Ontario

AN EVALUATION OF

Watershed Management in Ontario

FINAL REPORT

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1997

Submitted by the:

Watershed Planning Implementation
Project Management Committee (PMC)

Ontario Ministry of Environment and Energy (MOEE)
Ontario Ministry of Natural Resources (MNR)
Ontario Ministry of Municipal Affairs and Housing (MMAH)
Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
Association of Municipalities of Ontario (AMO)
Association of Conservation Authorities of Ontario (ACAO)

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FINAL REPORT

1. INTRODUCTION

This final report completes the Watershed Management Initiative evaluation project. The report *A Preliminary Evaluation of the Watershed Management Initiative* was prepared and submitted to the Provincial Steering Committee for consideration to determine the future role of the Province in watershed management in January 1996. A more detailed account of the evaluation framework and the findings and observations resulting from the evaluation may be found in the following four reports:

- *Watershed Planning Initiative Evaluation Plan* (October 1994);
- *Final Report of the Watershed Planning Initiative Science and Technology Task Group* (April 1995);
- *Report of the Watershed Planning Initiative Coordination, Resources and Effectiveness Task Group* (August 1995); and,
- *Final Report of the Watershed Planning Initiative Relevance and Responsiveness Task Team* (December 1995).

The evaluation was undertaken by a Watershed Planning Implementation Project Management Committee with representation from the Ministries of Environment and Energy; Natural Resources; Municipal Affairs and Housing; Agriculture, Food and Rural Affairs; the Association of Conservation Authorities of Ontario; and the Association of Municipalities of Ontario. The project began June 1993 with the release by the Ministers of Environment and Energy and Natural Resources of three Guidance Documents, entitled:

- *Water Management on a Watershed Basis: Implementing an Ecosystem Approach*;
- *Subwatershed Planning*; and,
- *Integrating Water Management Objectives into Municipal Planning Documents*.

Three Task Groups were created to assess:

- the use of the concepts and suggested approaches contained in the Guidance Documents;
- the evolving practice and application of watershed and subwatershed management in general; and,
- experience of participants in the seven designated pilot watershed/subwatershed management projects.

The current status and directions of science and technology in watershed management were determined from:

- the personal experiences of the Task Group members, each knowledgeable and experienced in one or more of the scientific components of watershed management;
- the opinions of invited experts in the science of watershed management; and,
- an extensive peer review of the draft report.

The processes and practices of watershed management were examined through:

- the views and experiences of representatives from key stakeholder agencies and associations; and,
- the experiences of participants working on the seven pilot projects.

Throughout this report, the word "stakeholders" refers to the former group and the word "participants" refers to the latter group.

At the time the evaluation was undertaken, the participants in the pilot projects were in the early phases of watershed/subwatershed management studies leading up to the preparation of the watershed management plan. Therefore, their views concerning later phases of plan development, implementation and benefits were largely based on anticipated results only. Some components of the evaluation were extended beyond the pilot project experience by drawing on the knowledge and experiences of Task Group members and others involved in a number of watershed or subwatershed studies which have recently been completed and have moved into implementation. This final evaluation report includes input received from stakeholders attending the third and final Watershed Management Forum held June 6, 1996.

2. THE NEED FOR WATERSHED MANAGEMENT

Definitions of "watershed" and "watershed management" were considered and are provided here to establish a common basis regarding the geographical setting and scope of issues and activities that may be included in watershed management.

What is a watershed?

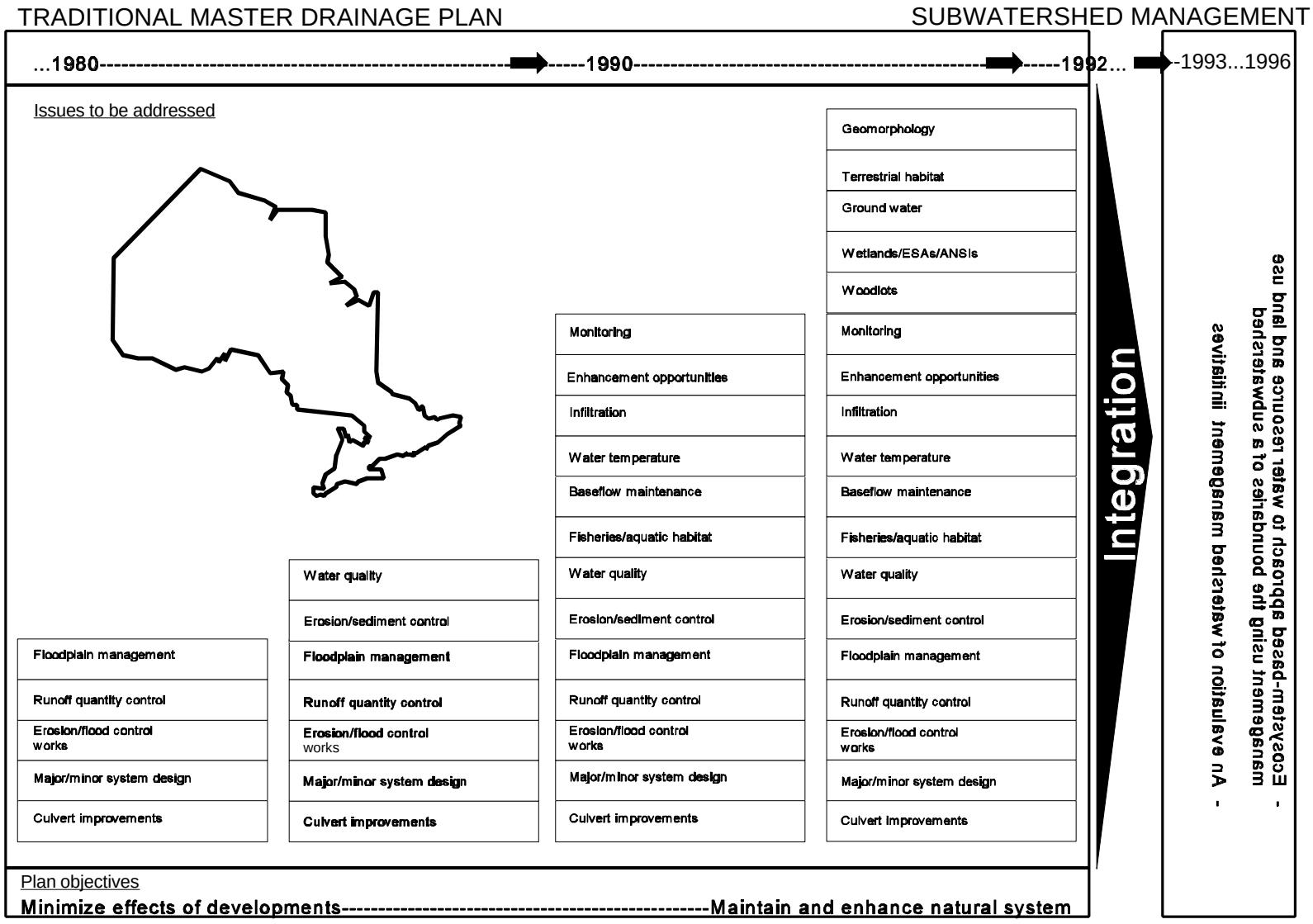
A watershed refers to the entire catchment area, both land and water, drained by a watercourse and its tributaries. A subwatershed refers to the catchment area drained by an individual tributary to the main watercourse.

