July 14 Great Lakes agriculture strategy session

Farm & Food Care Hosts:
Bruce Kelly
Micah Shearer-Kudel
Who is Farm & Food Care Ontario?

• First coalition of its kind, whole sector approach – all types of farmers and associated businesses working together.

• Funded by members, sponsors, projects.

• Common goal – building public trust in food and farming.
Building Public Trust in Food & Farming in Canada

Coordination & Strategy

Advocacy
Intelligence
Issue
Management

“Play defense”

Practices
Programs
Research
Regulations

“Do the right thing”

Public Trust & Outreach

“Let’s have a conversation”
A Toxic Algae Bloom Caused a Three-Day Ban on Water Usage for a Half-Million Residents in Toledo. Experts Say it's a 'Wake-Up Call' for Lake Erie

Tainted bloom
By Ryan Felton

America has a water problem. In California, there's not enough of it, with the state's severe drought continuing unabated — even in light of torrential downpours. In Detroit, the city's water department botched an aggressive campaign to shut off service to delinquent residents, drawing international condemnation and a mad scramble by city officials to save face. In West Virginia, earlier this year, nearly 300,000 families went without water for weeks, after thousands of gallons of toxic chemicals spilled out from the facilities of a company called Freedom Industries, tainting the water supply of a nine-county region. Last month, in Flint, where residents pay about $140 per month for water, some raised alarms when their faucets started spewing discolored water. Four years after the BP Deepwater Horizon spill of 2010, which sent over 170 million gallons of oil into the Gulf of Mexico, scientists are still finding new evidence of the incident's damage. And, earlier this month, in Toledo, a toxic algae bloom managed to contaminate the water supply of nearly a half-million residents.
CLEVELAND, Ohio — One of the wettest Junes on record has dumped some of the largest loads of phosphorus ever recorded into the Maumee River, raising the prospect of another huge toxic algae bloom this summer in Lake Erie's western basin.

"We're not looking at a mild event here," said Rick Stumpf,
PERRYSBURG, Ohio — State agriculture and environmental leaders have made a number of changes to attack toxic algae in western Lake Erie, most notably prohibiting farmers in northwestern Ohio from spreading manure on frozen and rain-soaked fields and requiring training before they may use commercial fertilizers. Soon, they'll be handing out $12 million to farmers who take steps to reduce the pollutants that wash off their fields and help feed the algae, which have contaminated drinking water supplies and helped form dead zones where fish can't survive.

Now the big question is, will it work?
## Trends in Ontario Agriculture: Crops

<table>
<thead>
<tr>
<th>Crops</th>
<th>Percent change (1976-2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasture, unimproved (area)</td>
<td>-37.2%</td>
</tr>
<tr>
<td>Pasture, improved (area)</td>
<td>-64.7%</td>
</tr>
<tr>
<td>Hay (area)</td>
<td>-27.1%</td>
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<tr>
<td>Corn, grain (area)</td>
<td>28.6%</td>
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<tr>
<td>Soybeans (area)</td>
<td>552.3%</td>
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<tr>
<td>Potatoes (area)</td>
<td>-18.2%</td>
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<tr>
<td>Tree fruits (area)</td>
<td>-51.9%</td>
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</table>

From: Paul Smith OMAFRA
## Trends in Ontario Agriculture: Livestock

<table>
<thead>
<tr>
<th>Livestock type</th>
<th>Percent change (1976-2011)</th>
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<tbody>
<tr>
<td>Cattle (number)</td>
<td>-44.9%</td>
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<tr>
<td>Dairy cows (number)</td>
<td>-52.2%</td>
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<tr>
<td>Pigs (number)</td>
<td>61.4%</td>
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<tr>
<td>Chickens (number)</td>
<td>56.5%</td>
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</table>

From: Paul Smith OMAFRA
Trends in Ontario Agriculture: Practices

<table>
<thead>
<tr>
<th>Farm practices</th>
<th>Time period</th>
<th>Time period</th>
<th>Percent change</th>
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<tbody>
<tr>
<td>No-till (area)</td>
<td>1991-2011</td>
<td>836.1%</td>
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<tr>
<td>Reduced till (area)</td>
<td>1991-2011</td>
<td>91.6%</td>
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<tr>
<td>Most of residue incorporated (area)</td>
<td>1991-2011</td>
<td>-45.9%</td>
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<tr>
<td>Fertilizer sales, Nitrogen (tonnes)</td>
<td>1954-1980</td>
<td>824.3%</td>
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<tr>
<td>Fertilizer sales, Nitrogen (tonnes)</td>
<td>1981-2011</td>
<td>3.1%</td>
<td></td>
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<tr>
<td>Fertilizer sales, Phosphate (tonnes)</td>
<td>1954-1980</td>
<td>159.2%</td>
<td></td>
</tr>
<tr>
<td>Fertilizer sales, Phosphate (tonnes)</td>
<td>1981-2011</td>
<td>-30.1%</td>
<td></td>
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<tr>
<td>Manure volume produced</td>
<td>1976-2011</td>
<td>-42.6%</td>
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</tbody>
</table>

From: Paul Smith OMAFRA
4R Nutrient Stewardship: Opportunities for meeting Lake Erie targets

Tom Bruulsema, Phosphorus Program Director
International Plant Nutrition Institute
Guelph, Ontario, Canada
Formed in 2007 from the Potash & Phosphate Institute, the **International Plant Nutrition Institute** is supported by leading fertilizer manufacturers.

