

An Evaluation of Water Resource Monitoring Efforts in Support of Agricultural Stewardship in Watersheds of the Great Lakes Basin

Submitted to Ontario Ministry of Agriculture, Food and Rural Affairs, Great Lakes Program, February 2009



The funding for this project was provided by the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem. The views expressed in this report are the views of the Recipient alone and do not necessarily reflect those of the Province.



Conservation
ONTARIO
Natural Champions

Conservation Ontario
Box 11, 120 Bayview Parkway
Newmarket, Ontario L3Y 4W3
905-895-0716
info@conservationontario.ca
www.conservationontario.ca

An Evaluation of Water Resource Monitoring Efforts in Support of Agricultural Stewardship in Watersheds of the Great Lakes Basin

February 2009

Executive Summary

On May 15, 2008 a multi-agency workshop was held to identify successful water resource monitoring initiatives, and to analyze how these programs can provide effective, relevant information for agricultural stewardship programming in Ontario's Great Lakes basin. Water monitoring programs provide information that is key to designing, implementing and evaluating agricultural stewardship programs. This report highlights outcomes from the workshop and recommendations for water resource monitoring, data sharing, information transfer and communication, as well as funding.

The workshop attendees were very positive about the value of multi-stakeholder groups coming together to discuss water resources and stewardship, as well as the need for ongoing opportunities to do this. Participants strongly recommended improved communication and information transfer on a practical level to meet the needs of practitioners of both watershed monitoring and stewardship programming.

It was recognized that more coordinated and targeted water resource monitoring is required to assess the benefits of ongoing agricultural stewardship programs and to address new and emerging concerns. Building on existing programs and partnerships was seen as an efficient approach. As such, current mandates and scales of existing monitoring activities can be improved to supply information for the effective design, implementation and evaluation of agricultural stewardship programs.





Acknowledgements

The funding for this project was provided by the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem. The views expressed in this report are the views of the Recipient alone and do not necessarily reflect those of the Province.

Thanks to Pamela Josse, OMAFRA, for support and guidance on the project. The following steering committee members contributed to workshop planning and project review: Pradeep Kumar Goel, Ministry of the Environment; Stewart Sweeney, Ontario Ministry of Agriculture, Food and Rural Affairs; Rick Steele, Maitland Valley Conservation Authority; Sandra Cooke, Grand River Conservation Authority; Charley Worte, Conservation Ontario; Jo-Anne Rzakdi, Conservation Ontario, and Karen Maaskant, Upper Thames River Conservation Authority. Kayak Consulting provided design of the group process, workshop facilitation, and summary reporting. Thanks to Ian Wilcox of Upper Thames River Conservation Authority for his input, and also to Chris Wilkinson and Matthew Millar, Conservation Ontario, for contributing to the data management section.

Acknowledgement goes to the valuable contribution of the 32 participants in the May 15, 2008 workshop representing agencies and organizations committed to agricultural stewardship and water resource monitoring programs (see Appendix C for session participants).

This report was prepared for OMAFRA by Karen Maaskant, Upper Thames River Conservation Authority, and Jo-Anne Rzakdi, Conservation Ontario.

Table of Contents

Executive Summary	i
Acknowledgements	ii
Table of Contents	iii
1.0 Introduction	1
1.1 Background	1
2.0 Project Approach	2
3.0 Overview of Findings	3
3.1 Importance of Water Resource Monitoring	3
3.2 Role of Information Exchange	3
3.3 Success Stories	4
4.0 Recommendations	5
4.1 Water Resources Monitoring	5
4.2 Data Sharing	7
4.3 Information Transfer and Communication	8
4.4 Funding	9
5.0 Conclusions	10
Appendices	
A. List of Examples of Current Water Resource Information Sharing Initiatives	11
B. Example of Communications Networks and Initiatives Regarding Stewardship and Monitoring	12
C. An Evaluation of Water Resource Monitoring Efforts in Support of Agricultural Stewardship in Watersheds of the Great Lakes Basin	13



1.0 Introduction

The purpose of the project was to identify successful water resource monitoring initiatives that:

- link to and evaluate the benefits of specific agricultural best (beneficial) management practices (BMPs), and
- evaluate the progress of agricultural stewardship programs in southern Ontario watersheds within the Great Lakes basin.

The project was initiated as part of OMAFRA's commitment to the 2007 Canada-Ontario Agreement (COA) to restore, protect and conserve the Great Lakes Basin ecosystem. This project supports the following OMAFRA Great Lakes Program commitment:

Strategic optimization of multi-agency monitoring and research efforts in support of Annex 3 to inform agricultural programs in order to address Great Lakes Basin ecosystem priorities, particularly in the tributaries and near-shore areas. Specifically this project addresses the following outcomes of COA:

Annex 4: Coordination of Monitoring, Research and Information

Goal 1: Undertake coordinated and efficient federal/provincial scientific monitoring and research

Result 1: Responsive and comprehensive monitoring and research programs

c) coordinate federal and provincial monitoring and research in support of Annex 3 to optimize programs and address priorities in the near-shore zones, coastal areas, open water, and tributaries

1.1 Background

Faced with growing environmental problems in the 1960s, Canada and the United States signed a Great Lakes Water Quality Agreement in 1972 that committed both countries to address water quality issues in the Great Lakes basin. Through the 1970s and 1980s, significant advances were made in identifying the impacts of agriculture on water quality and developing best (beneficial) management practices (BMPs) that address environmental protection within productive agricultural operations.

Programs such as Pollution from Land Use Activities Reference Group (PLUARG) in the 1970s and Clean Up Rural Beaches (CURB) in the mid-1980s to 1990s are two examples of early multi-agency programs whereby research was conducted on the farm-scale and in small agricultural watersheds to understand the issues. These programs involved extensive water monitoring and applied research to develop practical solutions with landowners.

Many of the environmental issues identified in the past continue to be relevant with current efforts to address them through agricultural policy and stewardship. Many past BMPs are part of today's range of solutions and projects for agricultural stewardship programs.

Today, new monitoring and applied research is needed to inform agricultural stewardship in light of other water resource issues of public concern (e.g., climate change, pharmaceuticals). Current threats to Great Lakes water quality, such as major algal blooms linked to phosphorus levels in Lake Erie, point to the ongoing need for expanded non-point source pollution programs in contributing watersheds.

2.0 Project Approach

A workshop was held in Puslinch, Ontario on May 15, 2008 to bring together expertise from across agencies and organizations involved in water resource monitoring and agricultural stewardship programs in Ontario's Great Lakes basin.

Direction and review were provided by a steering committee with representation from OMAFRA, Ontario Ministry of the Environment (OMOE), Conservation Ontario, and conservation authorities.

The workshop participants explored the following topics:

- Examples of successful water monitoring projects that inform agricultural stewardship,
- Characteristics of successful water monitoring programs or projects,
- Water resource information that is most useful in developing an understanding of the impacts and effectiveness of agricultural beneficial management practices and programming.
- Key information/data that is currently available,
- Key information/data that is currently unavailable, and
- Recommendations for future monitoring programs.

This report summarizes the primary discussions and priority recommendations developed through the workshop process. The appendices include the workshop facilitator's complete report, examples of current water resource information initiatives, and examples of communications networks and initiatives regarding stewardship and monitoring



3.0 Overview of Findings



Two elements became the focus of the workshop participants' input: water resource monitoring and information exchange. These elements were identified as necessary to the goal of providing effective, relevant information for agricultural stewardship programs.

3.1 Importance of Water Resource Monitoring

Water monitoring provides the means to understand the state of the water resources and the magnitude of effort needed to protect local watersheds

and the Great Lakes basin. Workshop participants identified three levels of monitoring to feed into agricultural stewardship programs.

- a) **Long-term, ambient monitoring** through provincial monitoring programs tracks trends in water quality across Ontario and provides valuable information linking land use and current pollution issues (e.g., the regional trends in nitrate concentration in southwestern Ontario streams).
- b) **Small agricultural watershed research and monitoring** is key to understanding sources, loadings, and fate of pollution in rural tributaries and demonstrating the cumulative benefits of agricultural stewardship projects at a manageable scale.
- c) **Site specific research and monitoring**, as part of the development of new agricultural BMPs, provides evidence of the environmental benefits of specific stewardship practices. This evidence is important to landowners and governments investing in new stewardship projects and initiatives. Workshop participants emphasized that new BMPs must have proven environmental impacts, as other variables, such as land use activities and climate, can mask the water resource benefits of these projects on a watershed scale. To link agricultural stewardship programming to water resource benefits, monitoring design needs to ensure relevant scale and frequency, addressing seasonal weather events and timing of agricultural practices.