What is watershed management?

Watershed management is a process of managing human activities in an area defined by watershed boundaries in order to protect and rehabilitate land and water, and associated aquatic and terrestrial resources, while recognizing the benefits of orderly growth and development. The goal is to contribute to the environmental, social and economic well-being of the area on a sustainable basis. Watershed management is a tool to assist land and water use decision makers. There are four phases: 1) issue identification and data gathering; 2) analysis and planning; 3) implementation; and, 4) monitoring. It should be emphasized that monitoring does not conclude the process, but rather initiates the beginning of understanding of the subwatershed, for which the plans should be updated over time.

In Ontario, the practice of watershed management has evolved over the last decade to become more comprehensive by integrating and addressing a broader range of resource and environmental protection issues and to more thoroughly evaluate the important linkages between land and water, between surface and groundwater and between water quality and water quantity. Figure 1 illustrates the evolution of watershed management in Ontario.

Figure 1: Evolution of Watershed Management



Is watershed management needed?

The evaluation concluded that watershed management is needed. Watershed management is necessary for the sustainable protection of natural resources and environmental health. Watershed management, which recognizes the hydrologic (water) cycle as the pathway that integrates physical, chemical and biological processes, is an important approach to achieving the goal of a sustainable environment, and is the tool to implement an ecosystem-based management strategy.

Most of the elements of watershed management are supported by the Provincial Policy Statement (PPS) and the *Planning Act*, R.S.O. 1990, c.P13 as amended. The PPS encourages municipalities to adopt efficient, cost-effective development and land use patterns in planning for community growth. Specifically, Policy 1.1.1.(e) encourages a coordinated approach to deal with issues that cross municipal boundaries including ecosystem and watershed related issues. Several Ontario municipalities, including the Cities of Waterloo, Guelph and London, have already adopted or are in a process of adopting requirements for ecosystem-based watershed management.

Stakeholders and participants endorsed the concept of watershed management as a comprehensive tool for planning for water and land uses in relation to the environmental, economic and social well-being of the communities within a watershed. A watershed may cross several political boundaries. Recommendations for improving the practice of watershed management were made by stakeholders and participants and are documented in Section 5.

Stakeholders and participants cautioned against duplicating other planning processes. Some suggested that an intensive watershed management approach is not universally required and that existing mechanisms or land based planning approaches may be more suitably used. As well, they stressed the need and importance of carrying out the implementation phases of watershed management.

Generally, stakeholders and participants supported the voluntary initiation of watershed management studies by conservation authorities or municipalities rather than provincially mandated watershed management except in the following circumstances:

- when development pressure was likely to degrade water quality/quantity or aquatic life;
- when there was an urgent threat to water resource sustainability; and,
- when there was existing environmental degradation and a pressing need for rehabilitation or restoration.

3. WHY IS WATERSHED MANAGEMENT INITIATED AND BY WHOM?

Watershed management projects are usually initiated in response to issues and concerns around existing environmental health, proposed land use practices, land use management or redevelopment/restoration demands. The evaluation concluded that projects are usually initiated in one or any combination of the following six ways:

- by a conservation authority as part of its mandate under the Conservation Authorities Act, as input to official plans and resource management programs, or to protect particularly sensitive environments;
- by a municipality or adjacent municipalities to address environmental protection

components in official plans related to or because of proposed land use change;
- by a developer landowner, or group of developers as a precursor to the subdivision approval process, commonly at the request of a commenting or approval agency;
- by a provincial agency in fulfilling its mandate to protect resources and preserve the environment;
- by a federal program for the designation of heritage rivers; and,
- in the future, through locally initiated, community driven activities.

Figures 2 and 3 identify the location of watershed projects commenced across the province since 1990. A corresponding inventory of these projects is included in Appendix 1. For the period 1990 to 1995, a recent inventory, July 1996, indicates that 86 watershed and subwatershed projects were begun, of which 55 watershed and subwatershed plans have been completed. The watershed and subwatershed projects were generally driven by any or all of the following:
- environmental resources - a larger scale strategy emphasizing environmental protection and management, eg. Nottawasaga Watershed Study, Moose River Environmental Information Partnership;
- land use changes - input to designate new land uses or input to alternatives for management of already designated, but not yet developed, land uses, eg. Waterloo and London areas or management of recreational lakes including lake trout lakes;
- land use management - input to new management applications and practices of already present land use types, eg. Maitland Valley Ecosystem Health Project; and,
- redevelopment/restoration - input to habitat restoration, pollution abatement or environmental enhancement options eg. Don River Watershed Plan.

4. WHO ARE THE STAKEHOLDERS AND WHAT ARE THEIR NEEDS?

The stakeholders were classified into four categories:

i) **Government Agencies**:
Officials and technical staff from local (including the conservation authority and municipality), provincial and federal agencies. This group included local elected officials, seen to be the key decision makers who were influential in the acceptance and implementation of a plan.

Needs: To prepare realistic and achievable long term resource management plans; protect, enhance, and restore fish and other aquatic resources; protect water quality and quantity, their uses and function; develop private and municipal water and sewage services; identify future development opportunities; land management activities; identify and protect wetlands; work in cooperation with the land use planning system; and, reduce the cost of remediation.

ii) **Affected Parties**:
Individuals or groups whose lifestyles or businesses or land use occupance practices may be positively or negatively impacted by watershed management decisions. This group includes private landowners, farmers, resource users, business and industry, developers and real estate agents.