Its mission is to develop and promote science for responsible management of crop nutrition.
4R: “right” means sustainable

“Building public trust”
**4R Adaptive Management for Plant Nutrition**

**Policy Level** – Regulatory, Infrastructure, Product Development

**Regional Level**
- Agronomic scientists, Agri-service providers

**Farm Level**
- Producers, Crop advisers

**DECISION SUPPORT** based on scientific principles

Recommendation of **right source, rate, time, and place** (BMPs)

**DECISION**
- Accept, revise, or reject

**ACTION**
- Change in **practice**

**EVALUATION of OUTCOME**
- Cropping System Sustainability Performance

**LOCAL SITE FACTORS**
- Climate
- Policies
- Land tenure
- Technologies
- Financing
- Prices
- Logistics
- Management
- Weather
- Soil
- Crop demand
- Potential losses
- Ecosystem vulnerability
SW Ag Partners invests in zone tillage

Farmers can explore variable rate technology

Innovative Farmers Association of Ontario conference in February, said he’s been able to reduce his fertilizer use by about 75 per cent – likely because of improved placement – as compared to conventional systems.

While fall operation of his equipment is an option, Reints likes to use his system just a day or two before planting. He said this helps warm the soil as well as supplying nutrients within the tillage zone.

Page said Soil Warrior is an all-in-one system rather than utilizing a cart to carry the fertilizer. There are three bins from which fertilizer can be dispensed at variable rates.

This allows farmers to better utilize the field information they’ve accumulated from such sources as yield maps, soil tests and visual imagery.

There are plans to demonstrate the equipment this summer. There will also be on-farm trials or SW Ag customers may simply plant a small acreage with the machine.

“This is very much about research. We’ll be able to partner with a small group of customers,” Page said.

The big John Deere that was part of the equipment package was a necessary investment. “It takes about 30 horsepower per row unit to pull it. There are 16 row units. You can do the math from there,” Page said.

The investment in the Soil Warrior is just part of SW Ag’s Sustainable Cropping Systems program, Page said. Other elements of the program will be introduced later.

SW Ag Partners is a supplier of crop input and grain marketing services in Southwestern Ontario with a heritage dating back to 1947. The head office is located in Chatham in Chatham-Kent.
Nutrient Stewardship Metrics for Sustainable Crop Nutrition

Enablers (process metrics)
- Extension & professionals
- Infrastructure
- Research & innovation
- Stakeholder engagement

Actions (adoption metrics)
- Cropland area under 4R (at various levels)
- Participation in programs
- Equity of adoption (gender, scale, etc.)

Outcomes (impact metrics)
1. Farmland productivity
2. Soil health
3. Nutrient use efficiency
4. Water quality
5. Air quality
6. Greenhouse gases
7. Food & nutrition security
8. Biodiversity
9. Economic value

(require regional definition of 4R)
Developing 4R Nutrient Stewardship Certification
1 Initial Training and Ongoing Education

1.1.1 Nutrient Service Providers, sales, and application staff have undergone an initial training and are able to demonstrate knowledge about 4R Nutrient Stewardship and the 4R Certification Program.

2 Monitoring of 4R implementation

2.1.1 Nutrient Service Provider records the recommendation given to the grower customer and track application with annual summary totals of fertilizer products applied on custom applied acres.

3 Nutrient Recommendations and Application

3.5.7 Broadcast applications of nitrogen and phosphorus without immediate incorporation are neither made nor recommended unless the NOAA forecast indicates less than a 50% chance of a rainfall event involving more than an inch of rain beginning in the next 12 hours.

http://4Rcertified.org/
The Lake Erie watershed includes cropland in Ontario.
# 4R Nutrient Stewardship Planning Guide

1. **Introduction**
2. **Farm Information**
3. **Sustainability Goals and Indicators**
4. **Production Information**
5. **Nutrient Balance**
6. **Planned Nutrient Application**
Certified Crop Adviser Specialties

- **4R Nutrient Management Planning Specialist**
  - Performance objectives effective May 2015, first exam August 2015
  - Anticipate 200 certified by end of 2016
  - May raise NM and SWM CEU requirement from 5 to 7
  - Additional fees; record-keeping in Madison, WI
  - Canadian version under discussion (CCA Ontario and CFI)

- **Sustainability Specialty Exam**
  - Performance objectives effective May 2015
  - First exam February 2016
  - References 4R Nutrient Stewardship
4R Research Fund – Lake Erie Watershed Project

• Evaluating the 4R Nutrient Stewardship Concept and Certification Program in the Western Lake Erie Basin

• GOAL: to evaluate the specific impacts of the adoption of practices associated with 4R Nutrient Stewardship, and the impact of the 4R Certification Program, on crop productivity and profitability, water quality, and perceptions of growers, nutrient service providers, and residents in the western Lake Erie watershed.