3.2 Role of Information Exchange

Workshop participants emphasized the importance of converting monitoring data into meaningful information. Monitoring data at all levels (provincial watershed monitoring, small watershed research, and farm-scale BMPs) needs to be translated into information that is practical and relevant to landowners, as well as to government and organizations designing and delivering agricultural stewardship programs and policy. The effective integration and delivery of this information to stakeholders is a critical step that workshop participants reported is often lacking. A number of efforts are currently underway to improve the availability and exchange of water resource data and information, as summarized in **Appendix A**.

Water resource information needs to be communicated to landowners, extension staff, researchers, and government to ensure practical and effective stewardship programs. Communication facilitates building on existing research and monitoring efforts, which workshop participants reported as key to successful research and monitoring projects. Examples were cited of projects, such as the Kintore Creek watershed study, where a number of researchers work in the same watershed and build on and share research data.

In promoting BMP adoption, communicating the results of monitoring data can motivate landowners and local groups to action and help to show environmental benefit for dollars invested. One effective approach is the conservation authorities' watershed report cards, which present data to the public on a smaller-watershed scale and report on environmental change every five years. By the end of 2009, 26 Conservation Authorities will have completed a Watershed Report Card.

3.3 Success Stories – Common Elements of Water Resource Monitoring Projects that Provide Effective, Relevant Information for Agricultural Stewardship

Workshop participants provided 42 examples of historical and current water monitoring projects that have provided effective, relevant information for agricultural stewardship programs (Appendix C). These projects had many common elements as summarized below.

Approach or Methodology

- Clear purpose
- Consistent research and monitoring methods
- Correct scientific design including appropriate scale
- Integrate a range of technical expertise from relevant disciplines
- Continuity – build on previous information, capturing long term information
- Results communicated effectively, leading to action

Partnerships

- All relevant partners involved – e.g. landowners, government, academia, local agencies and extension staff
- Clear and distinct roles for each partner

Funding

- All aspects of the program/project adequately funded, including monitoring, research and analyses, reporting of information, extension/education, landowner incentives

Information Benefits

- Useful for agricultural technology transfer
- Data and results help to develop, refine and support best (beneficial) management practices, stewardship policies and programs, and watershed plans
- Information linked to current issues/management practices of priority
- Create landowner awareness and further motivation for implementation of BMPs
- Identify environmental priorities to target programs/resources
- Knowledge that is transferable and relevant to public and decision makers

4.0 Recommendations

The following recommendations were developed by assessing and synthesizing the information shared through the workshop. These are the priority recommendations for building upon the successes of past and present water monitoring initiatives that have provided effective, relevant information for agricultural watershed stewardship programs.

4.1 Water Resource Monitoring

Recommendation #1

Establish coordinated approaches to water resource data collection and analysis in agricultural watersheds, by:

- Continuing efforts of the Province and Conservation Authorities to establish consistent and scientifically valid protocols for collection, analyses, and reporting of water resource data. These protocols will facilitate data sharing, reduce overlap, ensure better research design and outcomes among agencies, and be used in decision making by landowners and other land managers.
- Continuing annual provincial-CA technical workshops to train monitoring staff.
- Ensuring that provincial water monitoring programs strategically cover agricultural watersheds in order to generate results relevant to stewardship programs. This task will require an expansion of current OMOE-CA monitoring in some areas of the province.

Discussion

OMNR's Water Resources Information Project (WRIP) clearly identified the need for consistency in monitoring and reporting. Much progress has been made in ensuring scientifically valid protocols in current provincial-CA monitoring programs. There is a need to ensure future monitoring is linked to current agricultural stewardship issues along with other current issues. This step will require more effective linking of monitoring to evaluation of the effectiveness of specific agricultural BMPs. These efforts need to be established for all three scales of monitoring and address how these levels can interconnect so that monitoring data will be most useful and exchangeable. Technical workshops should involve monitoring personnel and researchers to share best practices and new research developments. Furthermore, these workshops should include identification of opportunities for integration of monitoring initiatives with agricultural stewardship efforts, watershed planning, and other inter-related disciplines.





Recommendation #2

Expand monitoring programs to better measure, understand and address current water resource issues and the effectiveness of current agricultural BMPs, by:

- Aligning monitoring program timing and frequency of sampling with storm and seasonal events and agricultural operations, to more accurately reflect agricultural issues and mitigation.
- Including an assessment of contaminants such as pesticides, pathogens, and pharmaceuticals in new water monitoring initiatives, and providing relevant information to the agricultural community.
- Expanding monitoring programs that assess rural groundwater to better understand the quality and quantity of rural water supplies.

Discussion

Provincial water monitoring programs are currently the key set of data used to assess water resources on a broad scale in watersheds across Ontario. For example, the PWQMN is recognized for its 40 plus years of surface water data at 400 sites across the province. This data is crucial to providing scientific evidence of the need for environmental programs, including stewardship programming in the Great Lakes basin. In addition, many agencies and institutions conduct water monitoring as part of research initiatives or local monitoring programs for various decision-making and program needs. Integration of this data would benefit many environmental programs and initiatives, including stewardship.

An increase in monitoring frequency, sites and additional parameters across agricultural watersheds would help to assess environmental response to the implementation of specific agricultural BMPs, as well as stewardship programs in general. An integrated watershed monitoring approach including surface water, groundwater, and aquatic life should be included in measuring the quality of water resources.

4.2 Data Sharing

Recommendation #1

Investigate business needs and develop a plan for a more coordinated approach to data collection, with a view to facilitating more efficient data sharing, by:

- Investigating data products that support CAs and other stewardship mandates and objectives.
- Completing metadata for all existing owned holdings.
- Supporting data sharing frameworks such as the Ontario Geospatial Data Exchange (OGDE).
- Ensuring that intellectual property rights are in place and understood when sharing third party data, so that data sensitivity is understood and recognized.

Discussion

Multiple water resource data related projects are identified in Appendix A. An efficient process is required to define custodians for the various pieces of owned data. A sustained funding mechanism is needed to ensure owned data is maintained, preferably, and where possible, to a common set of information. This should not be thought of as one large data model to be adopted by every organization and addressing every organization's needs. For example, this could be a series of data models by discipline (stewardship, water quality, etc.). By creating the data models where feasible, based on an agreed set of common information, the distributed network of data models could "talk to each other." This would facilitate environmental decision-making and benefit integrated watershed-based management. A good first step in discovering the data for inclusion into decision making is the population of metadata for each owned data set. The metadata could be published to a location where the data can be discovered such as OLID (Ontario Land Information Directory).

Recommendation #2

Develop an inventory of publicly accessible information on monitoring projects and programs in Ontario. Contributors would include municipal, provincial and federal governments, conservation authorities, and academic and research institutions.

Discussion:

An inventory could include (but not be limited to): abstract, site locations, data types, timelines, partners, and contacts. Any inventory would ideally be housed by provincial ministries and link to work updated by CAs and other stakeholders. OLID is one example of a mechanism for identifying who owns and manages existing monitoring and stewardship information in Ontario. Other organizations may wish to implement their own technological solutions, but should still hold information common to other organizations in order to facilitate sharing, analysis and communication between all creators and users of monitoring data and information. CO may be able to host an inventory of CA monitoring programs, the data for which is owned and managed by the CA only. The required input needs to be concise, simple and quick to submit to ensure participation. Good metadata and inventory of monitoring locations is required to make this exercise straight forward.

4.3 Information Transfer and Communication

Recommendation #1

Develop communication products based on the results of water monitoring that clearly identify issues of relevance to agriculture and feed into stewardship programs, by:

- Presenting data and information to agricultural producers, landowners, organizations, and agencies through public-friendly documents that support the environmental need and benefits of stewardship actions. For Conservation Authorities, it is recommended that this include producing watershed report cards, using appropriate and available data, by 2012.
- Developing products that summarize key technical outcomes of past (e.g., PLUARG) and current projects to reduce redundancy and build on what has been learned in past research efforts to guide today's stewardship program development and delivery.
- Holding collaborative workshops, starting in 2009, that involve water resource monitoring program and agricultural stewardship program personnel to ensure a stronger link between disciplines. Discussions during these workshops should include improving approaches to translating data to information that can be used in effective decision making by technical experts, agricultural producers and landowners.
- Developing a steering committee of representatives with expertise from monitoring and stewardship program development and field or local delivery of watershed programs to guide these actions.

Discussion

Many past stewardship research programs have clearly demonstrated through long-term research and monitoring the sources and pathways of contamination and the measurable benefits of many BMPs used today. There is a wealth of information that would be relevant to today's practitioners. A public-friendly product summarizing the findings of this extensive research would be very useful, enhancing and informing policy development and stewardship program development, and would reduce duplication of completed work. An example of a first step in this process is the current effort to compile and provide web access to PLUARG and other program documents (see <http://gis.lrs.uoguelph.ca/AgriEnvArchives/>). Appendix B provides some examples of current networks, such as the Stewardship Network of Ontario and Conservation Authorities Watershed Stewardship Group, that involve sharing information about stewardship initiatives towards more effective collaboration and coordination of efforts in implementation. These networks could be one vehicle for transfer of information between practitioners.



