

# The 2009 Great Lakes Phosphorus Forum



Sweeney

Pamela Joosse<sup>1</sup>, Keith Reid<sup>1</sup>  
and Ron Campbell<sup>2</sup>

<sup>1</sup>OMAFRA, <sup>2</sup>Ontario Agri Business Association

Lake Erie Millennium Network Conference  
April 27-29, 2010

# Overview

- Purpose and Achievements
- Interesting points from the Six Sessions
- Follow up Opportunities

*Why is phosphorus in the Great Lakes back on the radar?  
How are agricultural sources of phosphorus loading to the Great Lakes changing?  
What are the important sources, pathways and fate of P from agriculture?  
What are the options & trade-offs for mitigating agriculture's contribution of non-point P?*

**If you can contribute to answering these questions, mark the  
Great Lakes Phosphorus Forum  
on your calendar!**

**When:** Tuesday July 28 to Friday July 31, 2009  
**Where:** Hilton and St. Clair Centre, Windsor, Ontario, Canada

Held in conjunction with the Annual Meeting of the Organization to Minimize Phosphorus Losses from Agriculture (SERA 17). Check the web site [www.sera17.ext.vt.edu](http://www.sera17.ext.vt.edu) for updates on the program and registration in spring 2009.

Supported by:

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Respecting the Great Lakes Basin Ecosystem.

# Purpose and Objectives

- To gather together scientists, policy makers and extension professionals in the fields of agronomy, nutrient management, soil science, and water quality to share relevant information on managing non-point source phosphorus losses from agricultural land in the Great Lakes basin
  - To help bridge the science and understanding of non-point P issues between the aquatic and terrestrial science perspectives (lake and tributary, water and land) to better facilitate integrated watershed management of P;
  - To reassess and identify the conditions and pathways by which non-point source P is lost from land under agricultural production in the Great Lakes basin;
  - To confirm existing or identify new management practices for effectively reducing non-point source P losses through these pathways;
  - To articulate effective strategies for management of non-point source P from land under agricultural production; and,
  - To identify knowledge gaps in order to help set priorities for future research and program work

# Achievements

- Hosted the SERA 17 Annual Meeting – USDA information exchange group organized to minimize phosphorus losses from agriculture
- 20 speakers from across North America and 1 from Europe
- 30 poster presentations
- 1-day tour of Essex Region agri-environmental management sites
- >100 registrants - good mixture of aquatic and terrestrial experts
- >70% of respondents agreed the Forum was successful in bridging the perspectives of land and aquatic scientists
- >85% agreed it improved their understanding of agricultural P issues in the Great lakes basin
- >92% agreed it identified knowledge gaps for future research and program work

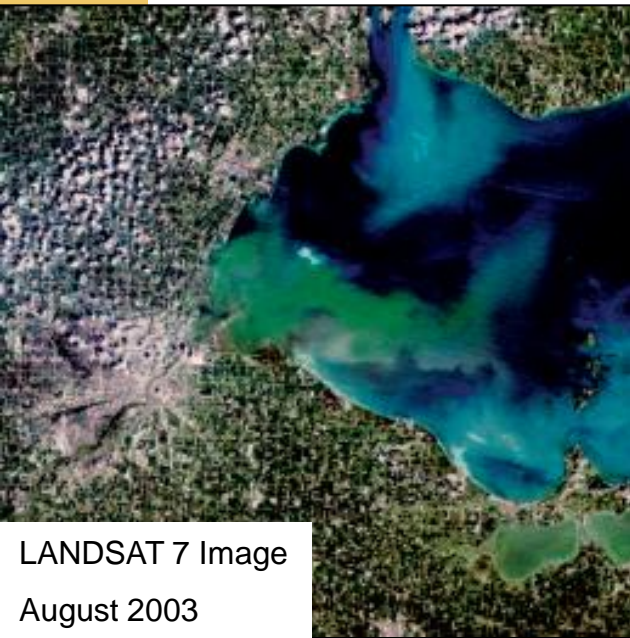
# Comments

- “As an aquatics person, I found the discussion (and field trip) very enlightening as I had very little prior knowledge with respect to current agricultural practices.”
- “Aquatic talks because of my own knowledge gaps.”
- “It was useful to see presentations from researchers/regulators with differing/opposing views of the issues.”
- “As someone completely new to SERA 17 I enjoyed the historical overview by Jerry Lemunyon following the banquet. It was light in tone but conveyed the good work being done through the collegial efforts of kindred spirits. We see similar energy in the Great Lakes community and it give me hope that we are going to sort out these complex issues.