Figure 2
Watershed Projects
- Ontario

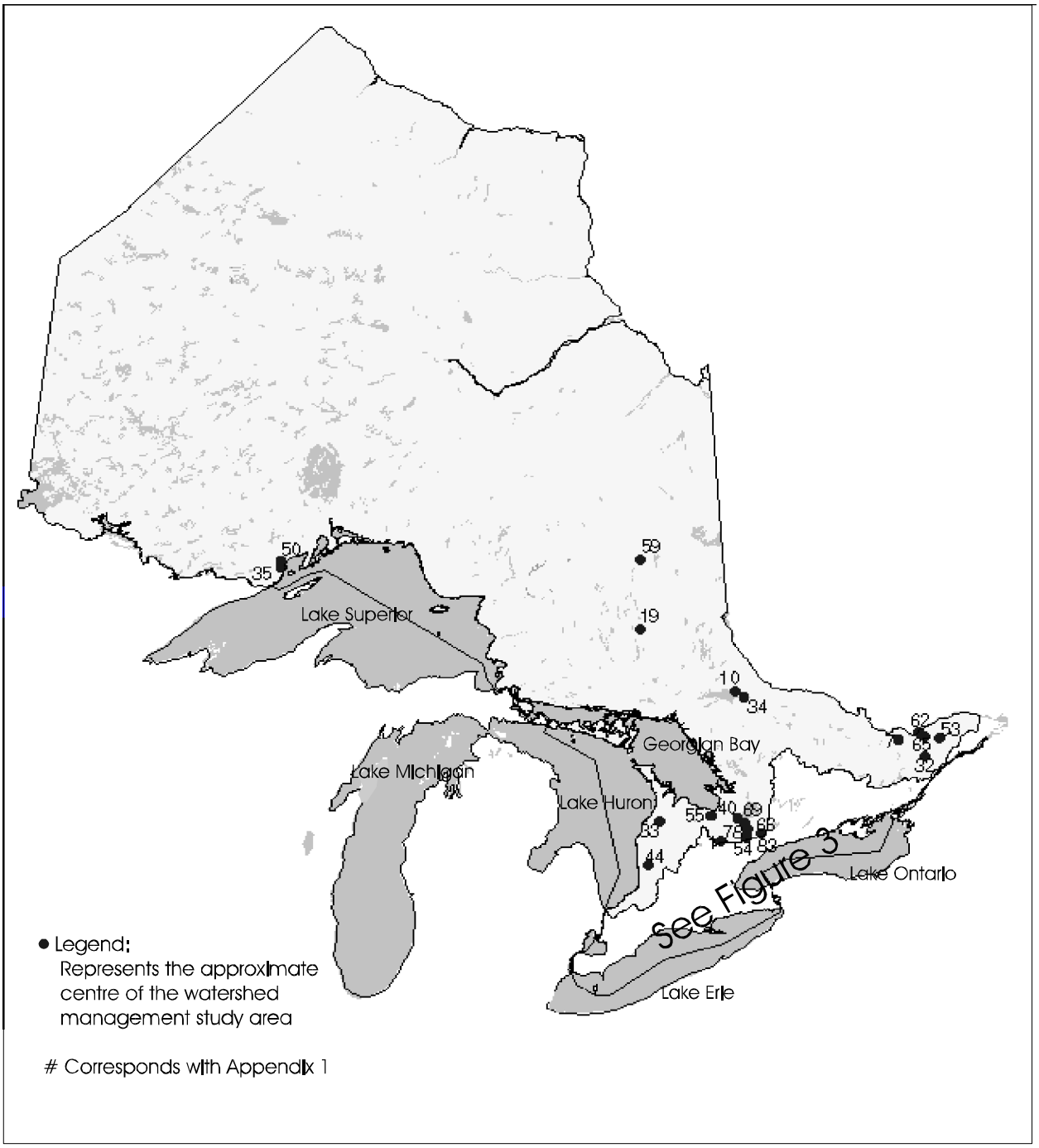
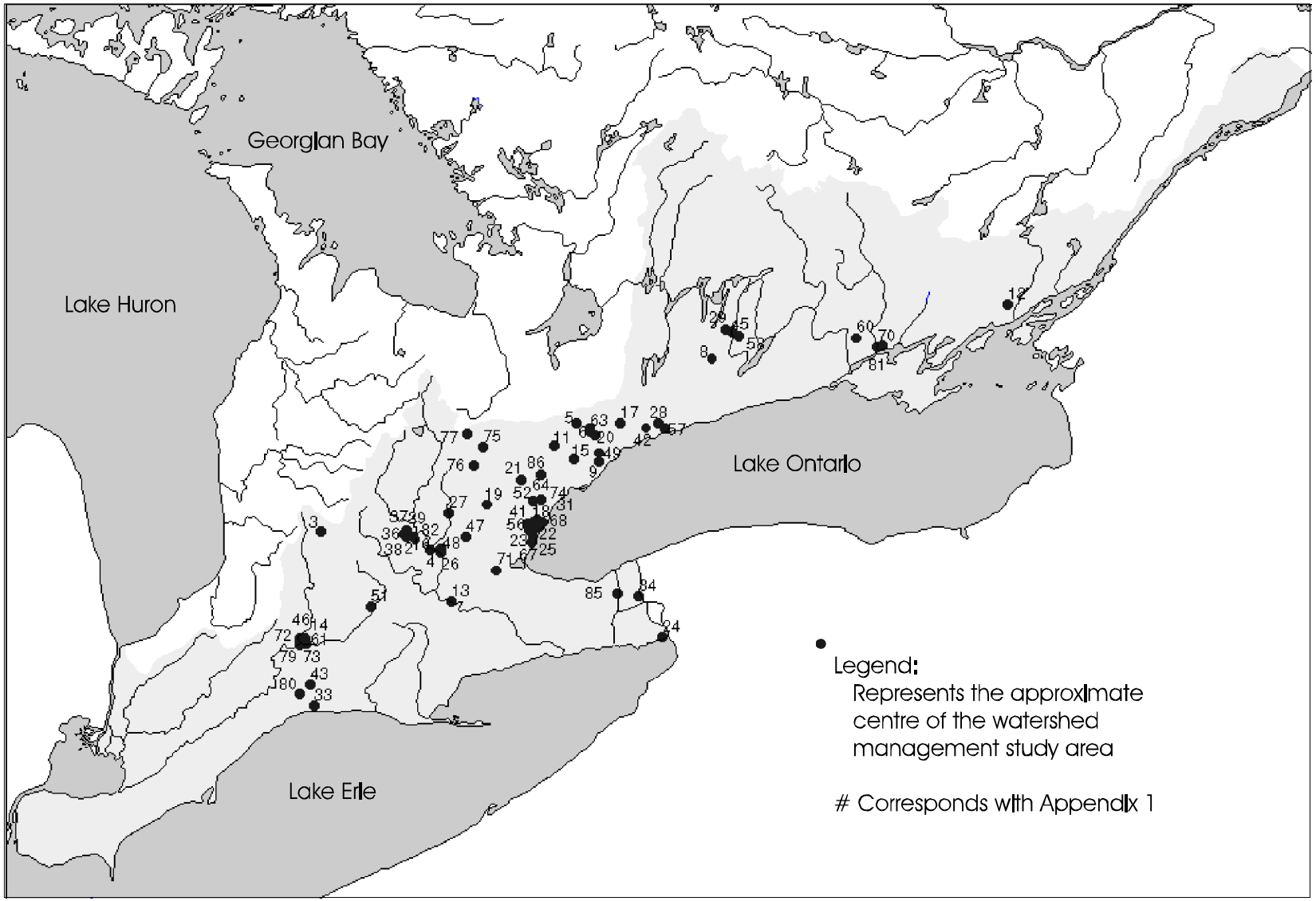


Figure 3
Watershed Projects
Southern Ontario



Needs: To represent the views of landowners and the agricultural community; protect resources from land use changes; improve water quality and quantity; prevent environmental degradation; address private landowner rights; stream-line approvals processes; and, reduce barriers to development, protection and management in the watershed.

iii) **Special Interest Groups**:
"Friends of" and non-government organizations (NGO's).

Needs: To protect recreational green space; and, establish criteria for development and land use change, which is sensitive to form, function, existing and proposed uses of the environment.

iv) **Community Members**:
Residents of the watershed.