4.4 Funding

Recommendation #1

Commitment from all levels of government is required to fund water resource monitoring in agricultural watersheds, in order to understand the state of water resources related to agriculture and, thus, develop and refine agricultural stewardship programs. Specifically it is recommended that:

- The Province commit to adequate long-term funding of provincial monitoring programs, including PWQMN, PGMN, OBBN.
- The Province expand provincial programs to ensure strategic coverage of agricultural watersheds in time and space to address current issues (e.g. pathogens in surface water) at relevant frequency and scale.
- Funding be directed to water resource monitoring, research and reporting that is supported by the science, in terms of being effective in assessing emerging issues related to agricultural practices and that supports private land management decisions that lead to the development and implementation of best management practices to address those issues.

Discussion

Provincial water monitoring programs are currently the key set of data used to assess water resources on a broad scale and in watersheds across Ontario. This data set is invaluable in tracking water resource trends and identifying issues related to land based activities. A provincial funding commitment is needed to maintain current monitoring and to expand monitoring to address information gaps. Building on current monitoring programs is an efficient approach to expanding current watershed monitoring. Adequate resources should be made available to address site-specific issues and to support research efforts.



5.0 Conclusions

What emerged from the workshop was clear support for improved communication and information transfer on a practical level that meets the needs of practitioners and those involved in watershed monitoring and stewardship program development and delivery. Information needs to be translated into knowledge that can be transferred, understood and used by agricultural producers towards effective management decisions.

This communication is necessary for the advancement of the recommendations highlighted in this document. As such, a first step in moving forward on some of these actions would be the formation of a multi-agency steering committee to begin implementing recommendations such as collaborative workshops.

A further common point that came out of the workshop is the recognition that there are effective and, in some cases, long-term partnership programs and networks in place (e.g., Provincial Water Quality Monitoring Network) that should be built upon to most efficiently address some of the recommendations. There was also recognition of the value of lessons learned from past programs that effectively linked water and stewardship that could be drawn upon in the design and delivery of future initiatives.



Appendix A. Examples of Current Water Resource Information Sharing Initiatives

Project	Discipline	Governance	Status	Description
Fishweb	Biologists	CAAG	In Progress	Creation of a multi-organizational collaborative "data model" based on the results of a survey for the management of Fish Distribution data in Ontario.
Large Scale Mapping Specifications	GIS	COPIM	In Progress	Guidelines for large scale topographic mapping specific to CAs, for projects such as DRAPE (orthophoto acquisition)
Stakeholder Consultation Software Review	Communications		Complete	Comparison of available consultation tracking software
EMRB CA Internal Geo-portal Project	Monitoring/GIS	MOE-EMRB	In Progress	Making OBBN, PWQMN, and PGMN data available to CA staff on a GIS enabled portal, with some summary statistics and mapping capabilities on a stand alone platform.
Low Flow / Base Flow	Monitoring / GIS	COPIM	Operational	Standardization of low flow monitoring and establishment of low/ baseflow monitoring across CAs.
Pollution Probe Ottawa Gatineau Watershed Atlas Geoconnections	GIS	COPIM	Operational	Will integrate multi-agency regional datasets, support cross-jurisdictional communication and information sharing, raise community awareness, and support and stimulate the development of a watershed management plan for the Ottawa River.
Groundwater Information Network	Hydro Geology	Dave Sharpe	Operational	NRCan project - inventory of groundwater information (new project currently going through testing)
PGMN / PGMIS	Hydro Geology	PGMN	Operational	Groundwater Monitoring Network water level and chemistry data
GeoSmart / CAMaps	GIS / Flood / CALands	COPIM	Operational	Possible tool to show stewardship activities within CA's
Conservation Lands (MNR)	CALands / GIS	COPIM	In Progress	Inventory of Conservation Properties
Stewardship Tracking System (http://comap.ca/)	Stewardship / CWA	Centre for Community Mapping	In Progress	Tracking system for stewardship activities initiated through SWP, and the CWA stewardship fund.
Data related CWA Regulations / Directors Rules	GIS	COPIM	In Progress	Additional data sources collected through the Clean Water Act, i.e., DWIS, PTTW, etc.

Acronyms:

CAAG - Conservation Authority Aquatics Group
COPIM - Conservation Ontario Provincial Information Management
CWA - Clean Water Act
DRAPE - Digital Raster Acquisition Project East
DWIS - Drinking Water Information System
GIS - Geographic Information System
MOE-EMRB - Ministry of Environment Environmental Monitoring and Reporting Branch
MWG - Monitoring Working Group
NRCan - Natural Resources Canada
OBBN - Ontario Bio Benthos Network
PGMIS - Provincial Groundwater Monitoring Information System
PGMN - Provincial Groundwater Monitoring Network
PTTW - Permit To Take Water
PWQMN - Provincial Water Quality Monitoring Network
SPR - Source Protection Region
SWG - Stewardship Working Group

Appendix B. Example of Communications Networks and Initiatives regarding Stewardship and Monitoring

Project	Discipline	Governance	Description
Conservation Ontario/ CA Working Groups	Watershed Stewardship, Forestry, Aquatics, GIS Communications	Conservation Ontario/ CAs	Conservation Ontario has established a number of working groups to encourage exchange of expertise, training and program development which involves sharing and reporting of results of stewardship initiatives and related information and data. There are opportunities to more effectively link water quality monitoring to development, implementation and evaluation of CA led stewardship initiatives.
Stewardship Network of Ontario	All disciplines related to Stewardship	SNO Leadership Committee	A network of stewardship organizations (government and non-government) from various disciplines working towards more effective and efficient collaboration of various stewardship initiatives in Ontario. Monitoring, reporting, identifying priorities and sharing of results towards effective programming is discussed at this table.
ARMAC-Stewardship Working Group	Aquatics/ Fisheries	DFO, MNR, CO	A working group of the Aquatic Resources Management Advisory Committee comprised of government organizations with an interest in Aquatic Management and Restoration. Objectives to identify priorities for Aquatic Stewardship initiatives for Ontario in consultation with stakeholders. Links to the Stewardship Network of Ontario.

Appendix C. An Evaluation of Water Resource Monitoring Efforts in Support of Agricultural Stewardship in Watersheds of the Great Lakes Basin.

Summary Document submitted to Conservation Ontario by Kayak Consulting, May 15, 2008.



creating process flow
www.kayakconsulting.ca

An Evaluation of Water Resource Monitoring Efforts
in Support of Agricultural Stewardship
in Watersheds of the Great Lakes Basin

Summary Document
May 15, 2008



Submitted to
Conservation Ontario

by
Kayak Consulting

TABLE OF CONTENTS

Introduction	2
Project Purpose	3
Project Objectives	3
Criteria for Success	3
Approach	4
Session Participants	4
Summary of Key Output	5
Recommendations	6
Next Steps	9
Key Elements/Characteristics for Success	10
Key Water Resource Information Needs	11
- Information/Data to Develop Knowledge	11
- Information/Data Currently Available	12
- Information/Data Currently Unavailable	12
Session Notes	13
Example Successful Water Monitoring Programs.	14
Water Resource Information Needs	27
- Information/Data to Develop Knowledge	27
- Information/Data Currently Available	28
- Information/Data Currently Unavailable	30
Recommendation Theme Areas	31
Evaluation of Session	32
Contact Information	35
Kayak Consulting	35

INTRODUCTION

INTRODUCTION

Session Purpose

The following purpose statement was developed by the steering committee to guide the planning and implementation of the session:

- Identify water resource information monitoring successes and needs that evaluate progress of agricultural stewardship programming in southern Ontario watersheds in the Great Lakes basin

Session Objectives

The following objectives were developed as part of the planning for this session:

- Provide a forum for sharing needs and information
- Identify successful approaches towards linking monitoring and program efforts
- Develop ways to learn from successes and improve water resource monitoring efforts

Criteria for Success

The best opportunities generated during the session met the following criteria:

- Promotes efficient use of resources
- Provides information needs that decision makers want
- Helps to target/evaluate stewardship program efforts
- Delivers obvious benefits to partners



Approach

The project was conducted in two phases:

Planning Meeting: March 20th, 2008

Project Session: May 15th, 2008

During the planning meeting the Project Steering Committee met with Kayak Consulting to discuss the outcome of the session and to develop the format for the session.