# 1. Distribution and Cycling of P within the Great Lakes

- **Great Lakes P 101 for the 21st Century**, *Jeff Reutter, Ohio Sea Grant Director, Ohio State University (presented by Jan Ciborowski)*
- **How does aquatic biology respond to changes in phosphorus inputs?** *Joe Makarewicz, State University NY at Brockport*
- **How do Zebra Mussels and the near-shore shunt influence acceptable P inputs?** *Bob Hecky, University of Minnesota, Duluth*



## Session 1 (cont'd)

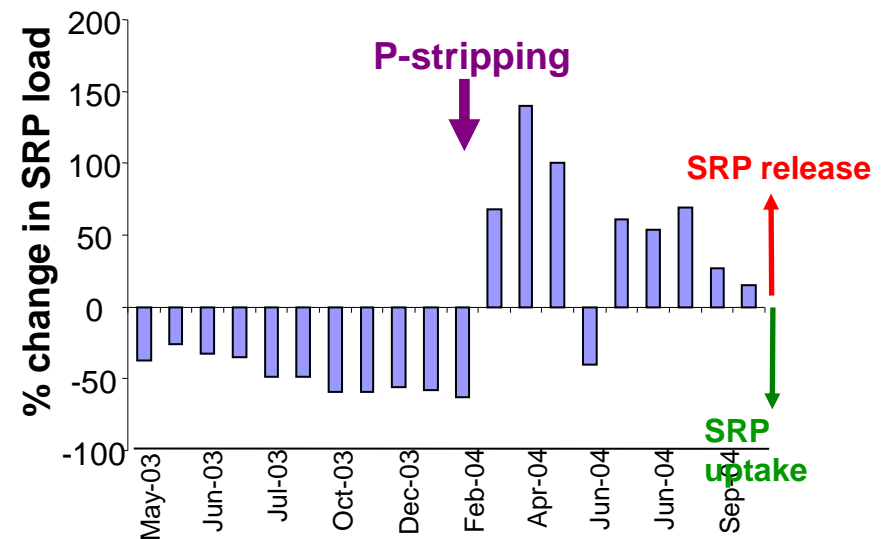
- To reduce *Cladophora* we would need to reduce open lake P to reduce phytoplankton which are food for the mussels. Could this be done? Should this be done? What are the tradeoffs from an aggressive P strategy on the integrity of food webs?
- In Oakville (Lake Ontario) nearshore, there is about 4,000 kg SRP from manmade sources annually and 16,000 kg SRP supplied internally because of Dreissenids
- Reasonable goals to achieve for the Great Lakes through human management/intervention of P:
  - Reduction of beach closures – maybe
  - Elimination of dead zone – no
  - Reduction of *Cladophora* – no
  - Reduction of harmful algal blooms - yes

## 2. Streams and Rivers: Conduits, sinks or sources of P?

- **Impact of processes within rivers and streams on P delivery.**  
*Helen Jarvie, Centre for Ecology and Hydrology, United Kingdom*
- **What changes have we seen in P coming out of tributaries?**  
*Dave Baker, Heidelberg University, Ohio*