Needs: Some stated that there was a need to restore water quality and ecosystem integrity and to prepare watershed plans with common sense and a sense of economic reality, while others did not understand or saw no need for watershed management in their community.

5. HOW WELL DOES WATERSHED MANAGEMENT MEET THE NEEDS OF STAKEHOLDERS AND PARTICIPANTS?

5.1 Planning Process, Scope and Products

At the time of the survey, the pilot project participants had only been involved in the early phases of watershed/subwatershed management, namely:

- identifying issues;
- collecting background data;
- setting terms of reference;
- establishing project scope;
- forming steering and technical committees;
- identifying needs for additional field studies and outside technical assistance; and,
- detailed studies.

As a result, a number of the participants were not able to state whether the watershed management approach had succeeded in meeting their needs, as the pilot project planning process had not been completed. They did share their opinions concerning the planning process based upon their experiences up until the time of the survey. However, several participants, practitioners and members of the Task Groups had personal experience with completed watershed or subwatershed studies and were able to provide additional guidance around planning, implementation and benefits.

Conservation authority staff recounted positive experiences, citing the following benefits of watershed management: 1) partnership formation among agencies; 2) role and responsibility

clarification; 3) information sharing; 4) greater stakeholder involvement; and, 5) consensus building.

As well, participants described what they expected the benefits of watershed management to be. The three benefits most consistently mentioned were:

- assists in providing an efficient, streamlined land use and development approval process;
- improved water quality; and,
- improved quality of life.

These anticipated benefits appeared to reflect not only the environmental, economic and social values of the watershed management initiative, but also those of the community. Watershed planning is a key proactive tool to manage water.

Other stated anticipated benefits included:

- increased use of naturalized channels and stormwater management thus avoiding expensive flood control and remediation measures;
- improved farm practices;
- reduced infrastructure capital and maintenance costs;
- improved tourism;
- increased opportunities for passive recreation;
- superior process for resolving conflicting views;
- a mechanism to integrate multi-disciplinary and multi-jurisdictional concerns;
- integrated water resource management across political boundaries;
- linkage between water resource protection and water servicing; and,
- a more comprehensive approach than the piecemeal approach of traditional site specific planning and development approvals processes.

Many of the participants made recommendations for improving the process of preparing watershed and subwatershed plans. These included:

- watershed/subwatershed management needs to be more clearly defined, stating what should be included as part of the study;
- name the process something other than "planning" as planning is often viewed with scepticism and negativity;
- the project scope needs to be realistic;
- reduce the plan preparation time and cost;
- improve mechanisms and opportunities for public consultation throughout the process;
- ensure that the process is open;
- ensure that a wide cross-section of the community and key people are present and involved in plan preparation;
- reduce the number of government requests for public consultation;
- take action, don't just plan; and,
- offer financial compensation when landowners must change land use practices to accommodate watershed management objectives.

For other studies that have moved into the implementation phase, particularly in the areas of Waterloo, Greater Toronto, Kingston and Ottawa-Carleton, watershed management is being credited with a number of benefits including:

- urban land developments that have featured the increased protection of local areas such as watercourses, valleylands, wetlands, woodlots and greenspace while maintaining viable development opportunities;
- open, fair and scientifically-supported resolution of competing community interests without the need for costly referrals to the Ontario Municipal Board;
- reduction in capital expenditures needed for storm drainage works; and,
- speedier and more straight-forward development approvals once the watershed plan is in place and endorsed by the participating agencies.

Most stakeholders and participants agree both benefits and costs need to be tracked and opportunities sought for improving efficiency and effectiveness.

5.2 Resources

5.2.1 Financial

Funding Sources

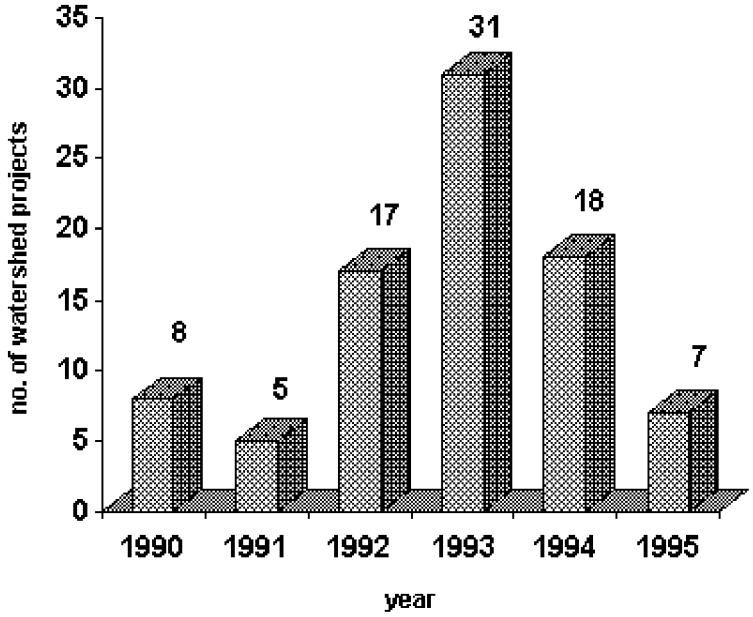
In the past, funding of watershed plans was supported through provincial (MNR) transfer payments to conservation authorities in combination with municipal levy support. Funding requests in recent years far exceeded available grants. In 1995, only 18% of the total costs of grant requests could be accommodated, resulting in 13 watershed and 11 subwatershed projects being funded with most of these being studies continuing from the previous year. Funding for the seven pilot projects was provided by the above grant process. As outlined by the Provincial Treasurer in the Fall Economic Statement, 1995, transfer payments to the Conservation Authorities will be reduced in 1996, and as of 1997 will not be available for watershed or subwatershed planning projects.

Some watershed studies were funded by other provincial ministries (MOEE, MMAH), federal agencies and the land development industry.

It is not yet possible to determine whether funding for the pilot projects was adequate to prepare effective watershed plans.

Figure 4 identifies watershed projects commenced since 1990. An inventory of these projects is included in Appendix 1.

Figure 4: Initiation of Watershed Management Projects



Stakeholders and participants suggested the following alternative sources of funding: license and user fees; *Development Charges Act* and/or special levies applied to studies with water related impacts; royalties for water use earmarked for watershed studies including implementation; partnerships with non-government organizations, infrastructure proponents, the education system and local stakeholders; a provincial lottery called "Watario"; and, reallocation of existing federal/provincial/municipal resources on a watershed management basis.

Total Watershed/Subwatershed Management Costs - Are They Realistic?

Watershed plan preparation can be expensive, however, it is a fraction of future benefits achieved by preventing environmental degradation and greatly reducing the need for costly remediation. Preliminary estimates of the total cost of the pilot projects ranged from $160,000 to $420,000. These estimates compare favourably with figures available from other similar completed projects.