• 10 collaborators... land-river-lake continuum.
Interim Joint Action Plan for Lake Erie: An Overview

Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
Food Safety and Environment Division
Environmental Management Branch

Cale Selby, Team Lead
July 14, 2015
• Ontario’s Great Lakes Nutrients Commitments
• Interim Action Plan and Collaborative Agreement
• Review of key actions for agriculture
• What does it all mean for agriculture?
• Input opportunities
• Next steps
Ontario’s Great Lakes Nutrient Commitments

Binational (Canada/US)

Ontario’s Great Lakes Nutrient Commitments

Domestic (Canada/Ontario)

New Phosphorus Reduction Targets by 2016 and Phosphorus Domestic Action Plans by 2018
Recent Great Lakes Activity

- The Premier of Ontario and Governors of Michigan and Ohio signed a Collaborative Agreement on June 13, 2015
  - 40% reduction of Phosphorus to western basin of Lake Erie by 2025, with an interim reduction target of 20% by 2020

- The Great Lakes Commission recently released an Interim Action Plan for Lake Erie that outlines 9 key actions that can contribute to achieving the 40% reduction target

- The actions to achieve these goals will be developed in collaboration with stakeholders and through programs that work for farmers
Process Towards Achieving Reductions

- Updated Draft Lake Erie Targets (finalized in 2016)
- Interim Action Plan (finalized in fall 2015)
- Domestic Action Plan (2018)

Ongoing consultations with stakeholders to develop cost effective reduction tools

Ongoing implementation of existing and new reduction practices

Healthy Lake Erie

40% Reduction of Phosphorus in the western basin of Lake Erie (2025)

Adaptive approach that incorporates new science and information
Interim Action Plan - Context for Action

• 2011 – worst algal bloom in Lake Erie’s history
  – Significant impacts to fishery, recreational uses, beach access, property values
• 2014 – Harmful algal bloom impacted drinking water supply
  – Interrupted water supply for 500,000 people in Toledo, Ohio
  – Drinking water advisory for Pelee Island

• Great Lakes Commission passed a resolution to form the Lake Erie Nutrients Target Working Group (LENT)
  – Develop new and refine existing practices, programs and policies to achieve reduction targets and/or identify additional remedies to improve water quality in Lake Erie
• LENT includes representatives from jurisdictions within the Lake Erie states (Michigan, Ohio, Pennsylvania, New York) and Ontario

• Purpose of the working group
  – To develop new and refine existing practices, programs and policies to achieve pollutant reduction targets and/or
  – To identify additional remedies to improve water quality in Lake Erie

• Through the Interim Action Plan, LENT aims to:
  – Offer a common roadmap for Ontario and the Lake Erie states to guide shared activities to help solve nutrient-related problems in Lake Erie
Joint Actions - LENT

The nine joint actions in the interim Joint Action Plan address:

I. Application of fertilizer and manure on frozen and snow-covered ground

II. The 4Rs Nutrient Stewardship Certification program and similar comprehensive management approaches

III. Discharges of phosphorus from seven key municipal facilities in the western and central basin

IV. Investments in green infrastructure for urban stormwater and agricultural runoff

V. Open water disposal of dredged material

VI. Performance-based incentives to reduce nutrients

VII. Residential phosphorus fertilizer

VIII. Adaptive management to validate and refine reduction targets and timelines

IX. Collaboration toward an integrated monitoring and modeling network.
What Does it Really Mean for Agriculture?

Does what we do HERE

- Tile Drain
- Work Fields
- Apply Fertilizer
- Grow Crops

Really matter out THERE?

- Nuisance Algal Blooms
- Intake Fouling
- Reduced Oxygen
- Mycrocystis toxin
What has changed?

• Highest risk period for Phosphorus loss from agriculture is in the non-growing season (Nov – April)
• Intense rainfall events during this period are increasing with climate change
• Over 80% of Phosphorus loss can occur in this period
Losses During the Non-Growing Season

Sediment and P loading occurs in the non-growing period

Average Total Phosphorous loading by month (2002 to 2011)

Average Total Sediment loading by month (2002 to 2011)
• Generally P is applied to meet crop uptake - studies have indicated that over-application is minimal (1 lb/acre)
• At a farm scale this is small, but with approximately 1.8 million hectares draining into Lake Erie it becomes significant
• Phosphorus loss potential varies significantly across the landscape and within fields
• Targeted action is needed with a systems approach to improving soil health and nutrient management
• Need landscape and community level solutions, and targeted action within fields
• It is envisioned that the draft Joint Action Plan will drive further consultation, discussions, and actions that Ontario and the Lake Erie states can advance in the near term.

• The Joint Action Plan will be refined during summer 2015, and finalized fall 2015.