### River reach mass balance studies:

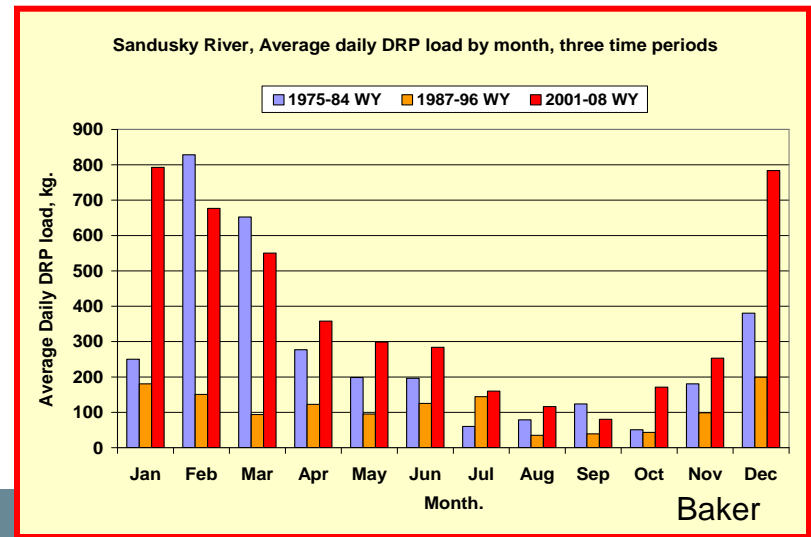


Jarvie et al. 2006, J. Hydrol.



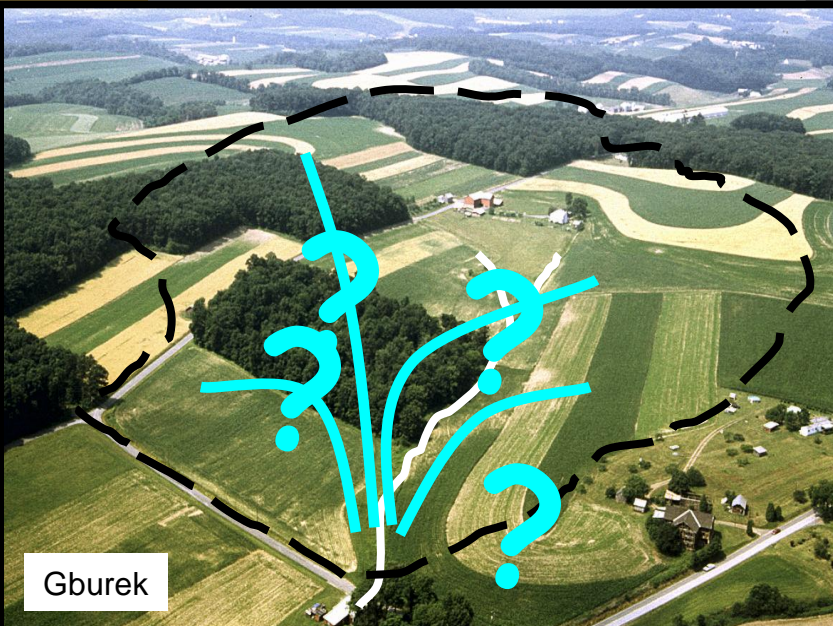
## Session 2 (cont'd)

- In-stream P cycling is likely to have a greater impact on river-water P concentrations under baseflow conditions than on annual/long-term river P loads to the Great Lakes
- When interpreting patterns in streamwater P chemistry at the catchment scale, we need to consider the connectivity and relative roles of catchment, riparian, in-ditch and hyporheic processing as well as in-stream processing
- Higher discharges and DRP loads in Sandusky River coming in winter months



### 3. From field to stream – addressing the Gaps

- **Beyond Contributing Areas:** Has the P index “missed the boat” by ignoring transport coefficients? *Bil Gburek, USDA-ARS (retired)*
- **What is the relative importance of overland flow and subsurface movement of P (tile drains)?** *Tiequan Zhang, AAFC/ Chandra Madramootoo, McGill University*
- **What are the processes and BMPs that control P losses during snowmelt?** *Don Flaten, University of Manitoba*



## Session 3 (cont'd)

- Each scale has inherent complexities, parameters and processes. Must be willing to give up some tenets or details in order to work across disciplines
- Tile drain losses of P are generally particulate P which is transported because of preferential pathways
- In a snowmelt dominated transport system cannot expect management practices designed/tested for rainfall dominated transport systems (i.e. buffers, cover crops, conservation tillage) to be as effective