Individual component costs varied based on the specific needs of each project. While project costs vary due to the complexity of issues in the watershed, level of detail of the study and amount of available data, it is important to manage costs and to be able to justify costs and to demonstrate project benefits to stakeholders. For example, options to assist in reducing overall project costs include:

- establish funding mechanisms to set limits to project and component costs;
- provide project managers with component costs information;
- provide a generic introduction for watershed plans to avoid "reinventing the wheel" (ie.

impact of urban development); and,
- maximize the amount of the project which can be completed in-house (ie. background study, terms of reference development) or by other in-kind contributions.

The range for each component is identified in Table 1. These costs were reported in the early phases of the pilot projects and are estimates only.

The opportunity exists to more effectively allocate funding to project components to ensure that existing funding "goes further". Project funding guidelines would assist project managers to:
- reduce the proportions of the budget project allocated to hydrogeology, analysis and public consultation components;
- reduce the project management proportion of funding; and,
- increase the budget allocated to the development of implementation and monitoring plans.

Table 1 - Component Costs

PROJECT COMPONENT	COST RANGE
Background Data Collection	$13,500 - 48,700
Hydrology/Hydraulic Studies	$0 - 59,000
Ecological Resources Studies (Aquatics/Terrestrial)	$3,600 - 54,100
Hydrogeology Studies	$0 - 113,800
Analysis	$2,000 - 88,500
Public Consultation	$5,500 - 34,300
Project Management	$24,000 - 111,000
TOTAL PROJECT COSTS (includes miscellaneous costs)	$160,000 - 420,000

5.2.2 Human

Roles and Responsibilities, Leadership, Level of Participation, Effective Use of Human Resources

Human resources were best utilized through specific committee structures. It was observed that a steering committee made up of senior agency representatives and political members to provide overall study guidance, and a technical committee with 6-10 people to provide specific technical expertise worked well. The use of smaller working or issue-specific sub-groups should be increased to ensure maximum involvement of participants.

The selection of the project leader was the single most important decision to successfully carry out a watershed management study. Effective leaders encouraged consensus building and issue resolution by leading participants through each phase of the project, ensuring that each

stakeholder interest and concern was understood, and if possible, addressed. This was not always possible and some participants reported that single-interest groups exerted disproportionate influence over the decision making process. Where project leaders were not as strong, many relied on technical or scientific members to resolve conflicts.

In successful initiatives, participants represented a wide cross section of the community and had influence over all aspects of the plan development including allocating human and financial resources and establishing issue priorities. In some communities, matching volunteer participant's skills and interests to study information needs helped save project budget resources for the more expensive or highly technical components.

Generally, clear definition and better communication of the roles and responsibilities of participants is required. All participants should be assured of equitable participation and consideration of ideas. In some areas, the participant's ability to influence was determined by the level of financial contribution or proficiency at lobbying. Again, "in-kind" contributions need to be recognized and valued.

Recognition of the role that the public and decision makers play in watershed management can increase study awareness and improve community buy-in.

Generally, provincial resources and commitment to watershed management were seen to be lacking. Ministry roles need to be defined and clearly communicated. Stronger provincial commitment is needed to provide technical expertise and guidance, and to improve access to existing data.

Involvement and Communication Techniques

The roles of stakeholders should be clearly identified at the outset of community involvement programs. Watershed plans were most successful when supported at both the local and provincial levels. Strong local support was achieved through an open planning process when: project purpose and participant roles were communicated early and throughout the process and in plain language; opportunities to participate directly were provided to all potentially interested businesses and residents within the communities; and, the communities were kept involved and informed of progress. When this did not occur, projects suffered from unresolved conflicts and less community commitment.

Stakeholder Understanding

Stakeholder understanding of watershed management could be improved by providing:

- more complete information about the benefits of watershed management;
- definition of the scope of watershed management; and,
- more effective awareness, public education and communication programs on watershed functions and management.

In general, a clear, practical definition of watershed management is needed which specifies the scope of the projects and defines what is included in each phase of the watershed management process. More specifically, participants requested information including:

- an overview of watershed management directed to laypeople;
- what citizens can do to improve the quality of water in their watershed;
- information to stakeholders on the impacts of watershed management;
- roles and responsibilities of watershed management partners;
- land stewardship mechanisms;
- linkages to existing programs; and,
- information on other watershed studies, ongoing and completed.

5.2.3 Information

Were the Guidance Documents Useful?

All the pilot project participants reported that the Guidance Documents were used. Most participants found the Guidance Documents to be adequate, while others suggested fine tuning the documents. Other watershed management stakeholders who were surveyed felt that additional guidance was needed to address:

- how to complete a project on time and on budget;
- how to reduce the cost of watershed management;
- compatibility with provincial policy statements;
- the role of participants; and,
- sample terms of reference for the study and composition of committees.

Specific recommended improvements to the Guidance Documents can be found in the three Task Group Reports.

Scientific Data

A common theme among all Task Groups was the difficulty and high cost of obtaining existing resource and environmental data and carrying out additional field investigations. This difficulty may be resolved by establishing a centralized inventory and/or network of relevant data which would list available data, and identify the location and format of the data.

Information Needs and Availability

Using locally based, existing information and expertise early in the process was the best method of saving money and time researching information and in developing community support and stewardship for the project.

Overall, there is a need for information to be shared among watershed management participants to reduce the time and expense of navigating through a new watershed management experience for the first time. Commonly, first time exercises spent too much time, money and effort on data collection and project management, leaving less for other phases of the study. While costs of certain study components are somewhat fixed, identifying data needs, availability and collection costs early in the study may assist in controlling these costs. The experience gained in recent watershed management studies and research projects

has demonstrated the feasibility of transferring knowledge of watershed functions and transferring interactions to similar watersheds to reduce costs of studies.

Typical data required for watershed management may include:

- topographical base mapping;
- boundary mapping (watershed, conservation authority, municipalities);
- land use;
- hydrology/hydrogeology;
- surface water;
- well records;
- recharge/discharge areas;
- aquatic resources;
- terrestrial resources;
- wetlands;
- Environmentally Sensitive Areas (ESAs); and
- geomorphology.

Specific information requirements are largely dependent on the conditions and issues of the watershed studied. The most difficult data to access is hydrogeological data. There is a need for research and information on hydrogeology relating to surface/groundwater interactions, quality/quantity, location and cross-watershed boundary information.

Geographic Information Systems (GIS) are not used to full capacity and often are only used for storage and display of data. Municipalities may not have the financial resources or staff time/expertise to fully utilize GIS. Improved data standards to address scale problems, data conversion technology and increased training may lead to more effective GIS use.

In general, most stakeholders looked to the Province to help identify the need and location of information. A general lack of coordination of information resources was identified. Data was reported to be inaccessible, inconsistent, and not synthesized. Effort should be made to better communicate and coordinate the availability of information. Provincial initiatives like Ontario Land Information Services (ONLIS) should be utilized and coordinated with other provincial and local initiatives such as Ministry Web Site Home Pages.