• Longer term efforts are underway through the GLWQA Nutrients Annex (Annex 4) process including:
  – 2016: Release of final Lake Erie nutrient targets
  – Ongoing consultation and input will be sought in the development of Domestic Action Plans.
• Connect with members of the Agricultural Task Team under the GLWQA

• We will capture what we hear today

• Directly input into the binational consultation process

• Comments directly to OMAFRA – Environmental Management Branch Director, George McCaw
gorge.mccaw@ontario.ca
# Agricultural Task Team Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anne Loeffler</td>
<td>Represents Lake Erie basin conservation authorities and Conservation Ontario</td>
</tr>
<tr>
<td>(Grand River Conservation Authority)</td>
<td></td>
</tr>
<tr>
<td>Karen Maaskant</td>
<td>Represents Lake Erie basin conservation authorities and Conservation Ontario</td>
</tr>
<tr>
<td>(Upper Thames River Conservation Authority)</td>
<td></td>
</tr>
<tr>
<td>Harold Rudy</td>
<td>Ontario Soil and Crop Improvement Association</td>
</tr>
<tr>
<td>Jenny Denhartog</td>
<td>Christian Farmers</td>
</tr>
<tr>
<td>Les Nichols</td>
<td>Chair of Farm &amp; Food Care’s Environment Council</td>
</tr>
<tr>
<td>David Armitage</td>
<td>Ontario Federation of Agriculture</td>
</tr>
<tr>
<td>Pam Joosse</td>
<td>Agriculture and Agri-Food Canada</td>
</tr>
<tr>
<td>Tom Bruulsema</td>
<td>International Plant Nutrition Institute</td>
</tr>
<tr>
<td>Debra Conlon</td>
<td>Grain Farmers of Ontario</td>
</tr>
</tbody>
</table>
• **Appendix A** – Proposed Interim Actions Related to Agriculture

• **Appendix B** – Great Lakes Nutrients Governance
I. Manage nutrient application on frozen or snow-covered ground

- This action calls for the management of manure, fertilizer and biosolid applications under the following conditions: on frozen or snow-covered ground, on saturated soil, or when the weather forecast calls for a severe rain event.

Spreading nutrients on frozen or snow-covered ground can significantly increase the risk of runoff as fertilizer, manure and biosolids can be washed away by spring snow melt or other heavy precipitation events.
II. Adopt 4Rs Nutrient Stewardship Certification program or other comprehensive nutrient management programs

- The 4Rs Nutrient Stewardship Certification program is a voluntary agricultural retailer certification program focused on nutrient stewardship through the implementation of best management practices (BMPs) that optimize the efficiency of fertilizer use.

- The objective of the 4Rs is to match nutrient supply with crop requirements and to minimize nutrient losses from fields.

The 4Rs increase production & profitability for farmers while ensuring the future of the agricultural industry:

- **Right Source** – Select the correct source of nutrient for your soil ensuring a balanced supply of essential plant nutrients.
- **Right Rate** – Perform annual soil testing & apply nutrients to meet crop requirements while accounting for nutrients already in the soil.
- **Right Time** – Apply nutrients at the right time so nutrients will be available when crop demand is high & do not apply fertilizer on frozen soils.
- **Right Place** – Place nutrients below the soil surface where they can be taken up by growing roots when needed.

Through sustainable actions, we can protect our soil, water and air for society.
VI. Promote and pilot innovative nutrient reduction initiatives in the western Lake Erie basin

• Performance-based incentives – exploring the use of payments based on ecological outcomes and provide flexibility for producers to find the most appropriate and cost-effective solutions for their specific farming operation or resource concern.

• Implementing pilot programs using innovative approaches, like “pay for performance” incentives, can help complement and promote alternatives to traditional cost-share approaches
VIII. Within 5 years, validate or refine the reduction targets and timelines using an adaptive management approach

- A long-term proposed target of reducing phosphorus loads into western and central Lake Erie by 40% (from 2008 levels) by 2025
  - An interim proposed phosphorus reduction target of 20% by 2020

- An adaptive management approach would be used to track the progress made under the Joint Action Plan and to adjust targets and actions based on new science and knowledge

- The GLWQA Annex 4 Subcommittee process will be an important source of new information and refining actions
IX. Collaborate toward an integrated monitoring and Modeling Framework

- Establishing an integrated modeling and monitoring network for Lake Erie by 2020
- System that would measure nutrient losses at edge-of field, as well as in streams and at river mouths
- Intended to measure progress towards achieving reductions and effectiveness of BMPs
Historical Lake Erie Phosphorus Management: Lessons Learned from SWEEP (1986-1992)

Farm & Food Care Ontario Strategy Session
July 14 2015

Ann Huber and Don King
The Soil Resource Group
<table>
<thead>
<tr>
<th>Year</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1909</td>
<td>Bi-national Boundary Waters Treaty</td>
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<tr>
<td>1970</td>
<td>IJC Report</td>
</tr>
<tr>
<td>1972-1978</td>
<td>GLWQA</td>
</tr>
<tr>
<td>1978</td>
<td>GLWQA</td>
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<tr>
<td>1978-1980</td>
<td>Phosphorus Management Strategies Task Force of the IJC</td>
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<td>1981-1983</td>
<td>Nonpoint Source Control Task Force of the IJC</td>
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<tr>
<td>1983</td>
<td>GLWQA Phosphorus Load Reduction Supplement</td>
</tr>
<tr>
<td>1984</td>
<td>Senate Report on soil erosion, Soil at Risk: Canada’s Eroding Future</td>
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<td>1985</td>
<td>Canadian Fed./Prov. Phosphorus Load Reduction Plan</td>
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</table>