The session was conducted at Cedarbrook Farm,
R.R.#3, Puslinch, Ontario - www.cedarbrookfarm.on.ca

Session Participants

Project Coordinators:

Jo-Anne Rzadki - Conservation Ontario

Karen Maaskant - Upper Thames River Conservation Authority

Project Funding Representative:

Pam Joosse - Ontario Ministry of Agriculture, Food & Rural Affairs

Project Steering Committee:

Pradeep Kumar Goel - Ministry of the Environment

Rick Steele - Maitland Valley Conservation Authority

Sandra Cooke - Grand River Conservation Authority

Stewart Sweeney - Ontario Ministry of Agriculture, Food & Rural Affairs

Session Participants:

Adam Yates - The University of Western Ontario

Allison Bruin - Agriculture Canada

Beth Sparling - George Morris Centre

Bruce Kelly - Ontario Soil and Crop Improvement Association

Bruce Bowman - Agriculture Canada (retired)

Cale Selby - Middlesex Stewardship Council

Craig Merkley - Upper Thames River Conservation Authority

Daryl McGoldrick - Environment Canada

Jamie Ferguson - Credit Valley Conservation

David Lapen - Agriculture and Agri-Food Canada

Gregory J. Wall - The Soil Resource Group

Ian Wilcox - Upper Thames River Conservation Authority

James Britton - Water Resources Information Program, Ministry of Natural Resources

John Bittorf - Grey Sauble Conservation Authority

Katherine Watson - South Nation Conservation

Kevin McKague - Ontario Ministry of Agriculture, Food & Rural Affairs

Lynne Parsons - Credit Valley Conservation

Mari Veliz - Ausable Bayfield Conservation Authority

Matthew Millar - Conservation Ontario

Philip Davies - Lake Simcoe Region Conservation Authority

Ramish Rudra - University of Guelph

Rob Diermair - Niagara Peninsula Conservation Authority

Ron Fleming - University of Guelph, Ridgetown Campus

Stephen May - Waterloo Stewardship Network

Wade Morrison - Agriculture and Agri-Food Canada Regional Office-Guelph

Facilitators:

Steve Sauder - Kayak Consulting

Cobi Sauder - Kayak Consulting

SUMMARY OF KEY OUTPUT

SUMMARY OF KEY OUTPUT

Session participants developed recommendations for the future based upon discussions of key elements/characteristics of successful water monitoring programs from the past and present. Session participants also discussed:

- information/data that is most important to develop knowledge for agricultural stewardship programming in southern Ontario watersheds
- key information/data that is currently available
- key information/data that is currently missing or unavailable

Recommendations

The following theme areas and recommendations were developed by participants to address needs and build upon the successes of past and present water monitoring initiatives. Each recommendation is followed by a rationale to explain why this recommendation is being made.

Consistent Approaches

1. Recognize that stewardship activities may have very local benefits that aren't reflected by end of stream monitoring initiatives. Water quality results don't necessarily indicate stewardship is ineffective.

Rationale:

- If data does not exist, other indicators/measurements can be used. Hope to communicate value of stewardship with 'softer' science where 'hard' science can't contribute

2. Land use and changes to land use need to be measured, quantified and reported when interpreting and assessing water quality data.

Rationale:

- Land use is very closely tied to water quality

3. Consistent approach to water quality data collection and analysis in rural areas. Develop protocols for collection, analysis and reporting of data.

Conservation Ontario, MOE, MNR (integrate in NIRVUS) leading to integrate protocols on the landscape.

Rationale:

- When? 0 – 10 years time frame with potential will - sooner the better!
- To allow data sharing, reduce overlap, scientifically valid, better results of research among many agencies
- Reduce resources needed to obtain quality data



Information transfer/reporting & Proving stewardship can improve water quality with direct links

4. That data be presented to landowners and public through documents, such as watershed report cards, or on-site discussions to increase awareness of stewardship impacts on their watershed. Further, that starting in 2012 all CA's produce watershed report cards using appropriate and available data.

Rationale:

- Reporting to landowners and public

5. That MNR WRIP begin development of a comprehensive website of current and historical water monitoring meta data for sharing among peers

Rationale:

- Supports reporting among peers

Data sharing and availability & Inventory of survey projects

6. Creation of publicly accessible inventory of monitoring programs in Ontario. Contributors - everyone from municipal, provincial, CA's, and federal.

Rationale:

- Inventory includes: abstract, site locations, data types, timelines, partners, and contacts
 - Housed, managed, updated by Conservation Ontario
 - Sooner the better, updated regularly through surveys
 - Required input needs to be concise and simple and not take a long time to submit, otherwise people will not cooperate

8. Notify CA that study is on-going

Rationale:

- CA has handle on monitoring data – everyone calls the CA

7. Everyone must fulfill their "OGDE" agreement and complete the "OLID" registry.

Rationale:

- Already setup and everyone signed agreement



Communication of outcomes

9. Making sure data is able to be used by those who need/interpret it to information. Consult with those interpreting/funding to make sure data is strategic. Consult up front before funding is granted.

Rationale:

- Funders (federal/provincial/municipal governments) of data monitoring programs need to collaborate and consult with each other before requirements are set for monitoring to gain efficiencies and relevance – set common stake standards and repositories
- NLWIS (federal) potentially have funders and resources that could coordinate the consultation - 2009

Communication of relationship/interpretation of data

10. Ensure consistent approaches (i.e. indicators, design, methods). These should be designed provincially across the agencies that are implementing stewardship projects.

Rationale:

- This will allow for local interests and projects to be measured consistently

Clear objectives over short and long term

11. Identify short and long term water quality information requirements at local and provincial scale.

Rationale:

- Consistent and reliable information will be available to address local (site-specific) and provincial objectives

Recommendation on responsibilities

12. Development of a meta database linking involved organizations and information being collected by there organization.

Rationale:

- This would be useful to avoid duplication of efforts and to design new monitoring programs and to identify existing data gaps



Next Steps

Participants worked in small teams to develop a list of potential next steps for moving forward. Their suggestions are listed below:

- Kayak will send report to Conservation Ontario by May 26th
- Reports should go to all participants
- Results should be presented to Conservation Ontario and OMAFRA for adoption (MNR and MOE as well)
- Consider presenting results as a session at the Latornell Conference
- Encourage MOE to commit to long term lab support for PWQMN & PGMN
- Develop an implementation plan from the recommendations:
 - Step 1 - identify agencies monitoring rural watersheds,
 - Step 2 - determine what they are doing and where,
 - Concurrent – determine overall goal for those agencies
- Evaluate the usefulness of this day as an annual meeting



Key Elements/Characteristics for Success

Session participants created lists of key elements/characteristics of a successful water resource monitoring program/project after discussing several success stories. The key elements are listed below and grouped together into categories:

Reporting

- Baseline datasets
- Synthesis and presentation of data in a meaningful way
- Long term data sets
- Watershed report cards
- Effective technical transfer
- Effective data sharing and reporting
- Use of appropriate technology
- Simple and focused
- Data converts to information

Consistency

- Consistent set of water quality parameters
- Consistent, long term monitoring data
- Quality assurance for quantity and quality protocols
- Application/implementation of consistent methods across all partners
- Standardizing approaches, methods, etc.
- Planned, relevant and people friendly indicators to measure success and transfer results to the public
- Regular network review and optimization (confirm objectives), approaches, etc.
- Meta database
- Clear purpose

Partnerships

- Strategic planning days like this session
- Partnerships from government to science to landowners
- Stakeholder involvement
- Fostering meaningful relationships
- Willingness to work with other agencies – share information/partnerships. Avoid 'protecting turf', promote communications.
- Public (landowner) involvement in monitoring purpose and need
- In field people (BMPs, research and small watersheds) working with landowners, useful outcomes/practical, trust and experience

Funding

- Committed resources – monitoring, people, implementation
- Incentives
- Long term funding, commitment, accountability for technical expertise and lab support
- Increased density and frequency of monitoring with site-specific focus
- Account for local differences
- Program flexibility

Water Resource Information Needs

Participants developed lists of information to develop knowledge, currently available information, and currently unavailable information. These lists were prioritized by the participants. The key points are listed below:

Information/data that is most important to develop knowledge and why

Participants developed and prioritized a list of currently available data/information. The following list includes only the top votes and describes why this information is important:

- Baseline data (12 votes)
 - gauge success
 - acts as reference point
- Baseline data, e.g., water quality, chemistry, pathogens, biological, quantity, thermal (10 votes)
 - determine where we are in our efforts
- Current land management practices at large and small scale and location (9 votes)
 - rate of BMP adoption
 - are we encouraging the right practices?
- Biota – integration with physical and chemical (9 votes)
 - this is really what it is all for
- Land use activities (8 votes)
 - property management, behaviours – how they impact efforts
- Cost benefit analysis (6 votes)
- Role of intermittent streams, drains, waterways, and flow paths (5 votes)
 - critical field to stream connection



Key information/data that is currently available (exists vs. available selectively) and why it is key

Participants developed and prioritized a list of currently available data/information. The following list includes only the top votes and describes why this information is important:

- Nutrient Management Monitoring Program (15 votes)
 - 15 watersheds in SW Ontario focus on agricultural watersheds and isolate rural water quality
 - need detailed land use practices information to adequately assess nutrient management
 - may not be small enough to see impacts < 60 km²
- Provincial Groundwater Monitoring Network and Provincial Water Quality Monitoring Network (12 votes)
 - monitor and design new programs
 - long term
 - measures variables most important for ecosystem health
 - no pathogen information is a weakness
- GIS (11 votes)
 - layers available to organize data and geo-reference Natural Resources Information System (NRVIS)
 - allocation of dollars, reduction of overlap
- Ontario Soil and Crop Improvement Association, Environmental Farm Plan Data Base (6 votes)
- PLUARG data/reports (5 votes)
 - some very relevant to today

Key information/data that is currently missing or unavailable and why it is key

Participants developed and prioritized a list of currently unavailable key data/information. The following list includes only the top votes and describes why this information is important:

- One stop shop for timely data sharing (14 votes)
- Field by field cropping, tillage, nutrient application, pesticide application (11 votes)
 - what is really going on within the agricultural lands?
- Changes in today's farming practices and related changes in contaminants, e.g., bio-solids use, tillage practices, cropping practices (9 votes)
 - adjust monitoring practices, parameters for current practices
- Emerging contaminants in rural watersheds, e.g., pesticides, pharmaceuticals (8 votes)
- Cause effect data (7 votes)
 - linking actions to results indicators and BMPs
- Long term loading data for rural stations (5 votes)

SESSION NOTES

SESSION NOTES

Success Stories - Water Resource & Other Monitoring Initiatives

Participants developed a summary of successful water resource and other monitoring initiatives. Current and historical initiatives are listed as captured by participants. This summary was used as thought starters for developing the key elements of successful water resource monitoring initiatives. The summary is not meant to be comprehensive. Initiatives are grouped together for easier reading.

Province-wide

1. Name of program or project: Provincial (Stream) Water Quality Monitoring Network

Data captured: Ambient water quality at over 400 locations across the province - surface water quality (nutrients, suspended solids, chloride, trace metals, other general chemistry)

Benefits derived from the information: Information is being used to develop policies, inform general public and to assess the impact of management actions - long term broad scale monitoring identifies water quality trends, e.g., nutrient trends and issues identified in surface water in agricultural regions across province

Possibilities for optimizing the water resource monitoring information:

- Program dollars could be expanded to monitor small watersheds/fields
- Addition of parameters of current interest (e.g., pathogens, expanded pesticides) to assess provincial trends

Elements for success? Partnership with conservation authorities and provincial government is the key

Priority in relation to other programs listed:

Most Impact/Influence **1** 2 3 4 5 Less Impact/Influence

2. Name of program or project: PGMN

Data captured: Groundwater levels and quantity

Benefits derived from the information:

- Baseline
- Climate change
- Water budget

Possibilities for optimizing the water resource monitoring information:

- More wells
- Standard indicators
- Ministry of Health data

3. Name of program or project: Ontario Stream Assessment Protocol (OSAP) and the Ontario Stream Monitoring Network (OSMN)

Data captured: OSAP is a procedural manual that provides standardized approaches for evaluating a variety of properties in streams. When used by hundreds of people a huge dataset emerges (over 8,000 records to date) that enable groups like OMAFRA to compare a set of specific sites against conditions that others have collected. In other words, you need only worry about collecting your site data (and perhaps filling a few gaps in other areas) and the main task of your study design is achieved. Now instead of having to spend millions of dollars to answer a question you can answer it for thousands or even hundreds (depending on the approaches used).

Benefits derived from the information:

The OSMN is a newly emerging idea that will help coordinate the collection of stream monitoring data across the province and help manage the data. In principle, it will be managed by all the agencies that have a vested interest in monitoring data. Again, by sharing the responsibilities tremendous savings will be generated by all and better still, we will finally be able to answer these burning questions about how our collective efforts are doing at protecting or improving stream health.

Possibilities for optimizing the water resource monitoring information:

This good study design that enables either (ideally both) trends across stations, e.g., all the stations where restoration work is done and trends in time. The study design must insist that similar procedures are used at all sites. This is essential to reduce variance in the datasets.

Need to have a large set of reference sites from which both expected condition can be derived and trends compared, i.e. are the conditions in our restoration sites changing at a different rate than at the reference sites.

4. Name of program or project: PWQMN

Data captured: Quality and concentrations of liquid manure flow to tiles based on different application methods

Benefits derived from the information: Exposed impact of liquid manure in no-till systems – offered creative solutions

Possibilities for optimizing the water resource monitoring information to address:

Requires better reporting to farm community and political level

Elements for success?

- Repeatable
- Widely applicable
- Clear purpose
- Partnership in its operation
 - from government to science to landowners
 - efficient operations
- Communicated

5. Name of program or project: Flood Forecasting

Data captured: Flow and precipitation network

Benefits derived from the information: Flow for loads and rainfall for models

Possibilities for optimizing the water resource monitoring information:

Share data better – combine with others (MTO, Agricorp)

6. Name of program or project: CURB Era Studies – Past work

Data captured: Water chemistry and bacteria in agricultural drains, tile outlets, field/farm runoff, stream sediments, and beach locations

Benefits derived from the information: Many water monitoring studies completed to understand and quantify rural pollution sources of bacteria and phosphorous, bacteria survival, bacterial transport in streams, effects of BMPs on water quality in streams and beaches

Possibilities for optimizing the water resource monitoring information: Follow up summary of useful findings relevant to today

Land-based

7. Name of program or project: Leamington Area Drip Irrigation Association

Data captured: Crop rotation, spatial location, soil type, drainage irrigation practices, and alternative water supplies

Benefits derived from the information: Credibility with regulators in approving project, irrigators knew they were being treated fairly

Possibilities for optimizing the water resource monitoring information:

- Provided that the farmers are willing to work as a group
- The template for collecting the information has been developed
- Strong municipal and producer group support

Elements for success? Farmer to farmer contract, common goal, critical water shortage, (develop and establish trust) lots of stakeholder involvement and long term commitment to communication

Priority in relation to other programs listed:

Most Impact/Influence 1 2 3 **4** 5 Less Impact/Influence

- This affects about 6,000 acres of high value crop land near Leamington

8. Name of program or project: Land Stewardship or OSUEPAP

Data captured: Percentage of crop residue cover, crops, tillage method, and model with LOTS

Benefits derived from the information:

- Showed results of practices – not assured
- Could be incorporated into models

Possibilities for optimizing the water resource monitoring information:

Link to a water quality model to interpret and extrapolate

Elements for success?

Linked to performance measures with farmer benefit and water quality measures

9. Name of program or project: Research for SWEEP – BMP verification - TED
(Technology Evaluation and Development)

Data captured:

- Erosion, runoff and sediment build
- Rainfall simulation 1m x 1m

Benefits derived from the information: Common protocol/independently applied to all separate projects – applies to apples

Possibilities for optimizing the water resource monitoring information:

Produced efficiently that can be used in water quality models

Elements for success?

- Led by one organization
- Farmers could see side by side
- Useful for technology transfer

Nutrient-based

10. Name of program or project: Nutrient Monitoring Program

Data captured: Enhanced monitoring in 15 small agricultural watersheds

Benefits derived from the information:

Water quality condition in agricultural watershed

Possibilities for optimizing the water resource monitoring information:

Extending the work to more watersheds and at small areas

11. Name of program or project: Agriculture Canada Manure Study

Data captured: Quantity and concentrations of liquid manure flow to tiles based on different application methods

Benefits derived from the information:

Exposed impact of liquid manure in no-till systems – offered creative solutions

Possibilities for optimizing the water resource monitoring information:

Requires better reporting to farm community and political level

Elements for success?

- Repeatable
- Widely applicable
- Clear purpose
- Partnership in its operation from government to science to landowners, efficient operations
- Communicated

12. Name of program or project: National Agri-Environmental Standards Initiative

Data captured: Nutrients, benthic invertebrates, algae discharge

Benefits derived from the information: Nutrient targets for small rural streams across Canada; related water quality to Biota

Possibilities for optimizing the water resource monitoring information: Project monitored small streams not usually included in monitoring networks – allows for identification of areas to target stewardship actions

Elements for success?

- Application of consistent methods across several provinces
- Access to provincial monitoring data (long term)

13. Name of program or project: Manure Study

Data captured: Bacteria and Nutrients

Benefits derived from the information:

Impact of farming practices on nutrient movement

Possibilities for optimizing the water resource monitoring information:

Preferential flow

Elements for success?