5.3 Watershed Science and Technology Components

The Science and Technology Task Group reported on the relevance and application of the most up to date science related to watershed management. A conceptual approach to watershed management focuses on the interrelationships of air, water, land and living things. Ten essential scientific components of watershed management were identified: aquatics, terrestrial, hydrology, stream morphology, water quality, groundwater/hydrogeology, economics, social, mapping and data management, and integration. Descriptions of these terms are found in the Glossary of Terms.

Each of these components was assessed by the Science and Technology Task Group with respect to the state, and the applications, of the science to watershed management. The Task Group report covers this assessment in some detail and describes specific improvements for the

components in their application to watershed and subwatershed management in Ontario.

The components of **aquatics, hydrology, and water quality** in watershed management generally reflect the state-of-the-art science. Small improvements in these components will enhance watershed management including: improved ability to predict impacts of watershed management proposals on aquatics and water quality, and groundwater and surface water interactions.

For the components of **terrestrial, stream morphology, groundwater/hydrogeology, economics, social, mapping and data management** in watershed management, the current application is lagging behind state-of-the-art science. Significant improvements are needed in these six components of watershed management. The Task Group report details the specific recommendations for each component.

An integrative approach to watershed management looks at the interrelationships among the components of air, water, land, living things and communities within the watershed. The science of **integration** is new, but emerging quickly. Integration in watershed management is variable, and often rudimentary.

There are a number of key ways in which integration can be improved, along with interim measures to help practitioners make decisions in the face of scientific uncertainties. For example, self-evaluation of successes and failures — such as an analysis of how integration has been addressed in existing watershed and subwatershed studies — would be useful to those working in the field and would help to develop more effective approaches. This will lead to improvements in integration which are required if cumulative effects are to be assessed on a watershed basis over time.

In summary, the scientific and technical components of watershed management need improvement in the following areas:

- predictive modelling and impact analysis for watershed management proposals;
- interactions/linkages among components;
- development of resource valuation methods, eg. assigning monetary values to natural resources;
- Geographic Information Systems technology and expertise;
- integration of the scientific and technical components in watershed management; and,
- economics of prevention versus remediation approaches achieved through watershed management.

5.4 Implementation and Monitoring

Watershed management activities should include processes to implement the watershed plan. A variety of implementation mechanisms are in use and were identified by stakeholders and participants:

- municipal land use planning;
- community and private land stewardship activities;
- project and works approvals under other environmental and resource management statutes;
- watershed report cards; and,

- landowner assistance programs.

Some stakeholders and participants gave consideration to implementation mechanisms, and some made their support for watershed management conditional on the success of implementation.

Monitoring was not generally considered during the plan development stage. Both environmental impacts and administrative mechanisms need to be regularly reviewed. Biophysical and administrative monitoring includes assessing the effectiveness of study implementation and the ongoing review of the relevancy of the plan. There is a need for monitoring guidelines.

6. CONCLUSIONS

The following key conclusions arise from the evaluation of recent watershed management experiences.

1. Watershed management is supported by the majority of stakeholders. Incorporation of ecological principles should be universally included.

2. When smaller scale and isolated land development is imminent, the majority of stakeholders accept site-specific or development-specific approaches, in an ecosystem context, as necessary alternatives to comprehensive watershed management.

3. There was broad support from stakeholders for continuing a locally initiated, community driven voluntary process of watershed management supported by the Province. Since the Guidance Documents were prepared, the lessons learned over the last three years should be included in a Watershed Management Kit, along with materials which would: clearly identify relevant government agencies and their roles and responsibilities; provide helpful advice on maximizing stakeholder input and involvement; list most probable sources of data, mapping and other information relevant to the study area; include an inventory of completed and ongoing watershed and subwatershed studies with essential facts and contact names; and, provide case studies to demonstrate successful approaches to reduce costs, better scope studies, ensure public participation, effective implementation and monitoring.

4. Some stakeholders suggested improving watershed management in the following areas: better scoping of study direction to reduce costs; providing strong study leadership and coordination; and, allowing for meaningful involvement of all stakeholder interests.

5. Environmental and resource management data should be accessible, current and in a consistent format.

6. With the present focus of the provincial government on deficit reduction, fiscal restructuring and redefinition of its key business, watershed management partners expect the Province to set out clear roles and mandate statements for each Ministry involved in watershed management.

7. The Province should: establish a continuing forum for the exchange of information and experience; support the continued advancement of the science of watershed management; provide policy, scientific and technical support to watershed management initiatives; and, analyze the environmental, social and economic benefits of watershed management.

8. Ministries, conservation authorities, municipalities and non-government organizations collectively need to look for opportunities to integrate and use existing service delivery programs to assist and to facilitate the implementation of watershed management recommendations.

   Such opportunities include education and awareness programs, assistance to landowners with respect to making changes to land use practices, research on rural and urban best management practices, innovative approaches to secure the long term protection of the natural environment, as well as public works spending.

7. NEXT STEPS

Future Provincial Role

Since the commencement in 1993 of the Watershed Management Initiative evaluation process, the Province has refocussed its roles and responsibilities in land use planning which is reflected in the following future provincial role for watershed management.

1. In the future, locally initiated, community driven, ecosystem-based watershed management should be supported and encouraged by the Province.

2. MNR, MOEE and MMAH should jointly provide leadership for watershed management initiatives, and develop, maintain and distribute a Watershed Management "How to Kit".

3. Opportunities to exchange information on watershed management will be actively pursued.

4. Monitor and re-evaluate the role of the Province in watershed management within five years.

Watershed Management "How to Kit" Contents

The Ministries of MOEE, MNR and MMAH should develop a Watershed Management "How to Kit" which would be made available on Ministry Web Site Home Pages. The Kit will include products such as: a layperson's guide to watershed management, community outreach documents (newsletters, factsheets, technical bulletins), an electronic data base, case studies, technical documents, and decision support systems. It is anticipated that some of these products could be made available in the Fall of 1996.

GLOSSARY OF TERMS

Aquatics: the application of aquatic ecology (study of organisms living in or near water in relation to each other and their environment) and biology and the study of aquatic systems and communities within a watershed.

Catchment area: an area from which precipitation drains into a river or body of water.

Community: refers to all individuals, including stakeholders, business, government, taxpayers and children, living or working within a defined geographic location.

Economics: the study of the economic aspects (e.g. valuation of natural capital and the cost of natural resource depletion) of a watershed, including the analysis of economic impacts of activities or plans, and the assessment of economic values.

Ecosystem approach: views the ecosystem as composed of air, water, land and living organisms, and the interactions among them. It is the basis for environmental protection and resource management. Ecosystem management requires consideration of cumulative effects on the physical, chemical and biological components and the relationship among the environment, the economy and society.

Groundwater/Hydrogeology: the study of sub-surface water within a watershed, its occurrence, movement and chemistry and the factors that influence it including interactions with surface flow systems (e.g. rivers, streams and creeks).

Hydrology: the study of surface water flows in a watershed and influences on flows.

Integration: the study of the entire watershed including the interrelationships between all the scientific components of watershed management.

Mapping and Data Management: the use of systems to collect, analyze, interpret and store data and to provide spatial graphical representations of data.