**Timeline**

- **1909**: Bi-national Boundary Waters Treaty
- **1970**: IJC Report
- **1972-1978**: GLWQA
- **1978**: GLWQA
- **1978-1980**: Phosphorus Management Strategies Task Force of the IJC
- **1981-1983**: Nonpoint Source Control Task Force of the IJC
- **1983**: GLWQA Phosphorus Load Reduction Supplement
- **1984**: Senate Report on soil erosion, Soil at Risk: Canada’s Eroding Future
- **1985**: Canadian Fed./Prov. Phosphorus Load Reduction Plan

**Mechanisms and Actions**

- **1972**: GLWQA
  - Measure the impact of land use activities on the Lakes, and potential solutions
  - Bi-national agreement with target P loadings and country allocations
  - Investigate alternative strategies for managing P inputs to the Great Lakes
  - Evaluate post-PLUARG activities, and related issues
  - Agreement to further reduce P input to Lake Erie by 2000T (including 200T from Ontario agriculture)
  - Key recommendations that supported the manner in which the SWEEP program was delivered
  - Required reduction of 200T/yr to be met by 400,000 ha of cropland converted to conservation tillage; $30M allocated to program
  - Implementation of the P Load Reduction Plan for Ontario Agriculture

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Timeline to the International Reference Group on Pollution from Land Use Activities (PLUARG)

- **Bi-national Boundary Waters Treaty**: 1909
- **IJC Report**: 1970
- **GLWQA**: 1972
- **PLUARG**: 1972-1978

Measures:
- **Mechanism to share responsibilities regarding Great Lakes**
- **Severe eutrophication of the Great Lakes**
- **Bi-national agreement for the remediation of the Great Lakes**
- **Measure the impact of land use activities on the Great Lakes, and potential solutions**
<table>
<thead>
<tr>
<th>Year Range</th>
<th>GLWQA Phosphorus Management Strategies Task Force of the IJC</th>
<th>Nonpoint Source Control Task Force of the IJC</th>
<th>GLWQA Phosphorus Load Reduction Supplement</th>
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### 1984 to SWEEP

<table>
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<tr>
<th>Year</th>
<th>Event</th>
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<tr>
<td>1984</td>
<td>Senate Report on soil erosion, <em>Soil at Risk: Canada’s Eroding Future</em></td>
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<tr>
<td>1984</td>
<td>Fed./Prov. soil erosion reduction plan</td>
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<td>1985</td>
<td>Key recommendations that supported the manner in which the SWEEP program was delivered</td>
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</tr>
<tr>
<td></td>
<td>Implementation of the P Load Reduction Plan for Ontario Agriculture</td>
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</table>

Fed./Prov. Soil and Water Environmental Enhancement Program (SWEEP)
<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>Abbreviation</th>
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<tr>
<td>1972</td>
<td>PLUARG - Pollution from Land Use Activities Reference Group</td>
<td>LS I/LS II</td>
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<tr>
<td>1974</td>
<td>TRIC - Thames River Implementation Committee</td>
<td>GLWQ</td>
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<tr>
<td>1976</td>
<td>SAREMP - Stratford - Avon River Environmental Management Project</td>
<td>NSCP</td>
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<tr>
<td>1978</td>
<td>RBS / CURB - Rural Beaches Strategy / Clean Up Rural Beaches</td>
<td>LMAP</td>
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<td>1980</td>
<td>SWEEP - Soil &amp; Water Environmental Enhancement Program (including Tillage 2000 &amp; OSCEPAP II)</td>
<td>ESI</td>
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<td>1982</td>
<td>LSEMS - Lake Simcoe Environmental Management Strategy</td>
<td>Green Plan</td>
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<td>1984</td>
<td>New Implementation</td>
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<tr>
<td>1986</td>
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<tr>
<td>1988</td>
<td>LS II Implementations</td>
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<td>1990</td>
<td>Green Plan - Canada-Ontario Agriculture Green Plan</td>
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http://agrienvarchive.ca/
Sweep Organization Chart

Federal / Provincial Management Committee
AC, EC, OMAF, OMOE, OMNR

Communications Committee

Federal / Provincial Working Committee
AC, EC, OMAF, OMOE, OMNR

TAP - Technology Assessment Panel

CIB - Conservation Information Bureau

PROVINCIAL

- Technical Assistance
- Extension Services

- On-Farm Demonstrations
- Tillage 2000
- Side-by-Side Demonstrations

Soil Conservation Incentives (OSCEP AP) - Ont. Soil Conserv. & Env. Protection Assistance Program

FEDERAL

Administration Monitoring Public Info

Evaluation & Monitoring Committee

TED - Technology Eval. & Develop.