Lobb

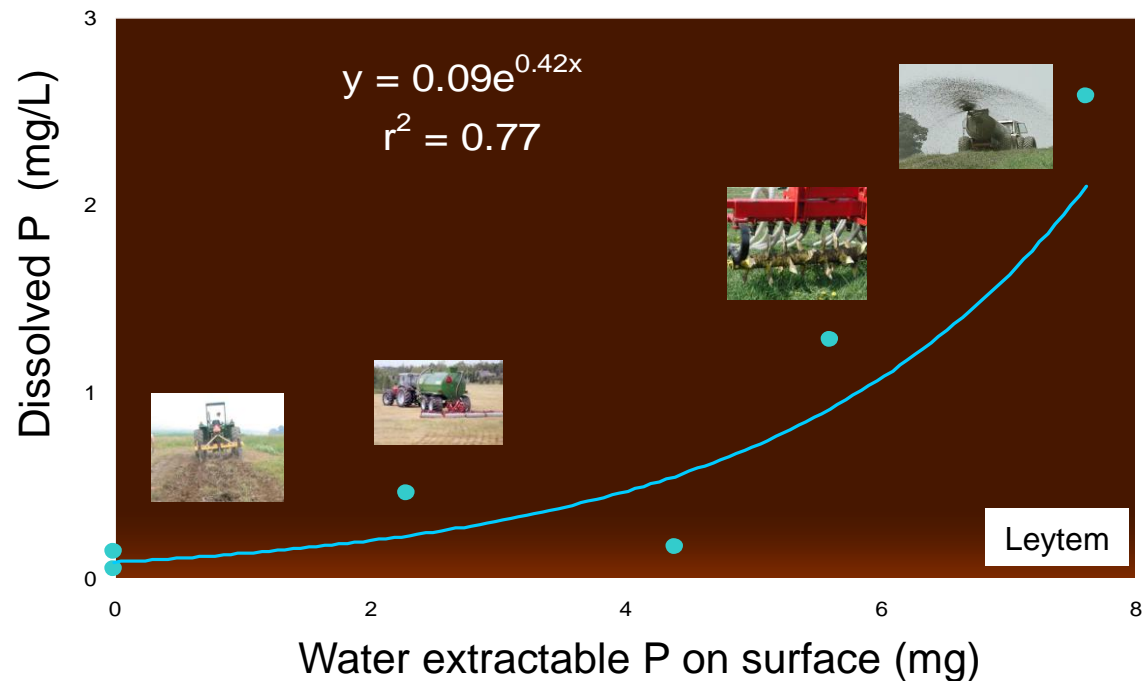
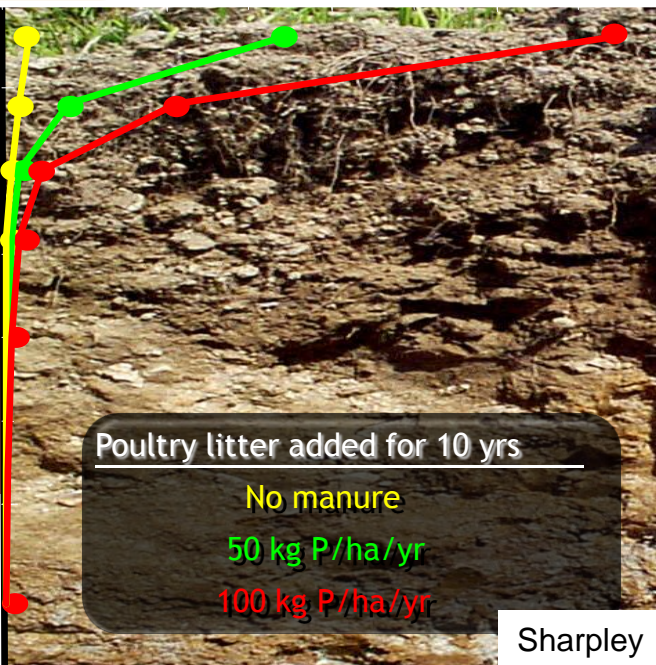