- Devoted staff
- Relationships
- Funding – lab access
- Communications
- Proximity to site
- Technical expertise

14. Name of program or project: Nutrient Management Joint Research Project

Data captured:

- Rainfall, runoff and tile flow rates, Nitrogen, Phosphorus and sediment concentrations and loading, from 4 field scale plots (15m x 35m each); 3 with conservation tillage, broadcast manure on corn and 1 with no-till, injected manure
- Movement of sediment and nutrients overland through tile and to groundwater as affected by surface inlets and manure management

Benefits derived from the information:

- Effect of different management (conservation tillage and broadcast manure versus no-till and injected manure) and drain types (French drain vs. hickenbottom) on water quality
- Inform best management practices

Possibilities for optimizing the water resource monitoring information:

- How to accurately measure over winter and spring freeze thaw and flooding, quantity value of conservation till
- Quantify value of conservation till, translate to Phosphorus index; potential residue cover programs

Elements for success? Link land and water, larger scale

15. Name of program or project: GAPs (AAFC)

Data captured: Risk of contaminants in ground and surface waters from land application of manure and municipal waste

Benefits derived from the information: Identify appropriate land application methods and determine relative pollution risk. Inform provincial nutrient management regulations.

Possibilities for optimizing the water resource monitoring information: Develop risk assessment models incorporating land application methods

Watershed-based

16. Name of program or project: Watershed Report Cards (communication product for integrated monitoring)

Data captured: Grading system for phosphorus, benthic invertebrates, e.coli, forest cover, forest interior. Also reports other surface water quality data, fish data, species at risk, riparian cover, spills, dams/barriers, tiles/drainage, stream flow, soil erosion, soil type, and land use

Benefits derived from the information: Reporting on the 28 watersheds of the Upper Thames River watershed every 5 years. Comprehensive watershed information reported succinctly for public and stakeholders to educate and motivate action. Includes watershed features, action plan, and progress made

Possibilities for optimizing the water resource monitoring information: Currently document stewardship progress over 5 year period through UTRCA partner programs. Next time assess other stewardship work. Report on additional agricultural parameters/information, e.g., pesticides, change in livestock/other practices

17. Name of program or project: Pesticide monitoring program

Data captured: Limited monitoring of pesticide in selected (~20) watersheds

Benefits derived from the information: Pesticide concentration in agricultural watersheds

Possibilities for optimizing the water resource monitoring information: Extend monitoring to more areas

18. Name of program or project: CVC Integrated Watershed Monitoring Program (CA Sub-watershed Studies and Monitoring Stewardship Effectiveness)
– Future planned project - Ongoing

Data captured: Surface and groundwater temperature, flow, benthic, fisheries, terrestrial (wetland, woodland, riparian), fluvial geomorphology, hydrology, meteorology; Characterization – Impact Analysis – Implementation – Stewardship

Benefits derived from the information:

- Long term watershed scale monitoring, detecting temporal and spatial trends
- Existing – limited by lack of tying monitoring to stewardship activities
- Future – to evaluate stewardship

Possibilities for optimizing the water resource monitoring information:

- Addition of parameters, refining/adding locations
- Setting priority areas for restoration/stewardship
- Actually implementing stewardship
- Assessing – targets for future work, what worked/didn't
- Using existing monitoring data and stewardship locations – look at it differently

Elements for success? Long term data, numerous locations, integrated multi-scale (watershed, sub-watershed, catchments, property) consistent set of WQ parameters, stakeholder involvement

19. Name of program or project: Riverwatch Community Monitoring Program

Data captured: Local landowners (volunteers) use water chemistry kits to track long term changes in river health

Benefits derived from the information:

- Good educational tool
- Some data captured, although accuracy questionable

Possibilities for optimizing the water resource monitoring information:

- Better equipment, additional equipment
- Grab samples to analyze in lab and calibrate kits

Elements for success?

- Lead time - pre and post monitoring
- Good communication of results
- Obvious benefits

20. Name of program or project: Sediment Survey - Past

Data captured: Sediment loads in monitored watercourses

Benefits derived from the information: Determine if efforts to reduce soil erosion/sedimentation are successful

Possibilities for optimizing the water resource monitoring information: Target watersheds where increased focus in stream bank/field erosion control is needed

21. Name of program or project: PLUARG (long-term sub-basin monitoring)
- Past, with limited work in present

Data captured: Range of agricultural information, e.g., erosion, cropping, water quality on "representative" watersheds across the province

Benefits derived from the information: Identify BMPs needed, source of contaminant loadings (delivery areas/targeting)

Possibilities for optimizing the water resource monitoring information: Long-term watershed demonstration to assess BMP impacts in a watershed context. Give an idea of what is realistically possible in an agricultural setting if full implementation of BMPs was achieved

22. Name of program or project: Joint Soil and Water Conservation Program
- Past

Data captured: Techniques for optimizing BMPs for Ontario applications
- Field/management practice specific (e.g., how to improve yields using no-till practices)

Top use or benefits derived from the information:

- Landowners apply learning to implement on their land base
- BMPs are implemented with greater degree of success

Possibilities for optimizing the water resource monitoring information: Add efforts to improve water use efficiency, and incorporate energy/biomass crops to double as erosion control measures

23. Name of program or project: Adopt a Watershed 40 km²

Available monitoring:

- Other programs and PWQMN
- ABCA enhanced
- Zurich Drain Adopt a Watershed
- Hobbs McKenzie Drain
- Historical CURB

Data captured:

- Water Quality – nutrients, sediment, bacteria
- Benthic

Benefits derived from the information:

- Encourage BMP use
- Test effectiveness of BMPs at watershed scale

Possibilities for optimizing the water resource monitoring information:

Increased number of sampling sites to measure BMPs

Elements for success? Community involvement

Priority in relation to other programs listed:

In comparison to PWQMN

Most Impact/Influence	1	2	3	4	5	Less Impact/Influence
-----------------------	---	---	----------	---	---	-----------------------

- In comparison to broad watershed

Most Impact/Influence	1	2	3	4	5	Less Impact/Influence
-----------------------	----------	---	---	---	---	-----------------------

- To site scale

- Unavailable information – need more bacteria data and more locations
- Water resources for success – needs to adapt to local situations

24. Name of program or project: ACLA Stream Testing

Data captured: Surface water quality (e-coli, NO₃, TP)

Benefits derived from the information: Information on small watershed – all Agricultural land, frequency samples

Possibilities for optimizing the water resource monitoring information: Combine with agricultural surveys and OMAFRA

25. Name of program or project: GSCA Benthic Monitoring

Data captured: Qualitative benthic sampling and identification to genus/species (BioMAP)

Benefits derived from the information: Long term monitoring – sensitive to thermal conditions

Possibilities for optimizing the water resource monitoring information:

- All benthic monitoring should identify to lowest practical taxonomic level – keys need to be made available for species level identification.
- BioMAP scoring can reflect thermal conditions in stream and creeks and the presents/absence of toxins/groups can reflect other impairments i.e. DO (organic enrichment)

26. Name of program or project: Green Cover Buffer Program

Data captured: Invertebrates, electro fishing, photo referencing, basic physical parameters & green line information

Benefits derived from the information: Repeatable and easily collected information that allows long-term comparisons

Possibilities for optimizing the water resource monitoring information:

The data is pretty coarse. Some more fine scale data like temperature profiles and repeated invertebrates/fish to eliminate short term bias may be more useful, but more expensive.

Elements for success?

- Repeatable, widely applicable
- Clear focus and direction/purpose
- Partnerships and community buy in
- Use a variety of easily measurable visible parameters
- Swimmable, fishable – relate to public
- Scientifically relevant and can be explained to public
- Transferable knowledge relevant to public
- Decision maker info – needs to show results

27. Name of program or project: WEBs: Watershed Evaluation of Better Management Practices (AAFC)

Data captured: Data pertaining to efficacy, at watershed scales, of tile drainage management BMPs and stream restriction BMPs with respect to pasturing cattle

Benefits derived from the information: Information to support producer buy in, inform cost share program efforts, assess impact broadly on surface water quality given climate change.