FLEA - Farm-Level Economic Analysis

PWS Pilot Watershed Study

Water Monitoring Quality / Quantity

SEE - Socio- Econ. Evaluation Component
Table 2. SWEEP Sub-Program Funding Allocations and Expenditures

<table>
<thead>
<tr>
<th>Sub-Program</th>
<th>Federal Contribution</th>
<th>Provincial Contribution</th>
<th>Expenditure</th>
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<tr>
<td>1. Technology Assessment Panel (TAP) +</td>
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<tr>
<td>Socio-economic Evaluation (SEE)</td>
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<td>Conservation Information Bureau (CM)</td>
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<tr>
<td>Sub-Total</td>
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<td>2. Technology Evaluation and Development (TED)</td>
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<td>3. Pilot Watershed Study</td>
<td>$5,250,000</td>
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<td>4. Local Demonstrations</td>
<td>Nil</td>
<td>$1,750,000</td>
<td></td>
</tr>
<tr>
<td>5. Technical Assistance</td>
<td>Nil</td>
<td>$6,000,000</td>
<td></td>
</tr>
<tr>
<td>6. Soil Conservation Incentives</td>
<td>Nil</td>
<td>$7,000,000</td>
<td></td>
</tr>
<tr>
<td>7. Administration, Monitoring and Public Relations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$29,945,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Federal SWEEP Expenditures</td>
<td>$14,614,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Ontario SWEEP Expenditures</td>
<td>$15,330,300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lessons learned

- **Setting targets**
  - Science-based, clearly defined, and achievable

- **Getting buy-in from farmers**
  - Collaborative, economically viable, identified targets
  - Present a reasonable challenge and they will try meet it

- **Establishing a program/acquiring funding**
  - Long-term planning/funding versus crisis management

- **Governance (SWEEP)**
  - 1. Define the goals
  - 2. Delegated the authority & associated funds to do the job
  - 3. Evaluate performance/success

- **Role of science/research**
  - Defines the problem and existing state
  - Identifies solutions, targets, critical areas, measures success
Lessons learned

- **Role of political/social climate**
  - International agreements, public awareness → support
  - Sometimes overrides science

- **Measuring success/environmental outcomes**
  - Evaluation design at the start of program
  - Recognize the lag-time in environmental response

- **Things that resulted in change on the ground**
  - $$ and people; extension ↔ on-farm research

- **Things not used that were limited**
  - Targeting

- **Things that have changed for today**
  - Voluntary programs may not work; monitoring (lack) extension/communications; technology
  - Political/social climate?
Then & Now

- 1970 – IJC documented a problem
- 1972-1978 – PLUARG defined the problem in detail
- 1980 – strategy developed
- 1983 – quantify and agree to load reduction targets
- 1985 – develop a plan
- = 16 years to the beginning of SWEEP

- 2013 – documented problem – eutrophication in Lake Erie
- 2016 – require load reduction allocations
- 2018 – require binational strategies & domestic action plans
- = 5 years (and the science [PLUARG] piece is missing)
The Lorax: a social barometer....

- “I hear things are just as bad up in Lake Erie.” (1971)

- .... PLUARG to SWEEP (1972-1992)

- “..... a body of water that is now, due to great civic and scientific effort, the happy home of smiling fish” ... (1986)
What we have learned about Agri-Environmental Management Processes

John FitzGibbon
University of Guelph
And
OFEC
They must be based on “Best Available Science”

They must be feasible technically and practically possible to implement

They must be affordable (economically efficient for both farmers and government)

They must be effective

They must be acceptable (fit in with the farm production system) (Source: Chris Attema)
Management Approaches

* Rules based: a fixed formula for management

* Precautionary: risk management based

* Adaptive: systematic evolutionary based on lessons from implementation

* Mixed approaches using elements from each of the above
Governance Approaches

- Command and Control: linked rules based management
- Co-Regulation: linked to negotiated environmental agreements based on both adaptive and precautionary management
- Self-Regulation: linked to certification and industry based approaches including rules, adaptive and precautionary management
- Stewardship: linked to Best Practices, moral and incentive based management using any of the management approaches.
The need for Collaboration

- Phosphorous efficiency management is complex and subject to significant uncertainty and variability (no silver bullet)
- Involvement of a wide range of stakeholders brings multiple perspectives
- Involvement of both public agencies, private individuals and organizations broadens ownership of programs
- Involvement of a wide range of stakeholders in the development of programs provides an opportunity for communications and trust building
- Collaboration provides an opportunity to resolve differences before a program is implemented
1) A strategy is a set of tactics or measures that compliment each other and are used in an adaptive fashion determined by the context in which they are applied.

2) Strategies themselves evolve as the field of action changes

3) Feedback from implementation is an essential part of strategic management
We need to agree on what management approach we are going to take.

We need to work together to develop the initial strategies and tactics.

They must include all of the sources of phosphorous (agricultural and non agricultural) that are a burden on the environment.

We need to develop a clear understanding of what we know well, what we are unsure of and what we clearly do not know.