Madramootoo



## 4. Getting to the Source of the matter – measuring and mitigating agriculture P sources

- **SOIL controls on phosphorus transfers from agricultural lands to surface waters.** *Peter Kleinman, USDA-ARS, Pennsylvania (Presented by Andrew Sharpley)*
- **What are the most important factors regarding P ADDITIONS in determining P losses to surface water?** *April Leytem, USDA-ARS, Idaho*



## Session 4 (cont'd)

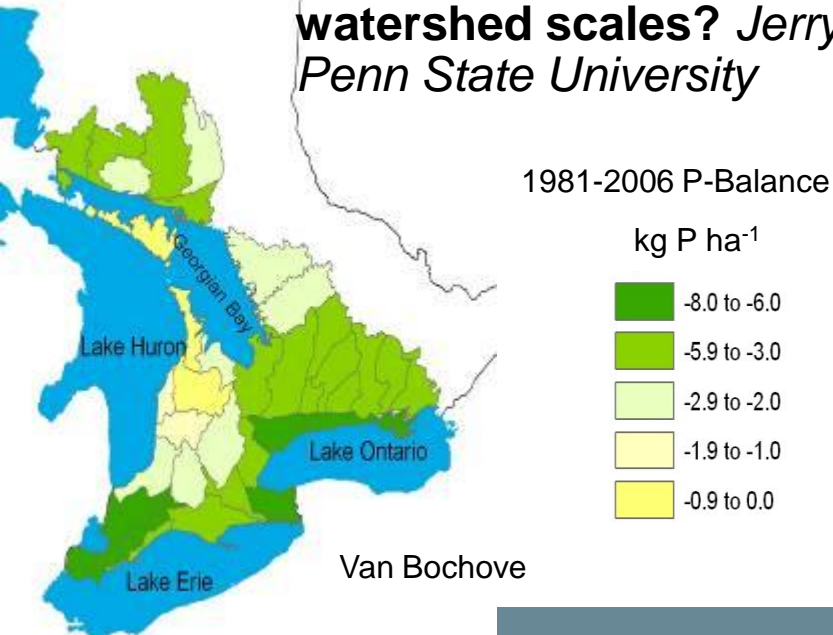
- Build up of soil P in areas vulnerable to runoff represents a “chronic” source which is difficult to control. For example, saturation excess runoff at toe slope.
- Both soluble P and total P are highly variable depending on P source material
- Use manure application methods that reduce P losses. Incorporation of manure decreases P losses.





## 5. What additional mitigation tools are needed beyond the P Index?

- **What do we really expect a P index to do?** *Keith Reid, Ontario Ministry of Agriculture, Food and Rural Affairs*
- **An indicator of risk of water contamination by phosphorus (IROWC-P) from agriculture in Canada: the integration of processes and BMPs at the watershed scale.** *Eric van Bochove, Agriculture and Agri-Food Canada*
- **Which BMPs will have the greatest impact at reducing P losses and achieving P balance, and are they different at field, farm or watershed scales?** *Jerry Lemunyon, USDA-NRCS / Doug Beegle, Penn State University*



