesirable loss of N during storage can occur, but this can be minimized through regular land spreading.

P runoff at plot and hillslope scales, from alum to plot renovators
Philip Moore, USDA-ARS, Fayetteville, AR
Soluble P is major form of P lost from pasture, while particulate P in rivers and streams can come from stream bank erosion and resuspension of in-stream sediments. Alum amendment of poultry litter reduces soluble P losses from litter amended soils when the litter is surface applied. Alum also reduces ammonia emissions by 70% and this extra N retention can help crop production. Long term grazing increases soil bulk density and runoff volume and hence P load. Pasture renovators (aerators that cut slits in the soil) can be used to overcome compaction and increase infiltration. This can also increase crop yield due to better soil moisture, so this is a very inexpensive BMP to reduce N and P loading from grazed pastures where compaction can occur.

Rethinking C and P interactions in soils
April Leytem, USDA-ARS, Kimberly, ID
The degree of P saturation for calcareous soils in 18 soils of the Pacific North West was studied. Organically related Fe and Mn were well correlated to P sorbed in isotherms. Once you surpass this P sorption, then you reach a point where much P is retained, possibly by precipitation with Ca. Organic matter actually increases sorption of P by soils, rather than competing with P for metal sorption sites. The more carbon there is in manure, the less soluble the P in the soil will be following application to calcareous soils. When we make P loss risk assessments in calcareous soils with manure incorporation we need to consider carbon.

Tracking P from field edge to downstream impact
Brian Haggard, USDA-ARS, Fayetteville, AR
In the Illinois river that flows through AR-OK, the P standard is 0.037 mg P/L yet concentrations can be up to 1 mg P/L. Storm water flow tends to have greater P concentrations than base flow. Discrete storm water samples are essential when estimating P loads. It was possible to trace elevated P upstream 47 km to a Waste Water Treatment Plant (WWTP). Sediment equilibrium P concentration (EPC) was also elevated downstream of the WWTP, compared to upstream. These EPCs downstream of the WWTP were several orders of magnitude greater than the water quality standard. Once WWTP effluent had P reduced from about 10 to 0.5 mg P/L the river P concentration decreased within 2 years.

Phosphorus transport: catchment and stream channel processes
Anne McFarland, Tarleton State University, Stephenville, TX

Hydraulic head was used to calculate groundwater contribution to or removal from stream flow. Surface water had a much greater P concentration than groundwater. During low flow times the P concentration decreased downstream of the WWTP, indicating removal of P from the system. This was due to sediment uptake of P from the stream water. At other times P may be released from the sediments. Peaks in sediment EPC could be linked to WWTPs or areas of dairy production. Growth rate of algae was generally P limited.

Work Group Reports

1. Management Policy Workgroup – Greg Mullins
SERA17 was asked by some of those involved with the AR-OK lawsuit to develop position papers to address some of the issues involved. There have now been five position papers developed (see individual reports later) on important issues. There will be several more issue papers developed over the next year.

2. Testing Workgroup – Dan Sullivan
An update was given on the sample exchange over the last year, designed to look at standardizing water soluble extraction of manure. The manure:water extraction ratios studied were 1:10, 1:100 and 1:200, all on a dry weight basis as wet weight basis does not work. These extraction ratios were then compared to concentrations of DRP in runoff, using box runoff data generated by Peter Kleinman. Results indicated that he 1:10 ratio could not be used for dairy manure and biosolids samples, but all three ratios predicted DRP in runoff. Due to larger equipment needed for the 1:200 extraction ratio, the 1:100 ratio was suggested as a standard. The results of this study will be published as a peer reviewed manuscript.

3. Modeling Workgroup – David Radcliff
The "Modeling P in the Environment" book is nearing completion under the lead of David Radcliff and Nathan Nelson. It includes 11 chapters, most of which have already been completed. Next year the "Modeling P loss in agricultural watersheds" conference will be held in collaboration with the annual SERA17 conference. The leading organizers for this conference will be David Radcliff and Bill Gburek and NRCS has promised to help with funding.