We must be mindful of the criteria that we have set out, Best Available Science, Feasible, Affordable, Effective, and Acceptable.
RECOMMENDED BINATIONAL PHOSPHOROUS REDUCTION TARGETS FOR LAKE ERIE

July 14th, 2015
Susan Humphrey – Environment Canada
Sandra George – Environment Canada
Presentation Outline

• GLWQA
• Nutrients Annex
• About Lake Erie
• The problem
• Why phosphorus
• Approach to developing targets
• Targets
• Consultation Questions
PURPOSE: …to restore and maintain the chemical, physical and biological integrity of the Waters of the Great Lakes
General Objectives

• Free from nutrients in amounts interfere with aquatic ecosystem health or human use
• Free from invasives that adversely impact water quality
• Free from harmful impact of contaminated groundwater
• Free from substances, materials or conditions that may negatively impact chemical, physical or biological integrity
Nutrients Annex

Sets out Lake Ecosystem Objectives

By 2016 and starting with Lake Erie

- Review, revise and/or develop concentration and loadings objectives for offshore and nearshore waters of Great Lakes
- Establish allocations by country
- Establish load reduction targets for priority watersheds that have significant or localized impact

By 2018

- Develop Domestic Action Plans
- Implement P reduction programs
GLWQA Nutrients Annex Governance

Nutrients Annex Subcommittee
Susan Humphrey, Co-Chair
Tinka Hyde, Co-Chair

Objectives and Targets Development Task Group
Sandra George, EC
Jeff Reutter, OSU

Agricultural Programs Task team
George McCaw, OMAFRA
John Schlichter, ODA

Urban and Rural Municipal Programs Task Team
Madhu Malhotra, MOECC
William Creal, MDEQ
About Lake Erie

- Shallowest and warmest of the Great Lakes
- Most biologically productive
- 13.5 million people in watershed
- Intensive land use - both urban and agriculture
- Provides drinking water for over 11 million people
- 8 billion gallons/day of treated sewage into Lake Erie and waterways
- 60-80% agricultural landuse
- Many areas of significant ecological interest
- Thriving sports and commercial fishery
Algal and cyanobacterial blooms in Lake Erie have been increasing since the late 1990s

**Environmental Impacts**
- Fish and wildlife habitat
- Animal health risks
- Ecosystem function

**Human Health**
- Algal toxins production affects quality of raw water for drinking and recreational water uses such as swimming

**Economic Impacts**
- 4 to 5.5 billion$ over the next 30 years
  - Commercial fishing, tourism, recreation and property values
  - Addition water treatment
  - Beach Closures

Algal toxins production affects quality of raw water for drinking and recreational water uses such as swimming.
It’s not a New Problem

• Harmful and nuisance algal blooms were a significant problem in Lakes Erie, Ontario and Huron in the 1960s and 1970s.

• Major driver for the signing of the first Canada-United States Great Lakes Water Quality Agreement in 1972
  – The Agreement established binational targets for the reduction of phosphorus discharges to the Great Lakes

• Governments responded by:
  – Regulating phosphorus in detergents
  – Investing in sewage treatment
  – Developing and promoting best management practices for agriculture lands
New Factors at Play

- **Population growth**
  - increased phosphorus discharges from urban and agricultural landscapes due to changes in land use and land management practices

- **A Changing Climate**
  - increased frequency of severe storms
  - increased temperatures
  - longer growing seasons

- **Aquatic Invasive Species**
  - changes to water clarity and nutrient flows caused by Zebra and Quagga Mussels

- **Bioavailable Phosphorus increasing**
Current ecosystem conditions
Recommended Phosphorus Targets
Target Development Process

The Objectives and Targets Development Task Team

- consists of 25 ++ experts from Canada and the US
- Used best available science and modelling

The process

- Evaluated conditions in the lake
- Determined what’s limiting algal growth
- Established eutrophication response indicators and selected benchmarks that task groups feels meets the intent of the LEO’s:
- Decided on an approach to link P loadings to eutrophication responses - multiple model approach
- Develop load response curves
- Select P loads from curves that meet eutrophication response indicator benchmarks
- Recommended loading targets
Phosphorus increases aquatic plant growth

However, too much leads to toxic and nuisance algae
Phosphorus Loadings over time

Canada contributes approximately 15% of phosphorus loads lakewide.
# Lake Ecosystem Objectives

<table>
<thead>
<tr>
<th>Location</th>
<th>Issue</th>
<th>Lake Ecosystem Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Basin</td>
<td>Low oxygen issues</td>
<td>Minimize the extent of low-oxygen zones (avg. 2mg/l oxygen late summer hypolimnion)</td>
</tr>
<tr>
<td>Eastern Basin</td>
<td>Benthic Algae (<em>Cladophora</em>)</td>
<td>Maintain the levels of algae below nuisance conditions (biomass 50g/m2 or less)</td>
</tr>
<tr>
<td>Nearshore</td>
<td>Blue-Green Algae (<em>Cyanobacteria</em>)</td>
<td>Maintain algal species consistent with healthy aquatic ecosystems in the near shore waters of the Great Lakes. (reduction in nearshore cyanobacteria blooms)</td>
</tr>
<tr>
<td>Western basin</td>
<td>Blue-Green Algae (<em>Cyanobacteria</em>)</td>
<td>Maintain cyanobacteria at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health in the waters of the Great Lakes. (reduced to non-severe levels 9 years out of 10)</td>
</tr>
<tr>
<td>Entire lake</td>
<td></td>
<td>Maintain mesotrophic conditions in the open waters of the western and central basins of Lake Erie, and oligotrophic conditions in the eastern basin of Lake Erie.</td>
</tr>
</tbody>
</table>
Proposed Bi-National Phosphorus Load Reduction Targets