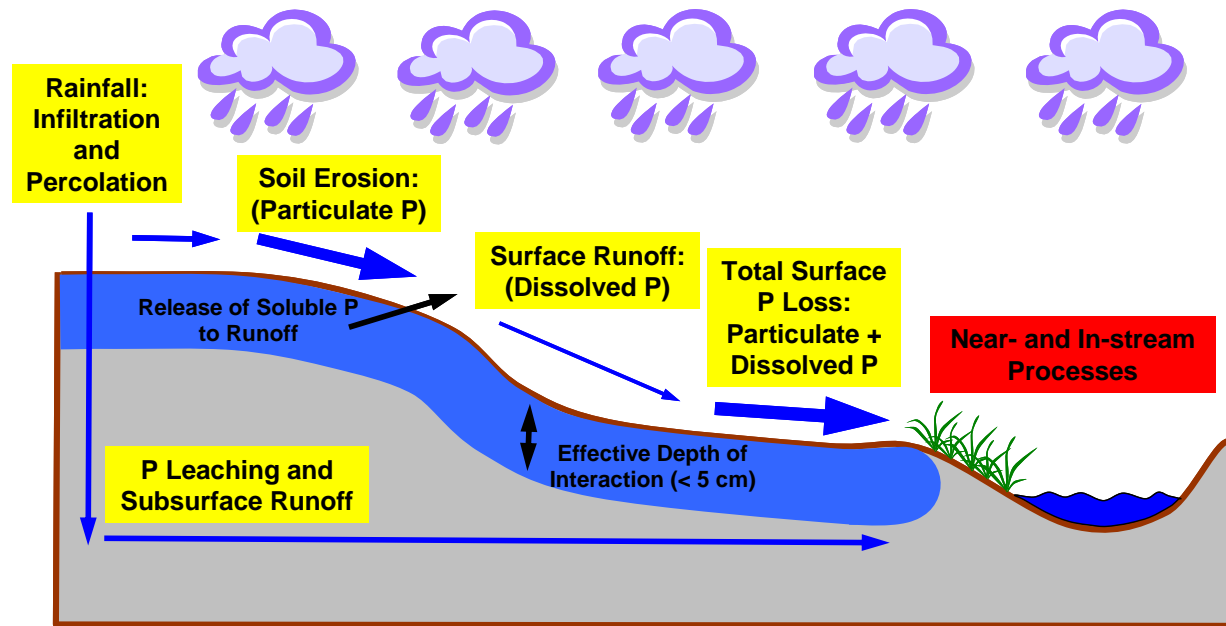
## Session 5 (cont'd)

- Many different users and different expectations of what a phosphorus index should be. P Index can be improved to more effectively change behaviour
- Need economic signals to sustainably handle [where there is] excess P, as economic advantage is still with those who over apply manure
- Based on USDA Conservation Effects Assessment Program, current conservation and nutrient management actions are reducing P losses 37%, and 80% of farmers are managing P well

## 6. Panel Discussion – Site Assessment Indices – Where to Next?

### Panel Members:

- *Andrew Sharpley, University of Arkansas*
- *Brad Joern, Purdue University*
- *Keith Reid, Ontario Ministry of Agriculture, Food and Rural Affairs*
- *Roberta Parry, US EPA*



(Adapted from Wood 1998)

## Session 6 (cont'd)

- EPA would like to stay out of tactics on the farm – in the absence of information or knowing if progress is being made, regulations will be required
- We shouldn't be asking the farmer what changes must be made. Farmer just happening to be sitting on land with a problem. They are reacting to other regulations/signals in the food system.
- Don't want to discourage particulate phosphorus BMPs (no-till, cover crops, erosion control) due to frustration that no improvements are being seen. Need to educate that site specific BMPs are needed for site specific problems.

# Acknowledgements

## Technical Steering Committee

**Eric Van Bochove** Agriculture and Agri-Food Canada

**Tom Bruulsema** International Plant Nutrition Institute

**Jan Ciborowski** Lake Erie Millennium Network

**Pamela Joesse** Ontario Ministry of Agriculture, Food and Rural Affairs

**Christoph Kessel** Ontario Ministry of Agriculture, Food and Rural Affairs

**Quirine Ketterings** SERA-17, Cornell University

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**Forbes Walker** SERA-17, University of Tennessee

**Tiequan Zhang** Agriculture and Agri-Food Canada



# Follow-Up Opportunities

- Proceedings and presentations from the Great Lakes P Forum available at: [www.sera17.ext.vt.edu](http://www.sera17.ext.vt.edu)
- Special Issue of Canadian Journal of Soil Science featuring papers and posters from Forum – available later this year
- SERA 17 2010 meeting in Madison, Wisconsin, July 27-30
- 14<sup>th</sup> International Conference, IWA Diffuse Pollution Specialist Group, September 12-17, 2010, Quebec City, Quebec  
[www.dipcon2010.org](http://www.dipcon2010.org)

Pamela Joosse, Ph.D.  
[Pamela.joosse@ontario.ca](mailto:Pamela.joosse@ontario.ca)  
519-826-3853