4. Best Management Plan Workgroup – Forbes Walker
Thirty two BMP factsheets have now been completed and posted on the SERA17 website. Funding was obtained from the NRCS to help with layout of factsheets and a limited number of hard copies have now been printed. Over the next year, more subjects for BMP factsheets will be identified and authors selected to develop them.

5. Transport and aquatics – Brian Haggard
This group wants to focus on in-stream processes. This is the start of this workgroup's efforts, so it is a work in progress.

Friday 29th July

Theme: Practical challenges of reducing P from agriculture
Session Chair: Frank Coale

Making change happen on the farm
Brent Paterson, Alberta Agriculture, Lethridge, Canada
Manure management will move from nitrogen based nutrient management plans to P based. Therefore several times more land will be needed for manure disposal. Soil P limits will be set for several areas to protect water quality. Flow weighted mean total P concentrations in runoff can not exceed 1 mg P/L. Long term, there needs to be balanced P inputs and outputs, which can be helped by reducing the nutrient concentrations in manures.

Economics of phosphorus management
Judy Annett, Kilkeel, Northern Ireland
Cost of practices to reduce P inputs to surface waters, their feasibility and the value of water quality improvements was analyzed to identify the most cost effective strategies to improve water quality in Northern Ireland. Currently in NI, most P in surface waters comes from WWTPs and agriculture. It was calculated that to prevent 1 kg of P per year entering surface waters, it would cost £6.56 by using iron induced precipitation in WWTPs, voluntary P removal from detergents and reduction of P in animal feeds had essentially no costs, while transport controls (such as buffers) cost £27 to 75. Therefore source controls were much more cost effective than transport controls.

Producer realities and challenge to scientists
John Kolk, Alberta Environmentally Sustainable Agriculture Council, Canada
Farms in Canada have become much bigger over the last 100yrs, due to economic necessities and other drivers. It is important that scientists understand the practical side of agricultural practices and nutrient management.

Where the law meets science

City of Tulsa vs poultry integrators update
John Elrod, Attorney/Partner, Connor and Winters, Fayetteville, AR
John Elrod gave an historical overview and update of the Tulsa vs poultry integrators lawsuit, as well as some details surrounding the recent legal settlement. He also gave an introduction to the lawsuit over the Illinois river watershed.

SERA17 Position papers
Five position papers have been developed by members of SERA17 to address issues raised in lawsuits. This effort has been led by Greg Mullins, as described above under the "Workgroups" section. First drafts of these position papers were sent to all members over the SERA17 list serve two weeks in advance of the meeting. In this session the leader of each of the five position papers led discussion so that a consensus position of SERA17 on each of the five issues could be confirmed by the group (Peter Vadas could not attend so

Antonio Mallarino led discussion of the fifth position paper). The titles of each position paper and the chair leading each were:

1. Phosphorus Site Index. Task Force Leader: Rory Maguire, North Carolina State University, rory_maguire@ncsu.edu
2. Edge of field P Loss Predictions & Monitoring of Edge of Field P Loss. Task Force Leader: David Radcliffe, University of Georgia, dradclif@uga.edu
3. Soil Phosphorus Threshold Levels. Task Force Leader: Sam Feagley, Texas A&M University, s-feagley@tamu.edu
4. Methods of P Analysis. – ICP vs Colorimetric Procedures. Task Force Leader: Gary Pierzynski, gmp@ksu.edu
5. Importance of Soil Sampling Depth. Task Force Leader: Peter Vadas, USDA-ARS, University Park, PA, Peter.Vadas@ars.usda.gov

Business meeting

1. Peter Kleinman nominated April Leytem for secretary of SERA17 for 2005-2006 and President for 2006-2007 and the motion passed unanimously.
2. The outgoing president, Peter Kleinman, gave thanks to the host for a successful meeting and passed the gavel to Rory Maguire, incoming president.
3. The 2006 SERA17 meeting will be held in concert with a modeling meeting, with the first two days covering modeling topics, followed by a field day and a day and a half for the regular SERA17 meeting. Participants will have the opportunity of attending either or both parts. The meeting will be moved to early August to avoid conflict with the IUSS meeting in Philadelphia.
4. Quirine Ketterings (Cornell University) offered to host the SERA17 meeting in Ithaca, NY, in 2006 and the motion was passed unanimously.