Possibilities for optimizing the water resource monitoring information: Broaden modelling efforts for larger watershed systems

28. Name of program or project: National Water Quality Surveillance Program (AAFC, HC, EC)

Data captured: Nature of bacteria, parasites in surface water and microbial source tracking

Benefits derived from the information: Identify fecal source and methods to target appropriate risk management practices

Possibilities for optimizing the water resource monitoring information: Address other emerging pathogens and correlate source tracking methods

29. Name of program or project: Sydenham River Recovery

Data captured: Surface water and tile water -nutrients, solids in selected sub water sheds

Benefits derived from the information: Target program resources to most effective measures for minimizing sediment and nutrient movement

30. Name of program or project: GSCA Baseflow monitoring

Data captured: Sites visited during baseflow/dry weather conditions – description of flow noted i.e. good, some, dry, etc. as well as clarity

Benefits derived from the information: Extremely valuable for planning and permit review – do not trust proponent information

Possibilities for optimizing the water resource monitoring information: May help to understand baseflow conditions and optimize project selection that will have the greatest impact, i.e. high baseflow vs. weak baseflow

31. Name of program or project: GSCA Thermal monitoring

Data captured: Maximum daily water temperatures during baseflow/dry weather conditions

Benefits derived from the information: Thermal classification – defends planning decisions where there is not fisheries plan, long term watershed monitoring (can be very site specific)

Possibilities for optimizing the water resource monitoring information: Identifying areas of rapid temperature increase helps to identify areas of greatest need for riparian protection

Subwatershed-based

32. Name of program or project: Cryptosporidium in Surface Water

Data captured: Cryptosporidium and Giardia

Benefits derived from the information:

Impact of land use on crypt in surface water

33. Name of program or project: P.H.D. Evaluating Monitoring Programs

Data captured: Remote sensing GIS geology, stream networks, and human stress-or data

Benefits derived from the information: Selecting reference sites for biomonitoring

Possibilities for optimizing the water resource monitoring information:

N/A – Project aimed to managers with an objectively defined reference site that can detect changes and test your rehabilitation

Elements for success? N/A – Make sure you are comparing biological communities from appropriate habitat

34. Name of program or project: Subwatershed Studies - Future

Data captured: Surface water quality, water temp, benthics, fisheries, terrestrial (woodland), fluvial geomorphology, hydrology, meteorology

Benefits derived from the information: Working with subwatershed scale recommendations, landowner basis

Possibilities for optimizing the water resource monitoring information: Examine recommendations for restoration/stewardship in light of current monitoring, and future stewardship plans

35. Name of program or project: Biomonitoring

Data captured: Biological condition of stream compared to reference/control

Benefits derived from the information: Identifies changes in biological community due to stress but difficult to determine cause

Possibilities for optimizing the water resource monitoring information: Couple biological data with temperature and dissolved oxygen information

Elements for success?

- Lead time - pre and post monitoring
- Good communication of results
- Obvious benefits

36. Name of program or project: Kintore Creek Paired Watershed Project – Past work

Data captured:

- Multi year/multi agency paired study. Extensive monitoring of tributaries/ drains for: water chemistry, bacteria, pesticides, stream flow, landowner cropping practices and inputs
- Q, TP, SS - 200 samples/yr/site, base and event based monitoring – demonstration vs. control subwatershed

Benefits derived from the information: Years of monitoring and field and plot scale research developed understanding of pollution sources, pollution pathways, effects of soil conservation practices, manure management, approaches to landowner stewardship uptake – attempt to quantify subwatershed benefits of stewardship

Possibilities for optimizing the water resource monitoring information:

- Accessing and reporting of historic data and reports from Kintore watershed study would be valuable – summary of key findings
- Data needs to be reviewed by dedicated staff – failure was in analysis and reporting

Elements for success?

- Respectable
- Widely applicable
- Clear purpose
- Partnership in its operation
 - from government to science to landowners
 - efficient operations
- Communicated

37. Name of program or project: Fletchers Creek and Effectiveness Monitoring Programs - Ongoing

Data captured: Surface and groundwater quality, water temperature, benthic, fisheries, terrestrial (woodland), fluvial geomorphology, hydrology, meteorology

Benefits derived from the information: Long term subwatershed and catchment scale monitoring, covering agricultural/ developing/ and developed land uses on warm/ cool and cold water systems

Possibilities for optimizing the water resource monitoring information: Addition of parameters, refining/adding locations

38. Name of program or project: Embro Watershed Study

Data captured:

- Extensive water sampling of drain and all tile outlets to drain
- Survey/assessment of all 15 farms/homes in watershed
- Dye testing to trace/confirm pollution sources

Benefits derived from the information:

- Multi year study of small agricultural watershed with initial nutrient and bacteria contamination
- Working with all 15 landowners identified all main pollution sources
- Remedial projects (OSCEPAP for agriculture) completed for manure (2), milk house (2) and septic sources (3)
- Monitoring following remedial work documents major improvements

Possibilities for optimizing the water resource monitoring information:

- Could revisit site for following study (15 years later)
- Communication of study

39. Name of program or project: Temperature Monitoring of Small Streams

Data captured: Seasonal temperature profiles using data loggers

Benefits derived from the information: Can examine temperature changes through a system very effectively to identify hotspots

Possibilities for optimizing the water resource monitoring information:

Used alone these provide only part of the health picture of a stream, but a great indicator

Elements for success?

- Repeatable, widely applicable
- Clear focus and direction/purpose
- Partnerships and community buy in
- Use a variety of easily measurable visible parameters
- Swimmable, dunkable, fishable – relate to public
- Scientifically relevant and can be explained to public
- Transferable knowledge relevant to public
- Decision maker info – needs to show results

40. Name of program or project: Impact Monitoring - Ongoing

Data captured: Surface water quality, water temperature, benthic, fisheries, terrestrial (woodland), fluvial geomorphology, hydrology, meteorology

Benefits derived from the information: Long term subwatershed, catchment and site-specific monitoring related to retrofit/restoration locations in urban creeks draining to Lake Ontario (will expand to other urban centres in watershed)

Possibilities for optimizing the water resource monitoring information: Addition of parameters, refining/adding locations

41. Name of program or project: Electrofishing Grand River Tailwater

Data captured:

Electrofishing the main stem of the Grand River and Conestoga River

Benefits derived from the information:

This really helps more with the fish community issues versus stream health but it can identify the "level of success" of an indicator species

Possibilities for optimizing the water resource monitoring information:

The details are not covered with this type of study. It can simply tell you if the system is supporting a particular target species. No real answers provided when the numbers are poor.

Elements for success?

- Repeatable, widely applicable
- Clear focus and direction/purpose
- Partnerships and community buy in
- Use a variety of easily measurable visible parameters
- Swimmable, dunkable, fishable – relate to public
- Scientifically relevant and can be explained to public
- Transferable knowledge relevant to public
- Decision maker info – needs to show results

42. Name of program or project: Historic Stewardship Activities and Monitoring Effectiveness – Near future

Data captured: new

Benefits derived from the information:

Watershed, subwatershed and catchment scale plans

Possibilities for optimizing the water resource monitoring information:

Map old projects with current monitoring, assess change, and add sampling

Water Resource Information Needs

Participants developed lists of information to develop knowledge, currently available information, and currently unavailable information. These lists have been categorized under baseline data, land use data, and data sharing.

Information/data to develop knowledge and why is it most important

Baseline Data

- Baseline data (12 votes)
 - gauge success
 - reference point
- Baseline data, e.g., water quality, chemistry, pathogens, biological, quantity, thermal (10 votes)
 - determine where we are in our efforts
- Biota – integration with physical and chemical (9 votes)
 - this is really what it is all for
- Master matrix for how we would monitor the province (4 votes)
- Geomatics (4 votes)
 - where what is happening
- Links to health, e.g., human and ecosystem (3 votes)
- Hydrological data, hydrography – flows, loads (3 votes)
 - understand the system
 - know your conceptual model, how the watershed works
 - design monitoring system/program and direct stewardship efforts
- How can we make intensive pilot small scale projects inform watershed scale improvements? (2 votes)
 - generate database that is long term
 - data that indicates when and where contaminants are being transported for implementing effective programs
- Ambient
 - sum total of impacts on watershed and within watersheds
 - long term, spatial
- Right now we offer voluntary BMPs and we hope to see water quality improvements at watershed scale. We need to provide more targeted BMPs and monitor their effect and keep track of this information
 - use biotic metrics, refine and cross calibrate physio-chemical objectives
- Physiography & surficial geology
 - determines what are the constraints

Land Use Data

- Current land management practices at large and small scale and location (9 votes)
 - rate of BMP adoption
 - are we encouraging the right practices?
- Land Use Activities (8 votes)
 - property management, behaviours – how they impact efforts
- Role of intermittent streams, drains waterways, and flow paths (5 votes)
 - critical field to stream connection

Session Notes

- Quantify upstream effects when stewardship is undertaken – maybe by using air photos, stewardship may be masked (2 votes)
- Research-based (1 vote)
 - addressing new issues at farm/plot scale
- Set standards for land classification
- More targeted BMPs that are monitored
- Land use changes, e.g., farm uses
 - macro drivers

Data Sharing

- Cost benefit analysis (6 votes)
- Interagency data sharing (3 votes)
 - need it to move forward and not repeat ourselves
- Historical information and knowledge (3 votes)
 - need access to it or the same thing will be repeated
 - what key parameters to follow
- Goals for reduction for current Great Lakes needs, e.g., tones Phosphorus reduction needed (2 votes)
- Document long term implementation of stewardship after program ends (2 votes)
- Goals for reduction for current Great Lakes needs, e.g., tones Phosphorus reduction needed (2 votes)
- In-house and eventually interagency exchange of water quality site and stewardship activities (1 vote)
- Evaluate your program at the relevant scale (1 vote)
 - we are currently using number of BMPs and large scale monitoring may be needed to look at smaller scale sites/small watersheds and relevant BMPs

Information/data that is currently available (exists vs. available selectively) and why is it important