<table>
<thead>
<tr>
<th>Lake Ecosystem Objectives</th>
<th>Western Basin of Lake Erie</th>
<th>Central Basin of Lake Erie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize the extent of hypoxic zones in the Waters of the Great Lakes associated with excessive phosphorus loading, with particular emphasis on Lake Erie</td>
<td>40% reduction in total phosphorus entering the Western Basin and Central Basin of Lake Erie – from the United States and from Canada - to achieve 6000 MT Central Basin load</td>
<td></td>
</tr>
<tr>
<td>Maintain algal species consistent with healthy aquatic ecosystems in the nearshore Waters of the Great Lakes</td>
<td>40% reduction in spring total and soluble reactive phosphorus loads from the following watersheds where localized algae is a problem:</td>
<td></td>
</tr>
<tr>
<td>Maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health in the Waters of the Great Lakes</td>
<td>40 % reduction in spring total and soluble reactive phosphorus loads from the Maumee River (U.S.)</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Addressing Central Basin Hypoxia

<table>
<thead>
<tr>
<th>Proposed Bi-National Phosphorus Load Reduction Targets</th>
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<th>Central Basin of Lake Erie</th>
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</thead>
<tbody>
<tr>
<td><strong>Lake Ecosystem Objectives</strong></td>
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<td></td>
</tr>
<tr>
<td>Great Lakes Water Quality Agreement</td>
<td></td>
<td></td>
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<td>Annex 4, Section B</td>
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<td><strong>Maintain algal species consistent with healthy aquatic ecosystems in the nearshore Waters of the Great Lakes</strong></td>
<td><strong>40% reduction in spring total and soluble reactive phosphorus loads from the following watersheds where localized algae is a problem:</strong></td>
<td></td>
</tr>
<tr>
<td>Thames River - Canada</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maumee River - US</td>
<td></td>
<td></td>
</tr>
<tr>
<td>River Raisin - US</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portage River - US</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toussaint Creek - US</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leamington Tributaries – Canada</td>
<td></td>
<td></td>
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<td><strong>Maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health in the Waters of the Great Lakes</strong></td>
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### Addressing Western Basin Blooms

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<td></td>
</tr>
<tr>
<td>Minimize the extent of hypoxic zones in the Waters of the Great Lakes associated with excessive phosphorus loading, with particular emphasis on Lake Erie</td>
<td>40% reduction in spring total and soluble reactive phosphorus loads from the following watersheds where localized algae is a problem: Thames River - Canada Maumee River - US River Raisin - US Portage River - US Toussaint Creek - US Leamington Tributaries – Canada</td>
<td>Sandusky River - US Huron River, OH – US</td>
</tr>
<tr>
<td>Maintain algal species consistent with healthy aquatic ecosystems in the nearshore Waters of the Great Lakes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health in the Waters of the Great Lakes</td>
<td>40% reduction in spring total and soluble reactive phosphorus loads from the Maumee River (U.S.)</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Achieving a healthy aquatic ecosystem in the nearshore

<table>
<thead>
<tr>
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</tr>
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<tr>
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<td>40% reduction in total phosphorus entering the Western Basin and Central Basin of Lake Erie – from the United States and from Canada - to achieve 6000 MT Central Basin load.</td>
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<td>N/A</td>
</tr>
</tbody>
</table>
## Substance Objectives for Total Phosphorus Concentration in the Open Waters of Lake Erie (ug/l)

<table>
<thead>
<tr>
<th>Basin</th>
<th>Interim Great Lakes Water Quality Agreement Annex 4, Section C</th>
<th>Expected Outcome from Implementation of Proposed Load Reduction Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Erie (western basin)</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Lake Erie (central basin)</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Lake Erie (eastern basin)</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>
Adaptive Management

- Implementation
- Enhanced Monitoring
- Research & Modelling
- Evaluate
- Adjust

Diagram from U.S. Department of the Interior
Consultation Questions

1. What do you think about the recommended phosphorus reduction targets to reduce cyanobacteria blooms in the western basin to non-severe levels most of the time, minimize hypoxia in the central basin of Lake Erie, and reduce nearshore cyanobacterial blooms?

2. What do you think about our not recommending phosphorus reduction targets for the eastern basin of Lake Erie at this time?

3. What do you think about the watersheds we identified for phosphorus reduction?

4. Is there anything else you'd like to tell us?

For more information
http://nutrientsbinational.net/intro
Discussion