Social: the study of social values, social impacts, local knowledge, demographics, cultural heritage, resource use, social structures and other aspects of communities living within a watershed.

Stream Morphology: the study of mechanisms that operate as a result of water and sediment movement within a stream channel.

Sustainable: ecological sustainability is the desired outcome of management decisions and human activities that place importance on the long term health of the environment and the natural resource base. Ecological sustainability contributes to sustainable development and economic stability.

Terrestrial: the application of terrestrial ecology (study of organisms living or growing on land in relation to each other and their environment) and biology, or the study of terrestrial systems and communities within a watershed, and connections to other systems outside the watershed.

Water Quality: the management of water through the study of the physical, biological and chemical characteristics of waters in a watershed.

REFERENCES

Coordination, Resources and Effectiveness Task Group, August 1995, Report of the Watershed Planning Initiative Coordination, Resources and Effectiveness Task Group.

Relevance and Responsiveness Task Team, Final Report of the Watershed Planning, December 1995, Initiative Relevance and Responsiveness Task Team.

Science and Technology Task Group, April 1995, Final Report of the Watershed Planning Initiative Science and Technology Task Group.

Watershed Planning Initiative Coordination Team, October 1994, Watershed Planning Initiative Evaluation Plan.

Copies of these reports may be obtained from the Ministry of Environment & Energy Public Information Centre at (416) 325-4000 or 1 800 565 4923, or the Ministry of Natural Resources Public Information Centre at (705) 755-2000 or 1 800 267 1940.

APPENDIX 1

INVENTORY OF WATERSHED MANAGEMENT IN ONTARIO

#	INITIATION DATE	PROJECT NAME	LEAD AGENCY	STATUS	MNR DISTRICT	MOEE REGION
1	01-Jun-92	ALCONA MASTER DRAINAGE PLAN	Town of Innisfil	completed	Midhurst	South West
2	01-Oct-95	ALDER CREEK SWP - PHASE 1	Grand River CA	ongoing	Cambridge	West Central
3	01-Jan-93	AUSABLE-BAYFIELD WSP REVIEW	Ausable-Bayfield CA	completed	Aylmer	South West
4	01-Jan-93	BLAIR-BECHTEL CREEKS WSP	Grand River CA	completed	Cambridge	West Central
5	01-Oct-93	BRUCE CK ENVMTL MGMT. PLAN	Town of Markham	completed	Maple	Central
6	01-Oct-93	BURNDENET CK ENVMTL MGMT. PLAN	Town of Markham	completed	Maple	Central
7	01-Jan-93	CARP RIVER BASIN STUDY	Mississppi Valley CA	ongoing	Kemptville	East
8	01-May-95	CAVAN CK & OTONABEE RIVER SWP	Otonabee Region CA	ongoing	Tweed	East
9	01-Jun-93	CENTENNIAL CREEK SWP	City of Scarborough	ongoing	Maple	Central
10	01-Jul-94	CHIPPEWA CREEK SWP*	North Bay-Mattawa CA	ongoing	North Bay	Northern
11	01-Jun-92	CITY OF VAUGHAN SW STUDY	City of Vaughan	completed	Maple	Central
12	01-Jan-90	COLLINS CREEK WS STUDY	Cataraqui Region CA	completed	Tweed	East
13	01-Jan-90	D'AUGBIGNY CREEK SWP	Developer	completed	Cambridge	West Central
14	01-Sep-92	DINGMAN CREEK SW STUDY	City of London	completed	Aylmer	South West
15	01-Jan-92	DON RIVER WS STRGY	Metro Toronto and Region CA	completed	Maple	Central
16	01-Jan-93	DOON SOUTH CREEK SWP	City of Kitchener	completed	Cambridge	West Central
17	01-Jan-90	DUFFINS CREEK WS STUDY	Metro Toronto and Region CA	ongoing	Maple	Central
18	01-Apr-94	EAST MORRISON CREEK SW STUDY	Town of Oakville	completed	Maple	Central
19	01-Jan-94	ERAMOSA RIVER WS STUDY	Grand River CA	ongoing	Cambridge	West Central
20	01-Oct-93	EXHIBITION CK ENVMTL MGMT. PLAN	Town of Markham	completed	Maple	Central
21	01-Jun-92	FLETCHERS CREEK SWP	City of Brampton	completed	Maple	Central
22	01-Jan-90	FOURTEEN MILE AND McCRANEY CKS WSP	Town of Oakville	completed	Maple	Central
23	01-Jan-93	FOURTEEN MILE/TAPLOW/McCRANEY CKS SWP	Town of Oakville	completed	Maple	Central
24	01-Jan-92	FRENCHMAN'S CK WS MGMT PLAN	Friends of Fort Erie's Creeks	ongoing	Cambridge	West Central
25	01-Apr-92	GLEN OAK CREEK SWP	Town of Oakville	completed	Maple	Central
26	01-Sep-94	GRAND RIVER STRATEGY	Grand River CA	ongoing	Cambridge	West Central
27	01-Jun-90	HANLON CREEK WSP	City of Guelph	completed	Cambridge	West Central
28	01-Jan-94	HARMONY AND FAREWELL CKS WSP	Central Lake Ont. CA	ongoing	Maple	Central
29	01-Sep-95	HARPER CREEK SW PLNG STUDY	Otonabee Region CA	ongoing	Tweed	East
30	20-Apr-94	JOCK RIVER WS MGMT STUDY*	Rideau Valley CA	ongoing	Kemptville	East
31	01-Jan-91	JOSHUA'S CREEK WSP	Town of Oakville	completed	Cambridge	Central
32	01-Jan-93	KEMPTVILLE CREEK WSP	Rideau Valley CA	ongoing	Kemptville	East
33	01-Jun-93	KETTLE CREEK	City of London	completed	Alymer	South West
34	01-Jan-91	LAKE NOSBONSING WS MGMT PLAN	North Bay-Mattawa CA	completed	North Bay	Northern
35	01-Jan-91	LAKEHEAD REGION WS STRGY	Lakehead Region CA	completed	Thunder Bay	Northern
36	01-Jun-92	LAUREL CREEK SUBWATERSHEDS #309/313	City of Waterloo	completed	Cambridge	West Central
37	01-Jan-94	LAUREL CREEK SW #311	City of Waterloo	completed	Cambridge	West Central