Baseline Data

- Provincial Groundwater Monitoring Network and Provincial Water Quality Monitoring Network (12 votes)
 - monitor and design new programs
 - long term
 - measures variables most important for ecosystem health
 - no pathogen information is a weakness
- Great Lakes Near Shore Monitoring (4 votes)
- Historical databases (3 votes)
 - for comparisons over time
- N & P & surface water (3 votes)
 - need to see changes over time
- MET data – water flow, level, discharge (3 votes)
 - provides context
 - provides mechanism to populate models
 - builds conceptual models
 - demonstrates imports, trends
 - explanatory variables

- Fish population data (2 votes)
 - biological indicator of health
 - may not be widely available
- Agriculture Drains Classification (1 vote)
- HYDAT, flow and sediment (1 vote)
- Thermal monitoring (1 vote)
- DWSP water budgets, AVSWAT (1 vote)
- CANSIS – NLWIS, high potential (1 vote)
- Terrestrial data, conservation authority scale sporadic
- Specific styles of satellite data, e.g., LOTS
- TMDL approach
- Ministry of the Environment EMRB
- DEM modeling
- Benthic information
 - locations of Best Management Practices
- Ontario Geological Society
 - surface geology, fisheries data
- Urban tributary Programs
 - urban information
- Specific conservation authority monitoring
 - may be more rurally focused
 - site specific, long term

Land-use

- Nutrient Management Monitoring Program (15 votes)
 - 15 watersheds in SW Ontario focus on agricultural watersheds and isolate rural water quality
 - need detailed land use practices information to adequately assess nutrient management
 - may not be small enough to see impacts < 60 km²
- Ontario Soil and Crop Improvement Association, Environmental Farm Plan Data Base (6 votes)
- PLUARG data/reports (5 votes)
 - some very relevant to today
- Drainage, soils (3 votes)
- Pesticide use

Data Sharing

- GIS (11 votes)
 - layers available to organize data and geo-reference Natural Resources Information System (NRVIS) free?
 - allocation of dollars, reduction of overlap
- Census data (4 votes)
- Aerial photography, satellite imagery (3 votes)
- Official Plans, growth scenarios

Session Notes

Key information/data that is currently missing or unavailable and why it would it be important

Baseline Data

- Cause effect data (7 votes)
 - linking actions to results indicators and BMPs
- Early spring data (3 votes)
- Bacteria data for surface water (3 votes)
- MDH/health units well sampling data (privacy issues) (2 votes)
- River nutrient loading (2 votes)
- Density of programs (2 votes)
- Climate Change impacts (2 votes)
 - we are not relating and analyzing temperature, streamflow, rainfall to environmental benefits
- Stream flows of smaller watercourses
 - nitrate movement
- Groundwater quality ambient
- Bio-monitoring data of drains and streams, e.g., fish, benthic, algae that is shared
- Accurate soil hydraulic information
 - understand changes on monitored streams
- Spatially accurate stream network

Land Use

- Field by field cropping, tillage, nutrient application, pesticide application (11 votes)
 - what is really going on within the agricultural lands?
- Changes in today's farming practices and related changes in contaminants, e.g., bio-solids use, tillage practices, cropping practices (9 votes)
 - adjust monitoring practices, parameters for current practices
- Emerging contaminants in rural watersheds, e.g., pesticides, pharmaceuticals (8 votes)
 - contaminants such as veterinary pharmaceuticals, agricultural pesticides
 - unknown impacts for agriculture, human health
- Long term loading data for rural stations (5 votes)
- Sediment loading data – is it available? Are we relating to BMP activities on the ground? (1 vote)
- Water quality for production and on-farm food safety, e.g., irrigation, herd health
- State of the pastureland in Ontario, e.g., stocking density, access to surface water
- Proximity of manure storages to water flow pathways, surface water

Data Sharing

- One stop shop for timely data sharing (14 votes)
- Need direct monitoring of stewardship projects (2 votes)
- Flow, concentration at 500-1000 ha. scale (2 votes)
 - GIS accuracy not up to date (2 votes)
- Information on small systems, e.g., flow, quality, aquatic species, temperature (2 votes)
 - location where agriculture impacts start
- Standardized stream flow data (1 vote)
- Ability to integrate existing and future data (1 vote)
- Pathogen monitoring standards, indicators, e.g., salmonella, e.coli (1 vote)
 - public health, analytical techniques
- Data, information on agricultural stewardship practices or lack of practices (1 vote)
- No standardized protocols for bio-monitoring
 - may be more cost effective
- Maps of water taking sites (privacy issues)
- Map of nitrate exceedances
- Map of centre pivots
- Micro-biological parameters – are they available?

Recommendation of Theme Areas

Participants developed ten potential theme areas for building recommendations. The suggested themes for recommendations are:

1. Consistent approaches
2. Information transfer/reporting
3. Proving stewardship can improve water quality with direct links
4. Data sharing and availability
5. Inventory of survey projects
6. Communication of outcomes
7. Communication of relationship/interpretation of data
8. Clear objectives over short and long term
9. Recommendations on responsibilities
10. Long term funding

Evaluation

Participants were asked to write down '2 things you liked about the May 15th session'. Listed below are the comments grouped by similar responses:

Format

- Identified issues for resolution
- Highlighted importance of watershed reporting
- Opportunity to hear what others are doing and interested in
- Diverse group meeting at a wonderful place and discussing an important topic
- Learned something
- Low pressure for participating/speaking
- Format
- Great ideas and conversation
- Open discussion
- Excellent way of participation
- Fast pace
- Good thought process
- Dialogue amongst various 'disciplines' and agencies
- Recognition of link between stewardship and monitoring
- 'Open' discussions
- Good ideas were put forward
- Participation in the meeting by everyone

Interaction

- Small size of group
- Good integration of variety of people
- Interaction – feel for what others are doing and what their needs are
- Excellent facilitator
- Sharing ideas
- Meeting people
- Small group discussions
- Great group discussions
- Cooperative atmosphere
- Meeting peers
- Information exchange
- Interaction networking
- Information exchange
- Good opportunity to network

Facility/Setting

- Food ++
- Weather – nice day
- Location and food
- Good food and ambiance
- Location and facilitation
- Great facility
- Location, facilities, food, facilitators, ideas shared, potential future actions
- Ambiance
- Venue and size of workshop

Participants

- Broad range of agencies
- Comprehensive view of monitoring role in stewardship reporting
- Common interests/concerns and agreement
- Good diverse group of people (not the same faces)
- Diverse group
- Good mix of demographics
- Good cross-section of water professionals
- Inter-agency participation

Participants were also asked to write '2 things that they hope will become reality from the May 15th session'. Listed below are the comments grouped by similar responses:

Data Sharing

- Posting of all studies and data somewhere
- All agencies understand how important it is to have data organized and geo-referenced
- Increased collaboration and data sharing intra – and inter-agency
- Lists of monitoring projects and program on CO website
- More shared data
- Would like to see a central IM system for consistent data collection and reporting
- Information from all sources can come together to reduce overlap
- Meta database/website for sharing information
- Registry of data bases
- Better use of LIO – Land Inventory Ontario
- Data transfer to L/O and practitioners from monitors
- On line water report database
- To see more data-sharing

Suggested Actions

- Change/action – any improvement
- Development of an effective monitoring program to support e.g., BMP practices and prove they work
- Cooperative approach to problem solving
- Concrete progress on developing integrated monitoring
- Monitoring improved for smaller and watersheds 500 ha – spray time
- Improved understanding of impacts of BMPs on water quality
- Improved/enhanced stewardship program design and effective targeting of resources
- More government commitment for monitoring
- Increased uptake of stewardship programs
- Recommendations are considered
- Additional cost benefit analysis
- That we will draw closer links between stewardship and improved water quality
- Set up detailed monitoring at several BMP/stewardship sites to show case projects/WQ improvements
- More understanding of tile drain impacts and role to make stewardship water quality improvements

Networking

- Further network opportunities
- Shared experiences regarding measuring impacts of BMPs
- Coordinate between stewardship (land) and monitoring (water) people
- Communication between organizations
- Annual meeting of same group
- Improved cooperation and communication among peers to increase monitoring
- Good format for communicating monitoring stewardship
- CA-wide communication between monitoring and stewardship efforts
- A session at Latornell
- More dialogue
- The initiative continues
- Better communication by all involved
- Further interaction amongst partners present today and future meetings with additional partners not present
- Politician never question the importance of stewardship projects

Consistency

- More consistent and effective water monitoring
- Consistent reporting and availability of information
- Consistent approach is developed
- More standardized approach to evaluating BMPs, etc.

CONTACT INFORMATION

KAYAK Consulting

Steve Sauder
Cobi Sauder
RR #2 St. Marys, ON, N4X 1C5
tel. 519.349.2889
toll free 866.kayak55
fax 519.349.2891
email steve@kayakconsulting.ca
cobi@kayakconsulting.ca
website www.kayakconsulting.ca