#	INITIATION DATE	PROJECT NAME	LEAD AGENCY	STATUS	MNR DISTRICT	MOEE REGION
38	01-Jan-94	LAUREL CREEK SW #314	City of Waterloo	ongoing	Cambridge	West Central
39	01-Jan-91	LAUREL CREEK WS STUDY	Grand River CA	completed	Cambridge	West Central
40	01-Jun-93	LOVERS & HEWITTS CKS MASTER WSP*	Lake Simcoe Region CA	completed	Midhurst	South West
41	01-Jan-90	LOWER MORRISON AND WEDGEWOOD CKS SWP	Town of Oakville	completed	Maple	Central
42	01-Jan-94	LYNDE CREEK WS MGMT STUDY	Central Lake Ont. CA	completed	Maple	Central
43	01-Sep-94	LYNHURST AREA SW STUDY	Central Elgan Planning Office	completed	Aylmer	South West
44	01-Jan-92	MAITLAND VALLEY ECOSYSTEM HEALTH PROJECT	Maitland Valley CA	completed	Cambridge	West Central
45	12-Nov-93	MEADE CREEK WSP	Otonabee Region CA	ongoing	Tweed	East
46	01-Sep-93	MEDWAY CREEK SWP	City of London	completed	Alymer	South West
47	01-Nov-93	MILL CREEK SW STUDY*	Grand River CA	completed	Cambridge	West Central
48	01-Jan-90	MOFFAT CREEK WSP	Developer	completed	Cambridge	West Central
49	01-Jun-93	MORNINGSIDE TRIB. SW STUDY	City of Scarborough	ongoing	Maple	Central
50	01-Jan-94	MOSQUITO CREEK WSP	Lakehead Region CA	completed	Thunder Bay	Northern
51	01-Sep-93	MUD CREEK SWP	City of London	completed	Alymer	South West
52	01-Jun-92	MULLET & LEVI CREEKS & MAIN CREDIT SW STUDIES	City of Brampton	ongoing	Maple	Central
53	23-Sep-93	NORTH CASTOR RIVER SWP	South Nation River CA	completed	Kemptville	East
54	01-Jan-94	NORTHWEST NEWMARKET SWP	Weston Larkin and Cosburn Patterson Mather	ongoing	Midhurst	South West
55	01-Oct-93	NOTTAWASAGA VALLEY WSP*	Nottawasaga Valley CA	completed	Midhurst	South West
56	01-Jan-95	OSENEGO CREEK SWP	Town of Oakville	completed	Maple	Central
57	01-Jan-94	OSHAWA CREEK WS MGMT STUDY	Central Lake Ont. CA	completed	Maple	Central
58	01-Aug-94	OTONABEE REGION WS STRGY	Otonabee Region CA	ongoing	Tweed	East
59	01-Jan-94	POLARIS CREEK SWP	Mattagami Region CA	completed	Timmins	Northern
60	01-Jan-92	POTTER CREEK WS STUDY	Moira River CA	completed	Tweed	East
61	01-May-93	POTTERSBURG CREEK	City of London	ongoing	Aylmer	South
62	01-Jan-92	RIDEAU VALLEY WS PLNG STRGY	Rideau Valley CA	completed	Kemptville	East
63	01-Oct-93	ROBISON CREEK SWP	Town of Markham	completed	Maple	Central
64	01-Jun-93	SAWMILL CREEK SWP	Credit Valley CA	completed	Maple	Central
65	01-Apr-92	SAWMILL CREEK WSP	Rideau Valley CA	completed	Kemptville	East
66	01-Jan-94	SHARON CK STRMWATER MGMT. STUDY	Town of East Gwillimbury	completed	Midhurst	South
67	01-Oct-91	SHELDON CREEK WS MASTER PLAN	City of Burlington	completed	Maple	Central
68	01-Jan-94	SIXTEEN MILE CREEK WSP	Region of Halton	completed	Maple	Central
69	01-Jan-95	SOUTH KESWICK DVLP AREA SWP	Metrus Management	ongoing	Midhurst	South
70	23-Nov-93	SOUTH SIDNEY WSP	Lower Trent Region CA	completed	Tweed	East
71	01-Jan-90	SPENCER CREEK WS MGMT STUDY	Hamilton Region CA	ongoing	Cambridge	West
72	01-May-93	STANTON DRAIN SWP	City of London	ongoing	Aylmer	South
73	01-Jun-93	STONEY CREEK SW STUDY*	City of London	ongoing	Aylmer	South
74	01-May-92	SUB-BASIN 8 OF JOSHUA'S CREEK SWP	Town of Oakville	completed	Cambridge	Central
75	01-Jan-92	SW NO. 12 PLAN	Credit Valley CA	completed	Aurora	Central
76	01-Jan-94	SW NO. 15 PLAN	Credit Valley CA	ongoing	Cambridge	Central
77	01-Jan-93	SW NO. 19 PLAN*	Credit Valley CA	ongoing	Midhurst	Central

#	INITIATION DATE	PROJECT NAME	LEAD AGENCY	STATUS	MNR DISTRICT	MOEE REGION
78	01-Jan-92	TANNERY CREEK SWP	Marshall Macklin Monaghan Ltd.	ongoing	Maple	Central
79	01-May-93	THAMES RIVER VALLEYLANDS STUDY	City of London	ongoing	Aylmer	South
80	01-Jun-93	UPPER DODD'S CREEK	City of London	ongoing	Aylmer	South
81	01-Jan-93	UPPER NO NAME CREEK WS STUDY	Moira River CA	completed	Tweed	East
82	01-Jan-92	UPPER SHOEMAKER CREEK WSP	City of Kitchener	completed	Cambridge	Cambridge
83	01-Nov-95	UXBRIDGE BROOK WSP	Township of Uxbridge/Lake Simcoe	ongoing	Midhurst	South
84	30-Aug-93	WARREN CREEK WS MASTER PLAN	City of Niagara Falls	completed	Cambridge	West
85	01-Jan-95	WELLAND RIVER WSP	Niagara Peninsula CA	ongoing	Cambridge	West
86	01-Nov-93	WEST HUMBER RIVER SW STUDY	City of Brampton	ongoing	Maple	Central

* indicates pilot project

APPENDIX 2

WATERSHED PLANNING IMPLEMENTATION
PROJECT MANAGEMENT COMMITTEE MEMBERSHIP

Name	Affiliation
Mel Plewes (Chair)	Ministry of Environment & Energy
Karen Abrahams	Ministry of Natural Resources
Laura Atkins	Ministry of Municipal Affairs & Housing
Hazel Breton	Association of Conservation Authorities of Ontario
John Hatton	Ministry of Environment & Energy
Maxine Kingston	Ministry of Agriculture, Food & Rural Affairs
John Kinkead	Ministry of Natural Resources
Pat Murphy	Association of Municipalities of Ontario
Karen Jones (Secretary)	Ministry of Environment & Energy

Additional Contributors

Raymond Biette	Ministry of Natural Resources
Patrick Donnelly	Association of Conservation Authorities of Ontario
Gordon Framst	Ministry of Agriculture, Food & Rural Affairs
Don Greer	Ministry of Natural Resources
Valerie Gust	Ministry of Natural Resources
Sue Harrison	Ministry of Municipal Affairs & Housing
Geoff Kettel	Ministry of Natural Resources
Rob Messervey	Ministry of Natural Resources
Phyllis Miller	Ministry of Environment & Energy
Wendy Moss	Ministry of Environment & Energy
Zdenek Novak	Ministry of Environment & Energy
Paul Odom	Ministry of Environment & Energy
Mike Seto	Ministry of Environment & Energy
Bill Snodgrass	Ministry of Transportation
Elizabeth Stanley	Ministry of Environment & Energy
Heather Stanworth	Ministry of Natural Resources
Stewart Thornley	Ministry of Environment & Energy